Management of Ecosystem Evolution:

The Effect of Macro and Micro Influencers on a Firm's Ecosystem Management Activities

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Declaration of Originality

I confirm that the research and text in this thesis solely belong to myself, except the content and format-based suggestions of the supervisors. Any form of contributions of others are properly acknowledged within the text.

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To my son,

To my father,

And to the great memory of Professor Mike Wright

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Abstract

This thesis intends to contribute to the academic understanding of a recent buzzword: ecosystems. It addresses how ecosystem evolution is led by organisations under various macro and micro level effects, such as the institutional context, ecosystem formation, or individual employees. The thesis aims to address the direction of these effects via a compilation of three separate research papers with different methodological approaches.

The first study is a systematic literature review in the form of a thematic synthesis, and provides a general outline of how the ecosystem management of a central organisation has been considered in previous research throughout an ecosystem's emergence, development and renewal/decline stages. It suggests that the cooperation or competition orientation in the business model of the ecosystem is determined by the ecosystem type, value complexity and relative resource power of the organisations.

The second abductive study investigates how competing ecosystems of a home country spread in a different economic context. The research focuses on ecosystems that originate from a developed economy, and compete in an emerging economy with institutional voids. It argues that institutional conditions in the destination economy and the business logics of the ecosystems interplay to determine ecosystem establishment and spread by affecting entrepreneurial activities.

The third study is concerned with individuals, especially the impact of employees on the ecosystem evolution of large companies. The quantitative case study shows the nature and demographic sources of evolution in the lower organisational hierarchies.

Overall, the thesis focuses on the firm as an actor that guides the evolution of its ecosystem via its decisions which are affected by institutional, ecosystem-based and individual level influencers. Mechanisms and contingencies are identified within the emergent framework.

Table of Contents

List of Tables

List of Figures

1. Introduction

1.1. Theoretical Background of Ecosystem Management Research

Since it was first used as an analogy by James Moore in 1993, scholars increasingly use and pay attention to understanding the ecosystem concept parallel to its increasing popularity among practitioners. Basically, it is considered to be the largest form of an organisation's environment as a community of stakeholders, including any entities that affect and enable the operation of the organisation within a modular relationship (Ansari et al., 2016; Furr & Shipilov, 2018; Jacobides et al., 2018; Parente et al., 2018). Thus, the ecosystem lens enables us to study various relations, including complementors, institutional and legal actors and other stakeholders, demonstrating a more realistic and holistic view of business (Attour & Della Peruta, 2016; Rong et al., 2015; Schwartz & Bar-El, 2015). Particularly with the emergence of platforms and IT industries, ecosystems are becoming more relevant for management scholars to study the interdependence between organisations and their environment. This is because organisations increasingly take part in modular systems in which their value proposition and market performance depend on the capabilities, goals, decisions, and complementary contributions of other entities (Adner & Kapoor, 2010; Gyrd-Jones & Kornum, 2013; Nambisan & Baron, 2013).

Recently, much effort has been placed on illuminating how a firm adjusts its position and determines its actions relative to its ecosystem. Ecosystems have been instrumental in studying many management issues including, but not limited to, innovation activities (Adner & Kapoor, 2010), product development processes (Ihrig & Macmillan, 2017; Mantovani & Ruiz-Aliseda, 2016), investment decisions (Kukk et al., 2015), or the degree of co-opetition (Davis, 2016; Hong & Snell, 2013). In addition to the function of defining the boundaries, the term was coined with a strong emphasis on its evolutionary nature (Iansiti & Levien, 2004; Moore, 1993). As a result, it is also treated as a unit of analysis with its own life depending on managerial activities (Banoun et al., 2016; Parker et al., 2017). Nevertheless, to date, aside from platform studies, the emphasis has been more on how ecosystems affect the core organisation rather than the other way around (e.g. Adner & Kapoor, 2010; Gomes et al., 2018; Parente et al., 2018; Pera et al., 2016), thereby limiting the theoretical importance of ecosystems as an organism rather than an environmental boundary. The evolution and fate of an ecosystem in interaction with

intentional behaviours of its members from various levels still stand as important concerns (Rong et al., 2015; Wareham et al., 2014).

Today, various ecosystem forms are studied including business, entrepreneurial, platform or innovation. Although researchers pay attention to defining and distinguishing between these concepts (Aarikka-Stenroos & Ritala, 2017; Clarysse et al., 2014; Jacobides et al., 2018), controversies and conceptualisation struggles are ongoing around the term, showing academic immaturity and opportunities for development (Mars & Bronstein, 2018; Oh et al., 2016; Ritala & Almpanopoulou, 2017; Suominen et al., 2019). However there is a notable increase in the theorisations regarding ecosystems, mostly within a structural perspective, which is a sign for the relevance and strengthening of the term in the field of management (Acs et al., 2017; Adner, 2017; Autio et al., 2018; Brown & Mason, 2017; Jacobides et al., 2018).

While ecosystem theories are emerging, noteworthy confusions exist for studying its evolution. As the unit of analysis of the thesis, the literature treats ecosystems in two ways. The first dominant treatment takes ecosystems as a value centred unit to emerge and develop around a core value (Helfat & Raubitschek, 2018; Iansiti & Levien, 2004; Lepoutre & Oguntoye, 2018; Selander et al., 2013). In this view which is stronger in platform-based studies, scholars focus on a core value controlled by the ecosystem leader and the relationships around that core. This interpretation simplifies tracking the lifecycle of ecosystems, however, boundary definitions and firm level interpretations are problematic and constrained as the field of business is a complex network of such value-centred formations. The second operationalisation is firm centric such that it defines the embeddedness of the firm in its external environment. According to this perspective, regardless of their status in determining the core value, firms participate in their own ecosystems that capture all interactions affecting their value offering. The majority of these studies have a practitioner lens in describing innovation and business ecosystems (Adner & Kapoor, 2010; Azzam et al., 2017; Ihrig & Macmillan, 2017; Rong et al., 2015; Sanchez & Ricart, 2010; Zahra & Nambisan, 2012). This understanding is easy to interpret from the standpoint of a firm that connects many industries, and has more practical relevance, but can be hard to theorise. Although this distinction might entail selecting a focus, in this thesis we offer a perspective to integrate these diverging understandings by treating ecosystem evolution as a matter of degree.

1.2. The Position of the Thesis

This thesis joins the ongoing conversation on business ecosystems from an evolutionary perspective. Rather than a structural and static view, it considers the ecosystem as a manageable unit that interacts with macro and micro level elements (Huber et al., 2017). In other words, it aims to improve the understanding of ecosystems from the perspective of their evolution subject to organisations' managerial activities driven by various determinants with varying impacts. We develop this understanding through the mechanisms and contingencies identified in three studies presented in Chapter 2, 3 and 4.

First, as indicated, the ecosystem literature is quite fragmented with missing, immature or unclear issues that necessitate a synthesis. For example, there are many ecosystem types which require the understanding of common and diverging characteristics as well as behavioural differences in managing them (Aarikka-Stenroos & Ritala, 2017; Clarysse et al., 2014). Although theoretical studies on the concept exist that define the structure of ecosystems, studies on their manageability are largely empirical, dispersed and incomplete. In this respect, there are ambiguities in the literature about ecosystem evolution. The mechanisms that bind the ecosystem are unclear (Rong et al., 2015), the stream is weak in terms of the later evolutionary stages (Thompson et al., 2018), and the fragmented literature does not identify when competitive and cooperative intentions are stimulated despite co-opetition is suggested to be integral in ecosystem research (Gawer & Cusumano, 2014; Hannah & Eisenhardt, 2018). In the form of a thematic synthesis, Chapter 2 compiles existing studies on managing the ecosystem environment in a lifecycle model, and develops propositions aiming to tackle such weaknesses.

Second, the stream is reportedly weak in examining different contexts and institutional conditions (Autio et al., 2014; Sarma & Sun, 2017). This is an important negligence as contrary to the expectations of economic interpretations which imply that it is advantageous to participate in market leader ecosystems (Anderson & Tushman, 1990; Autio & Thomas, 2014; Gawer, 2014; Kang & Downing, 2015),

institutional voids might create unexpected spread outcomes across countries especially in emerging economies during establishment (Harrison et al., 2018; Khanna & Palepu, 2010; Rong et al., 2017). Chapter 3 is an attempt to patch this gap by studying the transfer of ecosystems from a developed economy to an emerging economy, and argues that regardless of the home market dominance of the ecosystems; the fit between ecosystem logic and the environment, and the management of institutional voids by entrepreneurs jointly determine the spread performance of ecosystems in emerging markets.

In Chapter 4, another important consideration is addressed, that is - the employee contributions to the management of ecosystems (Taillard et al., 2016). Many scholars indicate that employees can affect a firm's strategy and ecosystem relations, nevertheless we found no studies that explicitly discuss the demographic sources and nature of ecosystem evolution driven by employees (Cunningham et al., 2019; Reitzig & Sorenson, 2013; Wales et al., 2011). Having identified in Chapter 2 that the literature currently lacks a link between organisational behaviour and ecosystem management, Chapter 4 argues that, based on their cognition, learning and organisational tasks, even subordinates can influence the ecosystem of their companies within legitimate feedback mechanisms especially in improving the derived value from the ecosystem and determining specific external links.

Overall, in addition to responding to important shortcomings of the ecosystem stream, these contributions build a coherent story in understanding ecosystem management, which begins with the role of logical fit on the macro level, continues with determining the strategic orientation depending on ecosystem level factors, and finalises with the practical management of the relations at micro level.

1.3. Research Methodology

To clarify the nature of effects on the evolution of business ecosystems, the thesis asks the general research question: How do the effects of different levels shape the managerial activities of firms in evolving their ecosystems? More specifically, this research question aims to understand the limits and

directions of several forces on the management of ecosystems. The problem is approached from three different angles, presented under three subsequent sections of the thesis.

In this respect, Chapter 2 addresses the research question, which is also the broadest form of the topic of this thesis: How do organisations drive the evolution of ecosystems along their lifecycle?" While ecosystem research is becoming popular, it becomes messier and difficult to link. Hence, drawing on the abundance of empirical research, the chapter is organised as a comprehensive systematic literature review on how ecosystems are managed during their lifecycle. As it is also required by the breadth of the topic, the systematic review approach enables us to present the research accumulation and derive propositions by linking unconnected pieces of research (Tranfield et al., 2003). Consisting of 122 SSCI papers which are classified under 22 first-order themes, the study also demonstrates the level of development in the stream, and offers several propositions and future research directions.

Chapter 3 investigates the management of ecosystems from the perspective of entrepreneurs who set up ecosystems in countries with different economic conditions than the originating markets. It discusses the macro conditions that affect the management of an ecosystem in a given environment, and asks: "How do institutional voids impact the spread of a business ecosystem in emerging economies?" This research aims to understand the performance differences of various ecosystems across different economic conditions by taking an institutional perspective against the economic understanding. As required by the research question and current state of literature, this chapter is a qualitative case study within an abductive approach (Dubois & Gadde, 2014). Thus, the implications of existing research in ecosystems and institutional voids are improved by inputs from the empirical data which is obtained from the assistive technology industry in Turkey.

In the micro level, Chapter 4 aims to enlighten the ordinary employees' impact on understanding the evolution of ecosystems. It deals with three related research questions: 1) Who are more likely to be concerned with changing the organisation's ecosystem? 2) Who are more likely to apply their ideas on ecosystem evolution? and 3) What type of ecosystem changes suggested by the lower level employees are more likely to be implemented? Thus, this research discusses the link between the most micro entity

as the subordinates' ideas, and the broadest form of the organisational environment, which is the ecosystem (Ben Letaifa, 2014; Goncalves et al., 2019). As justified by the questions and availability of literature, this research is conducted in the form of a quantitative case study which is built upon several logit models. The empirical context is the suggestion system of a large airline company in Turkey, which let us make comparisons on a large dataset and employee demography.

Following the three studies that constitute Chapter 2, 3 and 4, the conclusions derived from the studies are synthesised in Chapter 5.

1.4. Contributions to Theory and Practice

Responding to future research calls on the mechanisms that are used to organise the building blocks of ecosystems (Rong et al., 2015), the effects of macro and micro level factors on ecosystem governance practices (Huber et al., 2017), and the interaction between diverse stakeholders during an ecosystem's formation (Pera et al., 2016); this thesis, in a general sense, develops a framework for the firm as an entity that transforms its inputs from macro, micro and ecosystem level sources, and affects the external environment to which it is embedded subject to the constraints from such levels. We utilise the ecosystem construct to analyse these effects since the concept allows tackling many entities that are in relation to the focal organisation (Gomes et al., 2018). The main idea is that to understand the limits of managing a firm's ecosystem, the macro, ecosystem-based and micro influencers need to be jointly considered. The strategies and effects of the firm in its ecosystem can be understood with the integration of these three levels.

First, scholars are aware of the need to study the evolutionary development of ecosystems, especially the later stages of the lifecycle, in terms of the conditions that enable co-creation (Marcos-Cuevas et al., 2016; Thompson et al., 2018; Wareham et al., 2014). Chapter 2 addresses these requirements by integrating the current state of literature on ecosystems within a lifecycle approach. It identifies the strengths and weaknesses in ecosystem research, and enriches the stream by outlining many contextual

dependencies on its evolution. Briefly, the study underlines that competitive and cooperative managerial behaviours of ecosystem constituents are determined by the ecosystem type, value complexity, and relative resource power of actors. By means of capability execution, knowledge sharing and business model development, organisations behave competitively when they have stronger relative resource power and when their value proposition is not complex, but invest in network development vice versa. The lifecycle stage is also influential as emergence favours cooperation while competitive behaviour is stronger in mature ecosystems. In addition, functioning of ecosystems depends on the need for complementarity, and hence its disappearance is a major threat to their fate.

Second, it is necessary to study various stakeholders such as the government, users and complementors, and various economic contexts for strengthening the theoretical relevance of ecosystems (Autio et al., 2014; Chen et al., 2016; Sarma & Sun, 2017). In this respect, examining entrepreneurial firms at the earlier stages of an ecosystem lifecycle may demonstrate the shaping of the environment as opposed to embedding in current conditions (Selander et al., 2013). Responding to such future research directions, Chapter 3 suggests that, constrained by the ecosystem's functionality or flexibility oriented logics, entrepreneurs affect the ecosystem's fate by acting to respond to institutional conditions in the macro environment. This is an alternative for the economic interpretation of ecosystems which stresses the effect of opportunities arising from diversity of niches (Hong & Snell, 2013; Kang & Downing, 2015). Besides, the research supports the institutional voids theory by illuminating how entrepreneurs deal with different void levels (Doh et al., 2017).

Third, the literature lacks an understanding of absorbing external knowledge derived from the ecosystem (Berzosa et al., 2012), employees' collective actions on shaping an ecosystem (Taillard et al., 2016), and the contributions of the lower levels in strategy determination (Hong & Snell, 2013). Chapter 4 responds to these research calls by illuminating the demographic sources of ecosystem evolution initiatives. It extends the strategic management and HR fields by pointing towards the effect of subordinates on a firm's relations with its environment. The chapter finds that lower level members improve the effectiveness of the relations and the value derived from the ecosystem, and upper managerial levels can actualise greater changes. Specifically, drawing on innovation development, inertia and cognition-based theories, we find that the authority and intra-organisational networks have

a positive impact on the likelihood of implementing ecosystem change, particularly incremental and internal-oriented initiatives. Upper management support may be influential in introducing a greater change in the ecosystem, but inertial tendencies still apply for lower level initiatives requiring a greater workload for the firm.

The integration of these studies gives rise to a framework that defines how various effect levels contribute to various aspects of ecosystem management. The framework indicates that, as a result of the interaction between the ecosystem logic and institutional conditions, macro level factors are influential in determining the spread performance of ecosystems. In the ecosystem level, value complexity and relative resource power of actors control the degree to which the partners cooperate or act unilaterally for increased value appropriation. In the micro level, individuals, including ordinary employees, determine the specific relationships of ecosystem stakeholders such that different organisational levels can cause varying degrees of evolution in the ecosystem.

In terms of the conceptual coverage of ecosystems in its value or firm-centric treatments, the thesis does not choose one approach over the other due to the degree of ecosystem evolution concept suggested in Chapter 4. It rather contends that the firm and value centric ecosystem perspectives are not in conflict but reflect the degree of power in designing external conditions. The firm, which is subject to the influences of its upper and lower level members as well as macro conditions in the economy, exercises its strategies subject to limitations of value complexity, contextual conditions, the source of authority in the organisation, relative power of the ecosystem members, and ecosystem logics. Specifically, individuals aim to position the firm in its ecosystem for maximising its stake. Depending on what they can control, the shift in the positioning can involve the entire value proposition of the ecosystem, such as in the case of platform leaders, or only the connections of the firm in its own relationship structure. Based on the power of the influencing factors, the evolution can be managed either in terms of the position of the single firm, or entire value proposition around a core value. In this respect, the firm and value centric views actually complete each other in capturing the evolution of ecosystem interactions in a matter of effect scope.

In addition to the implications on the ecosystem stream, the thesis contributes to general management research by proposing a resolution to the mystery of co-opetition, offering a categorisation of institutional voids by defining their effect scope, and identifying the nature of the contribution of the lower level members to the strategy of a company. These will be discussed all throughout the coming chapters.

In terms of practice, the understanding of ecosystems as a manageable unit rather than a static structure that surrounds and limits organisations, allows practitioners to strategise on the broad ecosystem environment by using the tools available to them. Practitioners should adopt a holistic view in evaluating their value proposition, being subject to influences from various levels. As expressed in the relevant sections, the findings suggested in this thesis thus equip managers with valuable knowledge to decide on many business problems, ranging from the choice of ecosystem in their countries to HR policies, or from their cooperation vs. competition tendency to the strategies that bring their declining ecosystems back to life.

2. Ecosystem Evolution as an Actor-Driven Process: A Thematic Synthesis

2.1. Introduction

Popularised by the milestone articles of Moore (1993), Iansiti and Levien (2004), and Adner and Kapoor (2010), ecosystems are one of the hot topics of management, demonstrated by the rapid increase in the number of articles published since 2015 (see Section 2.3), as well as dedicated special issues such as Strategic Entrepreneurship Journal (2018/1), International Journal of Technology Management (2017/1-4), and Journal of International Management (2015/4). Tendency towards the concept is supported by the awareness that each ecosystem member is affected by the evolution of its ecosystem (Li, 2009). Nevertheless, poor academic clarity of the term and its specific types raises concerns about theoretical relevance (Aarikka-Stenroos & Ritala, 2017; Mars & Bronstein, 2018; Oh et al., 2016), and existing ecosystem theorisations concentrate on the structure and describe its operation, focusing on distinguishing it from other concepts, such as clusters or value networks (Autio et al., 2018; Jacobides et al., 2018). Improving the relevance and clarity of ecosystems as a strategy and entrepreneurship topic requires the understanding of the formation, manageability, and selection dynamics of different ecosystems (Marcos-Cuevas et al., 2016). Apparent scholarly interest from these domains indicates that the potential in ecosystem management is known (Adner & Kapoor, 2010; Ansari et al., 2016; Dattee et al., 2018; Thompson et al., 2018), but to date, such dispersed contributions are not synthesized in a way to provide a complete framework on how actors contribute to the evolution of their ecosystems and demonstrate a realistic development level of the concept (Wareham et al., 2014).

Many scholars work on defining specific types of ecosystems and describing how they function in a rather static view (Acs et al., 2017; Adner, 2017; Autio et al., 2018; Spigel, 2017). Reflecting this, although the term originated in a lifecycle model (Iansiti & Levien, 2004; Moore, 1993), the concerns on how ecosystems are formed and developed in time, and how they diverge and decline are not eliminated, which can strengthen the dynamic understanding of ecosystems (Adner, 2017; Lepoutre & Oguntoye, 2018). Formulating the ecosystem journey with a focus on the dynamics of change and the

role of the organisations in leading, sensing or managing these changes would show how and why relationships evolve in ecosystems (Chen et al., 2016). Considering the organisation as a catalyst of this evolution increases the practical relevance and supports the academic understanding of the concept. The abundance of research under the ecosystem lens may provide knowledge on such evolutionary concerns due to the origin of the term, yet such dispersed information should be integrated. Therefore, we formulate the research question of this article as "How do organisations drive the evolution of ecosystems along their lifecycle?"

We organise this paper as a thematic synthesis on the Business and Management studies in the SSCI that discuss the role of organisations in managing ecosystems. Analysing dominant theories, processes, and constituents allows us to spot the strengths and weaknesses of the literature around the topic, and how relevant the term is within management research. It would be a step towards clarifying ecosystem evolution using dispersed studies which illuminate different stages and activities. It would allow future comparisons on how similar or different it is to manage ecosystems than other networks. Besides, identifying research directions based on the current research supports improvement of the concept.

The review indicates that the managerial behaviours of ecosystem constituents are determined by the ecosystem type - i.e. the reason for interaction, value complexity - i.e. the diversity of required complementary contributions for the core ecosystem value (Dattee et al., 2018), and relative resource power of the constituent actors. Knowledge flow and capability management establish links between ecosystem elements, controlling cooperative or unilateral behaviours throughout the evolution. Besides, the strengths and weaknesses of the literature around different ecosystem types, evolutionary stages and managerial activities are identified; pinpointing the gaps that demonstrate the potential to broaden the understanding of co-evolution.

2.2. Research Methods

Over 25 years of emergence, numerous articles have dealt with how organisations shape the evolution of ecosystems, which should be coherently integrated. This paper addresses this concern in the form of a thematic synthesis. We bring together the dispersed academic knowledge on ecosystem management to summarise current research, connect the missing links, and offer future directions (Petticrew & Roberts, 2005; Tranfield et al., 2003). Additionally, we aim to create a point of reference and departure for researchers studying ecosystems, who may otherwise need to find their way in the complex accumulation in the field. Unlike narrative syntheses, thematic syntheses offer the chance to identify gaps and develop propositions to guide future research (Gough et al., 2012), which is made possible thanks to the plethora of existing studies.

Since our aim is to integrate the academic contributions on our research interest, we conducted our research in the Web of Science Social Sciences Citation Index (Wright & Hitt, 2017). This database hosts many studies from other databases and publishers. It contains refereed journals to which their impact factor is calculated, so that the scientific quality of studies is not a major concern. Such reasons make the database prestigious, popular and trusted among management scholars for literature reviews (Suominen et al., 2019; Takey & Carvalho, 2016).

To refine the studies which primarily deal with ecosystems as the research context, we searched for "ecosystem*" string in titles, keywords and abstracts of articles to list all relevant studies in the SSCI. Other keywords are not included such as value networks or supply chains to keep our focus on the development of the main concept. Similarly, because of evolving as a distinct literature, 'platforms" is not added as a keyword (Jacobides et al., 2018). However, in order not to miss the discussion about platform ecosystems as an ecosystem type (Aarikka-Stenroos & Ritala, 2017), not to lose a proportion of data due to considerable overlap between business ecosystems and platforms, and to respect the term selection in platform studies; returned results on platforms with the ecosystem keyword are not excluded for the completeness of our concept-driven research. As we are concerned with the managerial use of the concept, we limited our search to Management and Business fields.

We conducted our search on the 22nd August 2018, and found 1,070 results. We excluded book chapters, conference papers and reviews to control the variability due to the peer review process (Jones et al., 2011), obtaining 852 hits. Non-English materials and studies before 1993 (which is the date when James Moore's trailblazing article was published) were also dropped, limiting the list to 827 results. We excluded the following secondary fields which appeared irrelevant, after checking the article titles and, when necessary, the abstracts (Mateen et al., 2013): Environmental Studies (90), Hospitality Leisure Sport Tourism (19), Ethics (11), Communication (10), Computer Science Interdisciplinary applications (9), Social Sciences Mathematical Methods (6), Business Finance (5), Public Administration (5), Public Environmental Occupational Health (4), Agricultural Economics Policy (2), History of Social Sciences (2), Telecommunications (2), Education Educational Research (1), Industrial Relations Labour (1), Law (1), Mathematics Interdisciplinary Applications (1). Consequently 681 articles are obtained in the pool.

Next, we read all the titles, abstracts and keywords of these 681 articles. When the relevance of the paper could not be judged, we skimmed through the article and decided whether to pass the paper to the next stage. Of these, we found that 322 articles included 'ecosystem' incidentally, in buzzword form, or as a supportive element of an argument, and they were not analysing ecosystems. Besides, a total of 167 articles were on ecosystems, however they rather concentrated on non-evolving structures of relationships, definitions, or functions such as being a boundary to firm actions rather than an evolving and manageable unit. Hence, as required by the research question, we excluded the studies which did not discuss the ecosystem evolution as a managerially-driven process, and which considered ecosystems as a given and non-evolving condition impacting focal organisations. After applying these criteria, we got 192 potentially relevant papers. We coded 100 articles in Category A which strongly appeared to be relevant, and 92 articles under Category B which could potentially be of interest. After obtaining this list, we also searched for reviews in the SSCI database, and added two more papers, finalising the reading list with 194 hits.

We downloaded 168 of these papers and read them one by one in detail. 26 articles could not be accessed through the library of the research institution. Personal networks and open sources, such as the Research Gate website, are consulted for these articles, and of 14 out of 26, 8 relevant papers are

included, leaving the irrelevant 6 out (See Appendix A for the list of 12 un-accessed papers). These selected articles are read and coded according to various dimensions along with their bibliographical information, including but not limited to, ecosystem type, methodological approach, industry information, background theories, evolutionary process, key findings, and main ideas. In this step, 122 articles appeared relevant and included in the review while the remaining 58 articles were dropped as the initial abstract-based conservative selection provided false-positives about the potential of fitting with our criteria especially in manageability. The codes associated with the selected papers are double checked for ensuring confidence.

2.3. Descriptive Analysis

While the entrepreneurship and strategy domains are enhancing, interdependencies between the actors from different layers of the business environment increasingly attract attention. A given actor is affected by many entities beyond the boundaries of value networks or supply chains (Jacobides et al., 2018). Recognition of this sociological dynamic can trigger additional questions about the elements in this society concerning how they shape and manage their relationships in this complex environment. This interest is reflected on the increase in the number of studies that discuss how ecosystem evolution is driven by organisations, stakeholder groups, or even individuals. As shown in Table 1, of the 122 studies in our list, 51% belong to the time between January 2016 and August 2018; while only 12% were published before 2012. This is interesting when compared to articles that include the word ecosystem in their abstracts, titles or keywords in the SSCI - 368/681 (54%) articles are published in 2016 and onwards while 127/681 (18%) articles are published before 2012. Subtracting the papers of Kapoor and Lee (2013) and Pierce (2009) from our list as they are added manually from the Review category, the weight of the articles on the management of ecosystems after 2016 is almost parallel to the percentage of all SSCI articles containing the keyword ecosystem after 2016. On the contrary, most studies before 2012 include the ecosystem word in biological or buzzword form, representing the academic underdevelopment of the concept before that breakpoint.

Table 1: Yearly Distribution of Papers on Management of Ecosystems

Year	Articles	Percent	Year	Articles	Percent
2018 till Aug 22	22	%18	2013	13	%10.65
2017	20	%16.4	2012	7	%5.74
2016	22	%18	2010	4	%3.28
2015	16	%13.11	2009	3	%2.46
2014	7	%5.74	2008 backward	8	%6.56
Total: 122					

The business environment is not isolated for any organisation, and ecosystem concept provides a ground for studying the management of relationships within this environment. Thus, different perspectives acknowledge the managerially-driven nature of ecosystem evolution, represented in the relatively balanced distribution of the articles according to the journal theme and prestige. Table 2 lists all 47 represented journals and their classifications along with the number of included articles.

Table 2: Represented Journals in the Review

Theme	Number / %	Journals
Top Management	20 / 16.4	SMJ (10), Org Sci (4), Man Sci (3), AMJ (1), AMR (1), ASQ (1)
IT & MIS	17 / 13.9%	MISQ (5), JIT (4), IS Res (4), Inf. Mgmt (1), IT & Mgmt (1), JoMIS (1), Know Mgmt Res & prac (1)
I&E & Technology	40 / 32.8%	Tech Fore. & Soc Ch (7), Int J Tech Mgmt (6), Res Pol (5), Technovation (5), Inno Mgmt Pol Prac (2), Int Ent & Mgmt J (2), J Prod Inno Mgmt (2), JoTT (2), SEJ (2), Tech Ana & Strat Mgmt (2), Crea & Inno Mgmt (1), Entr & Reg Dev (1), ETP (1), RD Mgmt (1), Sci Tech & Soc (1)
Practitioner	14 / 11.5%	Hbr (6), CMR (3), MIT SMR (3), Bus Hor (2)
Marketing	4 / 3.3%	Indust Mar Mgmt (2), J Mar (1), Psy & Mar (1)
Others	27 / 22.1%	JBR (9), SBE (4), J Int Mgmt (3), EMR (2), Ind & Cor Ch (2), Asia-P. JoM (1), Group & Org Mgmt (1), J Lead & Org Std (1), LRP (1), Man Deci (1), Org Stu (1), Transf Bus & Econ (1)
Total	122 / 100%	47 journals

A noteworthy observation about the list is that the practitioner journals lost their dominance in ecosystem management research. Among the 11 studies published up to 2010, the weight of the practitioner journals is 54% (6/11), while this dramatically drops to 7% (8/111) thereafter. This indicates the increased academic attention to the concept and the shift in practitioner journals towards a daily coverage. We also observe that ecosystems are stronger in the innovation and entrepreneurship as well as the IS fields (due to platform studies). Nevertheless, although the inclusion of customers in the analyses creates opportunities for interesting research in the ecosystem stream (Clarysse et al., 2014), marketing journals are behind the trend.

These suggestions are triangulated by article fields. The strategy and entrepreneurship studies dominate our list, which can be expected as a result of our research orientation, but some fields are not mature. The strategy (46) and entrepreneurship (32) papers together constitute 63.9% of the list. While there are 14 practitioner papers (11.5%), 20 studies are recorded under marketing (16.4%), and 6 studies are identified under organisational studies (4.9%). A total of 4 articles (3.3%) are in international business. There is a room for improvement in marketing, organisational studies, and international business fields.

Although the concept originated in the form of business ecosystems (Moore, 1993; Iansiti & Levien, 2004), scholars examine different ecosystem types, and the paper list reflects this diversity. Platform (26/20.5%), innovation (28/22.4%), business (40/32%), entrepreneurial (16/12.8%), service (6/4.8%), knowledge (3/2.4%) and other forms (6/4.8%) are identified as dominant ecosystem types of the included papers (three themes are assigned as secondary types). Interestingly, some business ecosystem studies also discuss platforms (e.g. Kabakova et al., 2016; Parente et al., 2018). Although the types are diverging, the overlap between ecosystems and platforms remains confusing, and the terms are used for describing alike phenomenon (Qiu et al., 2017; Rietveld & Eggers, 2018).

The research methodologies are relatively balanced for such a fast-emerging stream. Table 3 presents the recorded methodologies of the papers.

Table 3: Methodologies of the Papers

Paper type	Number of items	% of occurrence
Qualitative single case study	37	30.3
Qualitative multiple case study	20	16.4
Qualitative, total	57	46.7
Theoretical/conceptual	18	14.8
Quantitative case study	23	18.9
Quantitative survey	7	5.7
Quantitative, total	30	24.6
Mixed method case study	3	2.5
Practitioner	14	11.5
Total	122	100

As it can be seen in Table 3, almost two-thirds of the papers are qualitative and theoretical (61.5%). Although in time the methodologies of the papers are expected to shift towards quantitative methods as a sign of maturation, the 24.6% rate surprisingly stays at 26.2% (11/42) for the last two years, indicating the continuation of the emergence of the term. On the other hand, while the weight of theoretical studies is only 14.8% in the sample, it rises to 21.4% (9/42) for the last two years, showing an increased scholarly effort towards tidying up the messy stream and developing propositions around the concept.

Another parameter indicating the current development level of ecosystem research is the diversity of industries in which the concept is applied. Diversity in empirical contexts extends the applicability and boundaries of the term in defining the business environment. Table 4 shows the industries constituting the research contexts of the included papers.

Table 4: Studied Industries

Industry	Number of items	% of occurrence
Entrepreneurial cluster	11	10.8
Digital & Software	41	40.2
Manufacturing	11	10.8
Services	19	18.6
Government, NGO, social	6	5.9
Agriculture, food	5	4.9
Academy	4	3.9
High-tech	20	19.6
Multiple	11	10.8
Total number of records	102	100

The table reflects the dominance of the rising knowledge intensive industries recorded under the digital and high-tech groups, which add up to 59.8%. Traditional manufacturing industries, as well as the non-profit sectors, are underrepresented. Some studies examining traditional sectors also investigate the digital aspect (e.g. Ansari et al., 2016; Barrett et al., 2016; Gyrd-Jones & Kornum, 2013; Wessel et al., 2016). This is risky for the development of the concept since platforms and software overpopulate the area, constraining the understanding of ecosystems.

The final descriptive table contains the studied ecosystem elements. Most articles have a detectable examined element to which its relation with the ecosystem is investigated.

Table 5: Studied Ecosystem Elements

Studied element	Number of items	% of occurrence
Ecosystem creators	16	13.1
Complementors & co-creators	31	25.4
Entire ecosystem & platform	17	13.9
Users & Consumers	8	6.6
Core firm, keystone, leader	35	28.7
Non-business supporting organisations	12	9.8
Products	3	2.5
Entrepreneurs & start-ups	10	8.2
Multiple	8	6.6
Total	122	100

The major examined element in most studies is the central organisation, which either establishes the ecosystem or governs it, in the form of a leader or platform core. Although there are much more members that contribute to ecosystems on the periphery, and their collective economic impact can be higher than the central unit, the representation of non-central actors is far from enough. Ecosystems are mostly viewed as networks that are centrally established, and transformed and devastated by as a result of the central entity's actions. This perspective is less dominant in the entrepreneurial ecosystem field where a collective formation is highly emphasised.

2.4. Thematic Synthesis

Just as their biological counterparts, ecosystems in the field of management have a lifecycle in which they arise, develop, and renew/die (Moore, 1993). We applied this distinction in classifying the papers, and recorded them under three major themes: 1] emergence where one or more actors create ecosystems, 2] progress where organisations manage their ecosystemic relationships to co-create and appropriate value; and, 3] renewal and decline where the elements are investigated during the devastation of the core value. Although such classifications bare the risk of missing overlaps, analysing papers based on their most apparent phase appeared relevant and pragmatic for developing

propositions and detecting the maturity of the literature. We recorded 44 articles under Emergence, 86 items under Progress, and 16 papers under Renewal and Decline; while 24 papers are recorded under multiple stages and 14 activity codes are assigned to the papers of the same stage. Therefore, we had 160 activity codes distributed over 122 papers, and the average code number per paper was 1.31. Thus, the literature on ecosystem evolution is fragmented.

The papers are classified under 9 second-order and 22 first-order activity codes. The remaining subsections of this part are organised to explain and synthesise the contributions of associated papers within these codes. At the end of each evolutionary stage, we provide a general evaluation of the discussed stage.

2.4.1. Ecosystem Emergence

This section details how ecosystems are created and supported during the emergence process, recognising that the initial ecosystem formation strongly affects the subsequent evolutionary stages (Dattee et al., 2018). The theme captures the creation of ecosystems by a single organisation or a collection of elements, and the role of government or non-political supporting actors during this stage. There are 44 papers synthesised under 6 first order codes in this theme. Notably, 10 out of 19 entrepreneurial and knowledge ecosystem articles fall under this category. Table 6 includes the codes and assigned papers of this stage.

Table 6: Emergence Papers

Code	Item	Description	Papers
1 Designing an ecosystem	16	Establishment of an ecosystem by a central unit	
1.1 Coordinating other members	5	How stakeholders are organised during the ecosystem creation by a central entity	Helfat & Raubitschek, 2018; Dattee et al., 2018; Li & Garnsey, 2014; Ritala et al., 2013; Williamson & De Meyer, 2012
1.2 System design	11	Designing the ecosystem mechanism by a leading member	Teece, 2018; Jacobides et al., 2018; Kuratko et al., 2017; Kabakova et al., 2016; Jha et al., 2016; Chen et al., 2016; Gawer & Cusumano, 2014; Li, 2009; Gawer & Cusumano, 2008; Garnsey et al., 2008; Cusumano & Gawer, 2002
2 Co-creating an ecosystem	17	Multiple organisations and stakeholders creating an ecosystem	
2.1 Coordination mechanism	10	How various stakeholders organise among each other at early phases	Thompson et al., 2018; Roundy et al., 2018; Sarma & Sun, 2017; Kornum et al., 2017; Planko et al., 2017; Taillard et al., 2016; Attour & Della Peruta, 2016; Kramer & Pfitzer, 2016; Hooge & Le Du, 2016; Liu & Rong, 2015
2.2 System co-design	7	How various entities form a coherent system	Jarvi et al., 2018; Larrucea et al., 2016; Hallingby, 2016; Overholm, 2015; Kukk et al., 2015; Best, 2015; Calcei & M'Chirgui, 2012
3 Support	13	The effect of non-competitive support on ecosystem establishment	
3.1 Policy support	5	The effect of policy involvement in ecosystem creation	Teece, 2018; Lehmann & Menter, 2018; Surie, 2017; Li & Garnsey, 2014; Rong et al., 2013a
3.2 Supporting organisations	8	How supporting organisations help the creation of an ecosystem	Goswami et al., 2018; Theodoraki et al., 2018; Yi & Uyarra, 2018; Wright et al., 2017; Hayter, 2016; Schwartz & Bar-El, 2015; Clarysse et al., 2014; Leten et al., 2013
Total	46		

2.4.1.1. Designing an Ecosystem: How does a Single Entity Create an Ecosystem?

According to a perspective, ecosystems are initiated by a central entity which designs the incentives, cooperation channels and parameters of interaction (Helfat & Raubitschek, 2018). Researchers study the management of the creation process by a single actor in 16 papers under 2 main concentrations: coordination of other ecosystem elements, and designing the system dynamics.

Coordination of other ecosystem elements. This group explains how stakeholder groups are organised and encouraged to contribute to an ecosystem during its establishment by a central firm. The theme splits around a central unit which offers the modular infrastructure that others may connect to (e.g. platforms), and resource-constrained organisations that are dependent on the support of externals.

Central organisations set up the governance mechanism, ecosystem structure, and properties of the core product when the vision and the dynamics of appropriation are unknown (Dattee et al., 2018; Helfat & Raubitschek, 2018). They find complementary partners, define their roles, support their learning, and govern the value capture parameters (Williamson & De Meyer, 2012). During this process, these firms attempt to control the key value capture positions using their integrative dynamic capabilities, which enable adapting, expanding, and transforming the ecosystem (Helfat & Raubitschek, 2018). Such capabilities allow for the preparing of tangible contractual or intangible relational structures in the ecosystem to limit uncertainty and to become indispensable in the value capture process (Ritala et al., 2013). Setting dynamic control points supports the same objective by preventing the emerging ecosystem from violating the organisation's value creation mission. For this purpose, undesirable future directions are eliminated through signalling, influencing, monitoring, and updating strategies (Dattee et al., 2018; Ritala et al., 2013; Williamson & De Meyer, 2012).

Resource constraint actors such as the individual entrepreneurs need to encourage participation of supporting organisations (Williamson & De Meyer, 2012). For the identified opportunities, supporting organisations are activated by trust building and fulfilling their expectations (Li & Garnsey, 2014).

System design. This group addresses how a central organisation, normally the platform firm, prepares the architecture which others would join. Within this perspective, business models, degree of openness, legitimacy, and partnership strategies are all shaped by the core organisation.

Establishment of ecosystems is characterised by the diversification of the activity range (i.e. niche creation) which attracts new stakeholders (Chen et al., 2016; Jha et al., 2016; Kabakova et al., 2016). The technology, value creation activities, and organisational capabilities evolve from independence and simplicity into inclusiveness and complexity with the expansion of the partner basis and implementation areas of the core value (Chen et al., 2016; Garnsey et al., 2008). The rising complexity is controlled through the business model of the ecosystem. Teece (2018) argues that to overcome the disadvantage of having limited control on complementary contributions, platform firms design business models that address the concerns of the complementors, who improve the core ecosystem value by developing supportive solutions. The business models outline the complementarities and interdependencies in the ecosystem, i.e. the direction, frequency and depth of relationships between the co-creators (Garnsey et al., 2008; Gawer & Cusumano, 2014; Jacobides et al., 2018). The degree of in-house development vs. complementor participation is also encoded in these rules (Cusumano & Gawer, 2002). The parameters of the business model have lasting consequences in ecosystems (Gawer & Cusumano, 2014). For example, strong modularity favours incremental innovations, while less flexible systems are appropriate for breakthrough innovations (Jacobides et al., 2018). Despite this significance in the fate of the ecosystem, due to associated uncertainties, the parameters of the model are not straightforwardly planned, but rather gradually experimented upon with the help of dynamic capabilities (Kabakova et al., 2016; Teece, 2018).

To ensure the adoption of the new ecosystem, the core organisation also controls the legitimation strategies depending on market and technological newness. Conformance to existing rules, selecting

novel markets, manipulating the existing cultural context, or investing in creating legitimacy are among the alternatives (Kuratko et al., 2017).

Finally, the creation of a portfolio of ecosystem partners depends on the resource strength of the creator. For smaller core firms, partnerships with big players provides a chance to approach to the centre, and embed the offering of the small ecosystem as a niche to a wider ecosystem (Garnsey et al., 2008), but if the resources allow, ecosystem creation through closely controlling the complementors is reasonable. For example, Cisco spreads its standards on its acquisitions, addressing a broad set of stakeholders through these organisations and their resources (Li, 2009).

2.4.1.2. Co-Creating an Ecosystem: How do Different Organisations Cooperate to Create an Ecosystem?

Ecosystems may be co-created by the actors of the same group or the cooperation of different stakeholders. Most of the papers under this code study entrepreneurial, social and decentralised ecosystems. The literature is based around the internal coordination mechanisms in which various partners are linked (10 papers), and system co-design activities (7 papers).

Coordination mechanism. This sub-theme consists of recent studies mostly belonging to 2016 onwards, and includes papers that define how different parties that create an ecosystem organise among themselves. The majority of these studies either discuss entrepreneurial ecosystems (Roundy et al., 2018; Sarma & Sun, 2017; Thompson et al., 2018) or the non-profit sector (Kramer & Pfitzer, 2016; Planko et al., 2017; Taillard et al., 2016; Thompson et al., 2018). Another group explores the case where the complex ecosystem value requires the participation of many complementors in co-creation, so that a single organisation cannot look after it (Hooge & Le Du, 2016; Kornum et al., 2017; Liu & Rong, 2015).

Generally, entrepreneurial or social ecosystems cannot be formed at a single leader's discretion. Many actors should organise among themselves to co-create the ecosystem value. The process of organising is

investigated in terms of neo-institutional and sociocultural mechanisms, which include the development of shared visions (Liu & Rong, 2015; Sarma & Sun, 2017), purposes (Planko et al., 2017), imaginaries (Hooge & Le Du, 2016), identities (Kornum et al., 2017), narratives (Roundy et al., 2018), intentions (Roundy et al., 2018; Taillard et al., 2016), meanings (Thompson et al., 2018), and mutually reinforcing activities driven by collective agendas (Kramer & Pfitzer, 2016). These mechanisms emerge as informal disjointed activities and structures, and later evolve into formal and coordinated relationships (Roundy et al., 2018; Thompson et al., 2018). At that point, the members are orchestrated by formal planning and a common strategic vision. The vision is communicated by architectural knowledge flows among actors (Attour & Della Peruta, 2016; Liu & Rong, 2015; Sarma & Sun, 2017). Boundary-spanners further increase the attractiveness of the ecosystem by connecting the integrated ecosystem value to new partners (Attour & Della Peruta, 2016). Institutionalised new practices foster collective learning and co-evolution (Sarma & Sun, 2017).

System co-design. Various organisations from the same or different stakeholder groups may collectively define the parameters of interactions. This process is mostly observed under complex value conditions (Best, 2015; Hallingby, 2016; Jarvi et al., 2018; Larrucea et al., 2016; Overholm, 2015). The collaborating organisations co-design the business models and appropriation conditions for potential participants, and shape the institutional structure (Hallingby, 2016; Kukk et al., 2015). This task falls into the hands of the early movers while the late movers do not take the challenge of modifying the structure, which may create positive externalities for their competitors (Kukk et al., 2015).

During ecosystem emergence, organisations and individuals choose to cooperate if a single entity is not strong enough for system building, or the diffusion of the value is dependent on the inclusion of other elements (Hallingby, 2016; Kukk et al., 2015; Overholm, 2015). The cooperation in the system depends on the shared use of discovered opportunities, motivated by shared goals (Jarvi et al., 2018; Larrucea et al., 2016; Overholm, 2015). Alternatively, an aggregator can draw a vision through its experimentations, resources and complementary activities (Best, 2015; Hallingby, 2016).

Scholars underline the key role of transparency as a signalling mechanism for the co-creation potential (Overholm, 2015). Transparency is achieved by employing channels for knowledge-sharing among the co-creating organisations, and makes the ecosystem predictable (Hallingby, 2016; Jarvi et al., 2018; Larrucea et al., 2016). Knowledge sharing also educates the actors with participation willingness (Overholm, 2015). As many actors adopt the same understanding, the system standardises and gains legitimation (Calcei & M'Chirgui, 2012; Hallingby, 2016).

2.4.1.3. Support: What is the Role of External Support in the Creation of Ecosystems?

This theme discusses the role of the supporting organisations which do not engage in market competition in the ecosystem such as the government, accelerators or universities during ecosystem creation. We distinguish between government support and other supporting organisations. The majority of these 13 studies are concerned with entrepreneurial and social ecosystems, or complex values.

Government support. Policy is necessary when actors are not capable of establishing the infrastructure in which the ecosystem value effectively spreads, and when the partners need resource support. Creating institutions, demand generation, and support for capability building improve the conditions for the diffusion of the ecosystem value (Surie, 2017). Policy can also reconcile the conflicting objectives of different stakeholder groups and improve cooperation (Rong et al., 2013a). In the case that a vibrant industry and enough human capital exists in the ecosystem, governments can simplify funding access for growth (Lehmann & Menter, 2018). Besides, protecting the interests of the R&D intensive organisations allows them to capitalise on their breakthrough technologies (Teece, 2018). For such functions, government support can be activated by network and trust building (Li & Garnsey, 2014).

Supporting organisations. This code describes the contribution of supporting organisations to the ecosystem creation, such as universities, funders, NGOs or accelerators. Most studies in this group examine entrepreneurial or knowledge ecosystems (Clarysse et al., 2014; Goswami et al., 2018; Hayter, 2016; Theodoraki et al., 2018; Wright et al., 2017; Yi & Uyarra, 2018) while Schwartz and Bar-El (2015) and Leten et al. (2013) discuss a business ecosystem case. The roles of the supporting elements are

identified as funding the ecosystem (Clarysse et al., 2014), increasing commitment and establishing links among members by disseminating knowledge (Goswami et al., 2018; Hayter, 2016), transforming the relationships through incentives and collaborations (Yi & Uyarra, 2018), and influencing the speed and effectiveness of the establishment process (Theodoraki et al., 2018; Wright et al., 2017). Besides, coordinators such as public research institutes enhance the value appropriation dynamics by determining the IP policy of R&D intensive ecosystems (Leten et al., 2013).

Supporting organisations benefit ecosystems with their resources and network capacities (Wright et al., 2017). For example, accelerators attract members to entrepreneurial ecosystems by supporting new ventures in forming connections, developing start-ups, coordinating stakeholder groups, and selecting mentors and founders (Goswami et al., 2018). TTOs play a network-bridging role by connecting the students and faculty to other social networks for tie and resource access beyond the boundaries of their closed networks (Hayter, 2016).

The type and source of support influence the subsequent behaviours of the receiving firms. Funding from central actors motivates organisations to exploit existing technologies rather than developing them, and reduces innovation. Organisations funded from smaller institutions are better in innovative output, but central funders cannot even increase the survival rate of receivers (Clarysse et al., 2014).

Studies on business ecosystems attribute an alike role for supporting organisations. When government intervention is not enough to clear the market failures in innovation ecosystems, industrial associations can drive the ecosystem by providing knowledge that helps create innovation capabilities. Such initiatives can build, strengthen, and activate ecosystems (Schwartz & Bar-El, 2015).

2.4.1.4. Synthesising Ecosystem Emergence

Most parameters of ecosystems are set during the emergence, and have a lasting impact on the ecosystem (Dattee et al., 2018; Gawer & Cusumano, 2014). Around one-third of the articles are

dedicated to how this stage is managed by the organisations from different roles. The synthesis of these contributions builds a coherent story and propositions about the management of this stage.

The creation of an ecosystem is characterised by the participation of stakeholders from different roles, and the emergence of interdependencies between previously disconnected actors (Attour & Della Peruta, 2016; Jha et al., 2016; Li & Garnsey, 2014). During this transition, the opportunity discovery evolves into co-creation (Best, 2015). Activities around the core value broaden (Chen et al., 2016), complementary niches emerge (Garnsey et al., 2008; Williamson & De Meyer, 2012), and informal relationships become structured (Ritala et al., 2013; Thompson et al., 2018). The level of uncertainty that occurs during this transition is controlled by experimentation (Hallingby, 2016; Kabakova et al., 2016).

The literature points to notable differences between ecosystem management activities based on the competitive orientation of ecosystems, resource power distribution of the members, and value complexity as the level of required complementary participation to the development of core ecosystem value. First, knowledge, entrepreneurial, service, social and some forms of innovation ecosystems either emerge with the intentional cooperation of multiple constituents, or are designed by a supporting organisation which empowers members without directly involving in co-creation and spreads cooperation among stakeholders (Goswami et al., 2018; Leten et al., 2013; Overholm, 2015; Wright et al., 2017; Theodoraki et al., 2018). In these ecosystems, co-creation motivations supersede appropriation objectives, and inclusive strategies suppress unilateral behaviour (Clarysse et al., 2014; Jacobides et al., 2018). On the contrary, platform, business and some forms of innovation ecosystems are market oriented. In these units the dominance of a powerful central actor is apparent (Williamson & De Meyer, 2012). The establishment activities that link diverse partners and shape the system dynamics are generally led by the platform or ecosystem leader (Jacobides et al., 2018; Ritala et al., 2013). These organisations design the value appropriation dynamics in a way to stimulate the participation of other entities, but at the same time, to retain the key positions in the appropriation structure (Helfat & Raubitschek, 2018). The impact of appropriation opportunities is much dominant in the participation motivation of the peripheral complementors (Liu & Rong, 2015). Therefore, we offer the following proposition:

Proposition 1. While platform and business ecosystems are oriented towards the central establishment of value creation and appropriation dynamics; ecosystems with social, entrepreneurial and knowledge creation objectives entail more inclusive behaviours to attract participation and support.

Another important factor that affects whether to individually set the ecosystem rules or collectively design the structure is the power distribution between the elements, characterised by resource strength. Superior resources and capabilities enable in unilaterally designing incentive structures and system parameters that define appropriation and participation to co-creation (Li, 2009). Power triggers opportunistic behaviour in a way to design a system to boost the criticality of the central element (Gawer & Cusumano, 2008). Partnership selection, niche creation, vertical integration or business model design are largely controlled by powerful firms while co-creators have limited stakes in such decisions (Garnsey et al., 2008; Kuratko et al., 2017; Li, 2009; Teece, 2018). Thus, a strong resource position reduces the tendency for seeking support on funding, network building or structure design (Cusumano & Gawer, 2002; Dattee et al., 2018; Gawer & Cusumano, 2014). On the contrary, when there is not a strong central element due to a relatively homogenous resource distribution among the elements, ecosystems have a flatter structure, and emergence occurs by active participation of various organisations (Larrucea et al., 2016; Liu & Rong, 2015). Resource-constrained organisations, such as small firms, entrepreneurs, or social ventures with resource constraints are more likely to be powered by supporting organisations and government in accessing resources and ties for overcoming the deficiencies in ecosystem establishment (Li & Garnsey, 2014; Teece, 2018).

Proposition 2. While resource constraints increase the tendency to engage with co-creators and supporting organisations to motivate them in designing the ecosystem, resource rich actors tend to design the system parameters alone, which allow other stakeholders to integrate and organise.

The creation, diffusion and appropriation of ecosystem value is also affected by its complexity, i.e. the required level of complementary contribution. Values that transform the sociotechnical paradigm or social structure require system level changes and participation of a broader stakeholder basis including

the external support actors (Hallingby, 2016; Kramer & Pfitzer, 2016; Kukk et al., 2015; Kuratko et al., 2017). In such a case, even powerful organisations can establish co-creation partnerships and require external support (Attour & Della Peruta, 2016; Hooge & Le Du, 2016). A less complex core value with limited complementor dependence is more appropriate for unilateral strategising since single firms can change the game through their capabilities (Williamson & De Meyer, 2012; Wessel et al., 2016).

Proposition 3. The tendency to involve co-creating partners and supporting organisations during ecosystem creation increases with the complexity of ecosystem value.

Basically, the involvement of supporting organisations and government is important in three main instances of emergence: when the constituents' resources are scarce, the infrastructure is insufficient for deploying the ecosystem value, or an aggregation mechanism is required to connect uncoordinated elements. As an important external which does not directly participate in co-creation, governments create legal and institutional structures for the value's diffusion, and provide resources to the ecosystem elements (Rong et al., 2013a; Surie, 2017). Other organisations, such as universities, accelerators, or associations mainly connect the ecosystem elements by employing channels for information flow. They resolve conflicts, and increase the tie quality of the elements (Leten et al., 2013).

To understand the emergence of ecosystems, two remaining questions must be answered: by which means the creation process is managed, and what defines the rules of cooperation. The literature addresses these questions. First, dynamic capabilities equip the firms with relevant skills to establish ecosystems. The elements create a viable partnership structure, adjust their relative positions, design the appropriation parameters, and control tensions using their dynamic capabilities (Helfat & Raubitschek, 2018; Teece, 2018; Yi & Uyarra, 2018). The second tool is collective behaviour enabled by shared intentions and practices, which organise the co-creators under mutual trust and transparency (Taillard et al., 2016; Thompson et al., 2018). Knowledge flow between elements underlies such aggregation mechanisms (Jarvi et al., 2018; Sarma & Sun, 2017).

Dynamic capabilities and knowledge flows help the formation of the ecosystem level business model as the structural mechanism containing the rules of the ecosystem for a stable operation (Teece, 2018). The dynamics of ecosystems, including the patterns of interaction, are imprinted in the business model which is designed by ecosystem constituents (Garnsey et al., 2008; Planko et al., 2017). Power distribution is reflected on the business model such that powerful organisations have more stake in this collective structure (Gawer & Cusumano, 2008; Teece, 2018). Thus, the appropriation dynamics of the business model reflect the power spectrum of the central actor dominance vs. collaborative orientation.

2.4.2. Ecosystem Progress

Once an ecosystem is established, it continues to evolve in line with the managerial behaviours of organisations. This theme synthesises the contributions of the current literature on how this progress is managed. Reflecting the fragmented development of the theme, we identify 86 papers and 98 assignments dispersed over 12 first order and 4 second order codes as shown in Table 7 below. Specifically, the theme examines the management of ecosystem parameters and coordination of the complementors by a central entity, the process of inter and intra-ecosystem competition, drivers of cooperative behaviour, and dynamics of participation to ecosystems.

Table 7: Progress Papers

Code	Item	Description	Papers
1 Coordination	20	Central coordination of ecosystems	
1.1 Controlling complementary contributions	7	The involvement of the central firm in managing the quality of modular contributions	Goldbach et al., 2018; Parker et al., 2017; Wessel et al., 2017; Tiwana, 2015a; Wareham et al., 2014; Gawer & Cusumano, 2014; Rong et al., 2013b
1.2 System management	13	Ecosystem governance by a central firm	Holgersson et al., 2018; Teece, 2018; Helfat & Raubitschek, 2018; Furr & Shipilov, 2018; Song et al., 2018; Azzam et al., 2017; Kapoor & Agarwal, 2017; Schaeffer & Matt, 2016; Bosch-Sijtsema & Bosch, 2015; Alexy et al., 2013; Hong & Snell, 2013; Ritala et al., 2013; Iansiti & Levien, 2004
2 Competition	22	Competition dynamics in and between ecosystems	
2.1 Strategic decisions	9	How actors strategise competition	Holgersson et al., 2018; Teece, 2018; Rietveld & Eggers, 2018; Toh & Miller, 2017; Mantovani & Ruiz-Aliseda, 2016; Kukk et al., 2015; Cennamo & Santalo, 2013; Alexy et al., 2013; Zahra & Nambisan, 2012
2.2 Core firms against the complementors	4	Competition of core firm vs. complementor in the same ecosystem	Li & Agarwal, 2017; Oh et al., 2015; Gawer & Cusumano, 2014; Pierce, 2009
2.3 Leadership battles	9	How actors compete for ecosystem leadership	Chen et al., 2017; Ansari et al., 2016; Wessel et al., 2016; Adner & Kapoor, 2016; Kang & Downing, 2015; Jacobides & Tae, 2015; Gawer & Cusumano, 2014; Adner & Snow, 2010; Gawer & Cusumano, 2008
3 Cooperation	43	Cooperation of various stakeholders to create ecosystem value	

3.1 Stakeholder activation	11	How a single organisation activates other players for value co-creation	Ramaswamy & Ozcan, 2018; Randhawa et al., 2018; Ihrig & Macmillan, 2017; Hayter, 2016; Schaeffer & Matt, 2016; Kankanhalli et al., 2015; Schwartz & Bar-El, 2015; Li & Garnsey, 2014; Berzosa et al., 2012; Williamson & De Meyer, 2012; Cusumano & Gawer, 2002
3.2 Drivers of cooperation	16	Motivations of ecosystem elements towards cooperation	Gomes et al., 2018; Furr & Shipilov, 2018; Armstrong et al., 2018; Brem & Radziwon, 2017; Pera et al., 2016; Marcos-Cuevas et al., 2016; Liu & Rong, 2015; Ben Letaifa, 2014; Kapoor & Lee, 2013; Gyrd-Jones & Kornum, 2013; Selander et al., 2013; Ben Letaifa & Rabeau, 2013; Pitelis, 2012; Adner & Kapoor, 2010; Adomavicius et al., 2007; Moore, 1993
3.3 Evolution of relationships	11	How ecosystem relationships progress and mature	Thompson et al., 2018; Roundy, 2017; Kornum et al., 2017; Davis, 2016; Banoun et al., 2016; Barrett et al., 2016; Peters, 2016; Chen et al., 2014; Ritala et al., 2013; van der Borgh et al., 2012; Moore, 1993
3.4 Internationalisation	5	Spread of existing ecosystems to other economies	Parente et al., 2018; Rong et al., 2015; Jones & Pitelis, 2015; Sanchez & Ricart, 2010; Tee & Gawer, 2009
4 Participation	13	Management of ecosystem participation	
4.1 Ecosystem selection	6	The choice of participating in an ecosystem	Lepoutre & Oguntoye, 2018; Song et al., 2018; Nylund & Cohen, 2017; Kapoor & Furr, 2015; Calcei & M'Chirgui, 2012; Ceccagnoli et al., 2012
4.2 Managing with multiple ecosystems	5	How participants manage the environment with multiple ecosystems	Jacobides et al., 2018; Bosch-Sijtsema & Bosch, 2015; Lindgren et al., 2015; Selander et al., 2013; Xu et al., 2010
4.3 Managing role conflicts	2	Reconciling ecosystem vs. individual roles	Qiu et al., 2017; Nambisan & Baron, 2013
Total	98		

2.4.2.1. Coordination: How Central Firms Influence Ecosystem Evolution?

This perspective takes the ecosystem as a unit, which is led by a central organisation managing the ecosystem with its decisions on controlling the complementary contributions and system management, being the focus of 7 and 13 papers, respectively. In addition to coordinating operations, these organisations maintain an effective structure in which they appropriate value. As it might be expected, information technologies and platforms heavily populate the perspective, while decentralised and collaborative ecosystems are almost non-represented.

Controlling complementary contributions. Central firms may orchestrate ecosystems, but their success is dependent on the contributions of the complementors (Gawer & Cusumano, 2014; Wareham et al., 2014). Selecting complementors, designing the modularity, or facilitating innovation by opening the system are among activities that core firms consider (Gawer & Cusumano, 2014). This code contains the studies that explain how central organisations affect and control the complementors for keeping the quality of the contributions at the desired level. All studies under this code discuss platforms and platform ecosystems, but controversies exist between studies.

Loosening or strengthening the control creates a dilemma between the complementor and user sides. Goldbach et al. (2018) suggest that weak control increases the perceived autonomy of app developers, app quality, and the continuation intention of complementors in a platform. On the same question, Wessel et al. (2017) find that diminishing the control increased Kickstarter's profits from the application commissions. Nevertheless, the long run health of the platform is jeopardised as strong competition and low-quality entries constrain the value for qualified participants and backers. Input control increases the level of user satisfaction, and ensures long term stability of the platform (Tiwana, 2015a). Loosening the control might provide immediate benefits for the leader and complementors, but in the long run, considering the user side, this should be discouraged.

The optimal time and ecosystem size to open the platform are controversial based on the dichotomy of increased cooperation vs. efficient coordination. On one hand, it is argued that during the birth and

expansion stages of platforms where uncertainty is high, openness motivates stakeholders to cooperate. The uncertainty reduces in time, and triggers a dominating strategy, which means controlling the platform and scaling up the volumes (Rong et al., 2013b). Wareham et al. (2014) tend to disagree, and argue that liberal governance causes fundamental problems with integration and standardisation while closed systems constrain demand realisation, ecosystem breadth and innovativeness. Therefore, control is helpful in young and open ecosystems, but openness is necessary in mature ones. Besides, by openness, bigger platforms can benefit from the opportunities of increased complementary development, but it is optimal for platforms with smaller developer networks to stay vertically integrated (Parker et al., 2017).

System management. This code discusses the tools, mechanisms, and strategies that the leader firm uses in managing its ecosystem. Platform research dominates the code.

Through their capabilities, ecosystem leaders coordinate the co-opetitive interdependencies, and spread their designs via shared capability development through disseminating common background knowledge (Hong & Snell, 2013). These capabilities can be classified as innovation capabilities, environmental scanning and sensing capabilities, and integrative capabilities for ecosystem orchestration which enable creating and seizing value (Helfat & Raubitschek, 2018). They also help in preparing and modifying the business model of the ecosystem (Teece, 2018). The business model defines the connections in the ecosystem, and enables the complementors to improve their performance by leveraging their relations with the central actor and creating niches (Iansiti & Levien, 2004). The model is responsible from the balances of operational stability vs. flexibility, power versus symbiosis, and collaboration vs. competition so that the appropriation and co-opetition dynamics are aligned (Bosch-Sijtsema & Bosch, 2015; Furr & Shipilov, 2018; Ritala et al., 2013).

Platform leaders also control the generational transitions (i.e. updates), and the level of structural complexity which allows complementors to design their own sub-ecosystems. Higher structural complexity helps in sustaining the superior performance of experienced app developers. But generational transitions have a negative impact on sustaining the performance, worsening with

complexity (Kapoor & Agarwal, 2017). Thus, frequent updates in the platform are detrimental for complementor performance (Song et al., 2018). Another examined mechanism in which ecosystem leaders manage downstream activity is knowledge revealing. In addition to its impact on competitor manipulation, it establishes coordination within the ecosystem and induces isomorphism, that is, others need to ensure compatibility in a way to harmonise with the core design. Hence it binds the members, and shapes future paths (Alexy et al., 2013).

Since platform-based ecosystems are open, value appropriation and IP rights are major concerns. Regardless of its source, a change in IP approach, such as starting a patent war, spreads to entire ecosystem, and shifts the general practice (Holgersson et al., 2018). As a peaceful strategy, licensing patents to stakeholders enables small firms to commercialise innovations in unexpected markets, thereby introducing stability to the ecosystem by strengthening the ability of the vulnerable partners to cope with fluctuations (Azzam et al., 2017).

Aside from platform centric actors, Schaeffer and Matt (2016) study the system management activities of a university, which leads an immature academic entrepreneurial ecosystem. Here the role of the university is to create innovation intermediaries and to coordinate local players that take part in the start-up creation process. It ultimately acts as a boundary spanner, network builder, and network orchestrator.

2.4.2.2. Competition: Dynamics of Competition In and Between Ecosystems

The ecosystem literature is not currently mature enough to evaluate inter and intra-ecosystem competition separately. Therefore, we included studies which discuss competition in and between ecosystems under the same second order code. 22 studies address the strategic decisions about competition (9 papers), core firm vs. complementor competition (4 papers), and leadership battles (9 papers). Collaborative ecosystems such as entrepreneurial, social or knowledge ecosystems are not represented in this code, indicating a gap.

Strategic decisions. This group explains the strategic behaviour of for-profit organisations within the ecosystem to capture a greater value proportion. Introducing new practices may be copied, but strategies such as entry timing or leveraging specific assets can be tied to the firm.

Ecosystem elements try to control the bottleneck assets for increased value capture (Teece, 2018). However, this triggers a competitive cycle in the ecosystem. Such strategies spread around, and induce retaliation (Holgersson et al., 2018). There exists safer strategising zones which provide actor specific advantages. For example, the selective revealing of knowledge is used for issue spreading, agenda shaping, product enhancing, and niche creating. This signalling mechanism works to change competitor behaviours, create isomorphism among the participants, and support the spread of the revealers' technologies (Alexy et al., 2013; Toh & Miller, 2017). A second actor-specific decision is entry timing, which influences the burden of investments. Early movers are responsible from the design of the institutional and structural diffusion conditions. Late entrants determine the cost and marketing structures. Therefore organisations may avoid system building expenditure through late entry (Kukk et al., 2015). Entry timing also affects the degree of R&D investments. The demand is heterogeneous among the early and late adopter groups such that the late adopters are risk averse. Hence, at the early phases of an ecosystem, it is reasonable to spend in developing innovations, but in the latter phases, investing in the successfully adopted areas is more rational (Rietveld & Eggers, 2018).

Strategic behaviour of the organisations should be well calculated and tailored to the characteristics of the ecosystem (Zahra & Nambisan, 2012). Missing this point may result in unexpected results. As an example, Mantovani and Ruiz-Aliseda (2016) argue that in mature markets, increased complementarity of co-creators is to the advantage of consumers, because the quality improves. Nevertheless, appropriation does not account for the expenditure for complementarity as there is no growth potential in mature markets. As another example, trying to improve platform dominance by opening the system for complementary contributions and binding suppliers with exclusivity conflict in the complementor side, and undermine platform performance. Skilled complementors would have little incentive to lock themselves in the platform while low quality participants create strong competition; therefore, these strategies should not be used together (Cennamo & Santalo, 2013; Gawer & Cusumano, 2008).

Core firms against the complementors. For a stable operation of an ecosystem, value appropriation should reflect a balance between the leader and complementors (Oh et al., 2015). As exemplified by Facebook's Instagram integration, entering into downstream competition by integrating the core with its secondary solutions makes the leader better off in the short run, shifting the demand for the complements towards its own products (Li & Agarwal, 2017). This is risky for the complementary market. The leader's entry to niche areas increases the failure rate among the complementors, and destroys the diversity in participation (Pierce, 2009). In the long run, platform firms should be coherent. They should not compete with downstream players but rather support their business models (Gawer & Cusumano, 2014).

Leadership battles. The studies in this group treat ecosystems as evolving organisms such that their leadership can change hands against the external attackers or the downstream players (Gawer & Cusumano, 2014). The determinants of the outcome are the value complexity (Wessel et al., 2016), development opportunities of the legacy ecosystem (Adner & Kapoor, 2016), technological investments (Jacobides & Tae, 2015), and the network strength (Adner & Kapoor, 2016; Ansari et al., 2016; Kang & Downing, 2015).

The disruption of a technology does not occur easily. Incumbents might retaliate, or retreat against the entrant technology by repositioning themselves in old or rising ecosystems (Adner & Snow, 2010). In the former case of competition, the winning solution and the length of the battle depends on the resources and complementor network of the new offering, and the development opportunities of the old technology and its network (Adner & Kapoor, 2016; Kang & Downing, 2015). However, the network strength of the incumbent is a double-edged sword. Existing relations might place adaptation difficulties on the old leader. Upstream and downstream relationships in the ecosystem lock the incumbent while the attacker can efficiently internalise critical functions such as R&D. Hence, established organisations should align their partners for potential transformations (Wessel et al., 2016).

In the case of start-ups and diversifying entrants competing for platform leadership, start-ups are more likely to exit rather than diversifying entrants. A lack of complementary assets and legitimacy for gaining the ecosystem's support, and immature integrative capabilities that facilitate information flow between ecosystem actors may be the reason for the defeat of start-ups instead of the diversifying entrants. This outcome is not observed in non-platform or mature ecosystems (Chen et al., 2017).

Leadership might also change hands between existing ecosystem elements. Positioning the core offering on the centre through modularity or building coalitions are two attacking strategies to which their success depends on the activation of peripheral elements (Gawer & Cusumano, 2008). In addition, the kingpins of the industry make significant R&D investments, and develop superior capabilities (Jacobides & Tae, 2015). Such investments not only enhance the positioning of the player, but also shift the centre of the ecosystem towards the specific complementary role of that kingpin.

2.4.2.3. Cooperation: How and Why do the Stakeholders Organise to Co-Create Value?

This theme discusses the dynamics of cooperation and organisation of the participants for value co-creation. This is the most emphasised theme in ecosystem research with 43 papers, almost doubling 'competition'. The studies discuss the ways in which ecosystem elements are activated by other members (11 papers), drivers of cooperation (16 papers), evolution of relationships over time (11 papers), and internationalising the ecosystem value (5 papers).

Stakeholder activation. The interdependence of value creation in an ecosystem requires the participation of various stakeholders (Adner & Kapoor, 2010). Despite the relative underdevelopment of the ecosystem stream, scholars have clearly demonstrated how different stakeholders are activated by others to contribute.

The direction of activation can be top down, bottom-up, or horizontal according to the position of the activating elements; having the potential to trigger reciprocal developments in the ecosystem (Adner &

Kapoor, 2010; Armstrong et al., 2018). Top down activation is orchestrated by ecosystem leaders which design incentive structures for the complementors and users to participate in co-creation (Cusumano & Gawer, 2002; Kankanhalli et al., 2015). These leaders share knowledge, grant access to critical resources, design the technological pathways of contribution, and orchestrate joint learning within the network (Ramaswamy & Ozcan, 2018; Williamson & De Meyer, 2012). When multiple actors should be activated, conflicts of interest between stakeholders need to be reconciled by leaders based on the necessities of the innovation project and the prioritisation of the most critical stakeholder interests (Ihrig & Macmillan, 2017).

Berzosa et al. (2012) address how downstream actors can activate upstream elements for co-creation from a technological perspective. The transformation of the tacit knowledge into explicit knowledge by the lead users supports the ecosystem leader in increasing its capacity to extract value and to sense the market. From the relational perspective, Li and Garnsey (2014) propose that trust building and fulfilling the expectations of the policy help entrepreneurial ventures to motivate the state and other stakeholders.

In collaborative ecosystems, the activation depends on fostering interaction between stakeholders. Knowledge intermediaries such as TTOs and incubators broaden the networks of the students and entrepreneurs to access diverse resources, and create innovation intermediaries that empower them towards co-creation (Hayter, 2016; Schaeffer & Matt, 2016). Simplifying knowledge exchange also activates other partners in the horizontal level, and helps in developing innovation capabilities and awareness for participation (Randhawa et al., 2018; Schwartz & Bar-El, 2015).

Drivers of cooperation. The reasons for an organisation to engage in cooperative activity is thoroughly investigated around facilitating and pressurising factors for co-creation. The most apparent driver is the interdependence of the value, since an improvement in one of the complementary fields triggers progress in other fields (Armstrong et al., 2018; Furr & Shipilov, 2018; Kapoor & Lee, 2013). The reason for such a spillover is that the ability to appropriate value requires meeting the upstream challenges and

controlling downstream risks, which might come from several sources such as components, complements or applications (Adner & Kapoor, 2010; Adomavicius et al., 2007).

Second, opportunities and appropriation objectives may create a self-motivation for cooperation. Economic opportunities that improve value creation and diffusion conditions drive coordinated behaviour among ecosystem stakeholders (Moore, 1993; Selander et al., 2013). By cooperating, organisations may avoid uncertainty and chaotic consequences of uncoordinated behaviour, and capture greater value (Ben Letaifa, 2014; Gomes et al., 2018; Pitelis, 2012). Hence, the requirement of complementarity increases cooperation during co-creation (Furr & Shipilov, 2018). Aside from the value-related reasons; reputation, experimentation, and relationship building are among other self-motivations for ecosystem participation (Pera et al., 2016).

The cooperation is simplified under a shared understanding and culture among stakeholders. Participation of even peripheral actors is necessary for success, and it depends on the development of a shared vision (Liu & Rong, 2015). For that vision to emerge, the existence of cultural complementarity between elements is necessary since diverse stakeholders are only linked when they are congruent (Gyrd-Jones & Kornum, 2013). The importance of culture is further underlined by an interesting study by Ben Letaifa and Rabeau (2013), who suggest that only the social proximity of firms stimulate cooperative behaviour rather than any other form, such as geographical, cognitive, organisational or institutional proximities. Communication increases with social proximity while the other proximities might trigger competitive intentions. Trust, inclusiveness and openness emerge under shared cultures (Pera et al., 2016), which are effective in strengthening the communication and network utilisation for co-creation (Brem & Radziwon, 2017; Marcos-Cuevas et al., 2016).

Evolution of relationships. As the ecosystems progress from their emergence to the later stages, the relationships between the elements mature. The value becomes more complex, and cooperation is structured and coordinated (Moore, 1993; Thompson et al., 2018). As a result, the links evolve from pre-planned contractual relationships and informal communications into established formal structures and contracts (Ritala et al., 2013). Over time, the constituents get more and more connected as it is not

feasible to reduce the integrated (heteropathic) resources into their parts (Peters, 2016). Not only do elements become more connected, but also more stakeholders are attracted. The addition of each stakeholder group enriches the nature of the ecosystem value because of the emergence of shared capabilities (Chen et al., 2014).

While the relationships evolve from dyads to complex forms over time, managing them becomes difficult due to the conflict arising from prior relationships and role overlaps (Banoun et al., 2016; Barrett et al., 2016). For managing these tensions, Davis (2016) suggests iterating between dyads and complex relationships in a cycle whenever it is possible to control associated risks.

In addition to the evolution of the relationship breadth, some mechanisms drive elements to converge over time. Ecosystem identity and culture, which are created by the leader and enhanced by each participant, align the behaviour of the cooperating organisations (Kornum et al., 2017; Roundy, 2017; Thompson et al., 2018). They are coded in the ecosystem's business model, which integrates the business models of the individual elements, and introduces harmony into the ecosystem. The organisations that cannot adapt to this model are expelled through an evolutionary process (van der Borgh et al., 2012).

Internationalisation. Although ecosystem internationalisation can be a cooperative process because of implying the transfer of the entire ecosystem value to a different economic context, the issue has not been deeply investigated, and existing studies emphasise cross-border operations of the leader rather than the growth of an existing ecosystem. Therefore, the current literature overlooks the stakeholders in the home economy. Operations of different ecosystems in different economies rather than a global ecosystem constitutes the focus. Thus, internationalisation is evaluated as an entrepreneurial behaviour of the core organisation, which slightly modifies the existing ecosystem in the destination economy (Sanchez & Ricart, 2010), or creates a new ecosystem from scratch by using its previous experience (Jones & Pitelis, 2015). Reflecting this perspective, Rong et al. (2015) propose a process model of ecosystem internationalisation which begins with creating a friendly environment by communicating with potential partners, continues with selecting key partners, and finalises with integrating partners

through a shared vision. The success of internationalisation is dependent on how well the local industry architecture is addressed, including the rules, customers' priorities, and interdependencies with local partners (Parente et al., 2018; Tee & Gawer, 2009).

2.4.2.4. Ecosystem Participation: Dynamics of Ecosystem Selection and Participation

Industries might host multiple ecosystems, and stakeholders should manage the interactions in such environments. This theme discusses the participation of non-leader elements to ecosystems. There are 13 studies around 3 concentrations, which address the dynamics of selecting an ecosystem (6 papers), relationships with the environment consisting of multiple ecosystems (5 papers), and self-management of the role conflicts (2 papers).

Ecosystem selection. Many business fields are characterised by the presence of various ecosystems, and organisations face a decision problem in selecting one in which to participate (Jacobides et al., 2018). Almost all scholars identify the value diversity as a factor which affects selection decisions, being a function of the ecosystem population. Firms are more likely to join or stay in bigger alliances, coalitions with bigger players of other industries, and populated ecosystems with the intention to comply with standards (Calcei & M'Chirgui, 2012). Taking part in such ecosystems is deemed to be a signalling for compatibility, resulting in a sales growth (Ceccagnoli et al., 2012). Besides, a large number of participants create positive network externalities, thereby increasing the attractiveness of the ecosystem (Lepoutre & Oguntoye, 2018). Similarly, in entrepreneurial ecosystems, the availability of interdisciplinary activities raises the number of niches. This attracts new entrants, and increases diversity. However, the survival rate goes down because of the difficulty of coping with the complexity (Nylund & Cohen, 2017).

The positive effect of diversity on ecosystem selection holds for the users as well (Lepoutre & Oguntoye, 2018). However, this effect exists in the short run in platforms. Core firms need to coordinate the system in a way to protect this attractiveness by being responsive and stable (Song et al., 2018).

The only study that introduces context-dependence to this general argument belongs to Kapoor and Furr (2015), who claim that ecosystem selection depends on whether the element is a start-up or a diversifying entrant. Since complementarity is expected to be higher, populated ecosystems are preferable for start-ups with related pre-entry capabilities. However, diversifying entrants are more likely to seek technological superiority in their ecosystems.

Managing with multiple ecosystems. Ecosystem participation is a complex process which involves simultaneous operations across multiple ecosystems or switch decisions. Participation to multiple ecosystems facilitates searching and redeeming capabilities across different value systems to address various layers of innovation. By operating in multiple ecosystems, organisations follow a pluralistic strategy, and do not invest all the effort into a single network. They continuously reassess their embeddedness, and adapt their engagement strategies on cooperation vs. competition, and power vs. symbiosis dimensions (Bosch-Sijtsema & Bosch, 2015; Selander et al., 2013).

Downstream elements can switch their ecosystems as a response to the changes in the nature of complementarities. Unidirectional, unique relationships favour one party over the other, and create incentives for the excluded party to change its ecosystem (Jacobides et al., 2018). This decision can be executed by updating the routines and business logics in a way to establish relationships with actors in a new ecosystem (Lindgren et al., 2015). On the other hand, the users continuously judge ecosystem alternatives based on technology, social influences and complementarities. The degree of difference may be strong enough to make a switch decision (Xu et al., 2010).

Managing role conflicts. Organisations face the necessity to act as ecosystem members that contribute to co-creation, at the same time performing their daily stakeholder duties for value appropriation. Hence, the goals of the cluster may conflict with entrepreneurs' own goals. These tensions are solved by the self-regulatory processes of entrepreneurs which enable reconciliations via goal setting, maintaining focus, performance evaluations, and adjustments (Nambisan & Baron, 2013). App developers experience a similar conflict, and resolve the tension between their entrepreneurial and platform

related goals by synthesising the market and task logics without compromising any of them (Qiu et al., 2017).

2.4.2.5. Synthesising Ecosystem Progress

Around 70% of the studies in the SSCI on ecosystem management discuss the progress phase. These studies belong to four major areas: central coordination of ecosystems, competition between ecosystems or participants, cooperation dynamics, and participation motivations. Ecosystem type, power distribution among the elements, and value complexity are also influential at this stage. The theme is populated by competitive ecosystems.

The transition from the establishment to the progress stage is characterised by the emergence of an ecosystem level business model and a stable co-creation environment. The relationships become formal, and dyadic relations evolve into broader forms (Banoun et al., 2016; Davis, 2016). A shared culture, social proximity, and a coherent identity align the members, powered by the knowledge flow in the ecosystem (Alexy et al., 2013; Ben Letaifa & Rabeau, 2013; Gyrd-Jones & Kornum, 2013; Kornum et al., 2017). The structure that rules the interaction and coordination in the ecosystem is the business model to which its parameters are mostly determined by early entrants (Kukk et al., 2015). Organisations adapt to the ecosystem with their capabilities (Hong & Snell, 2013; Teece, 2018). These suggestions are in line with those of the emergence stage.

The coordination is largely under the control of a central unit in competitive ecosystems where resource possession is heterogeneous (Ihrig & Macmillan, 2017; Kapoor & Agarwal, 2017). These organisations design incentive structures, facilitate knowledge sharing, and shape the business model that outlines the nature of interactions in the ecosystem (Alexy et al., 2013; Iansiti & Levien, 2004; Kankanhalli et al., 2015). An important function of these organisations is to adjust the level of openness that account for the quality of the complementary contributions. Weaker control motivates complementors to join the ecosystem at the expense of reduced quality for customers (Goldbach et al., 2018; Wessel et al., 2017). Hence, it is a sound strategy to loosen the control when the participation and co-creation should be

increased. On the other hand, in the long run, weak control decreases the quality for the consumers (Tiwana, 2015a). Openness also discourages qualified complementors in mature ecosystems as value capture cannot be expanded (Mantovani & Ruiz-Aliseda, 2016; Parker et al., 2017).

Stakeholder activation practices also reflect the resource power distribution. Powerful organisations define the parameters of the ecosystem by using unilateral techniques that involve limited network engagement such as determining incentive structures, revealing knowledge, or prioritising activities (Gawer & Cusumano, 2014; Hong & Snell, 2013; Song et al., 2018). Less powerful organisations employ softer, network centric techniques such as coalition or trust building (Berzosa et al., 2012; Li & Garnsey, 2014). When the power distribution is more homogenous, such dynamics are increasingly controlled by stakeholder coalitions. Reflecting this, in collaborative ecosystems where there is no central dominance, stakeholder activation is based on network capacities and knowledge transfer (Schaeffer & Matt, 2016). Shared cultures, knowledge flow, and a willingness to cooperate based on opportunities and constraints support interacting (Hayter, 2016).

The contributions of users or complementors on shaping ecosystems lack attention (for an exception see Berzosa et al., 2012). However, dynamics of selection and cooperation are well addressed. In choosing the ecosystem, value diversity is the major decision parameter, describing the case where a large number of co-creators from different tasks help formation of various niches (Calcei & M'Chirgui, 2012; Ceccagnoli et al., 2012). Complementors, users and suppliers are likely to choose ecosystems with greater value diversity since co-creation opportunities, demand for components, and potential availability of customisations for specific user needs are greater (Ceccagnoli et al., 2012; Kang & Downing, 2015; Lepoutre & Oguntoye, 2018; Selander et al., 2013; Teece, 2018), with the notable exception of resource-rich firms that prefer technological superiority over complementarity (Kapoor & Furr, 2015). This effect holds to a point since open systems may create excessive competition, which alerts the qualified complementors to stay away from the ecosystem. This demotivates customers and inverts the expansion of value creation and appropriation possibilities as well as complementor motivations (Cennamo & Santalo, 2013; Jacobides et al., 2018; Pierce, 2009).

Proposition 4. Ecosystem elements tend to join populated ecosystems. But in the co-creation side, the tendency inverts after a threshold where excessive competition crowds out opportunities.

The elements cooperate when they are afraid of losing the competition, or when cooperation is more efficient (Gomes et al., 2018; Moore, 1993). Value complexity and technological lock-ins increase the willingness to cooperate (Furr & Shipilov, 2018; Peters, 2016).

Demonstrated by the number of papers in the cooperation (43) and competition (22) groups, co-creation is more emphasised than value capture in ecosystem research (Clarysse et al., 2014). Nevertheless, important insights exist within ecosystem competition studies. First, although seminal pieces on ecosystems point to the necessity of co-opetition (Iansiti & Levien, 2004), it is difficult to maintain cooperation when competitive intentions are strong (Ben Letaifa & Rabeau, 2013; Gyrd-Jones & Kornum, 2013). This is one of the reasons why a core firm which competes with its complementors risks the ecosystem's future (Li & Agarwal, 2017). Second, resourceful organisations can take over the leadership by investing in technological superiority (Adner & Kapoor, 2016; Chen et al., 2017; Jacobides & Tae, 2015). On the contrary, less powerful organisations try taking the leadership by creating a network around their technology (Gawer & Cusumano, 2008). Thus, the outcome of the competition depends, not only on the technological superiority of the offerings, but also on established networks. If the actor network helps in addressing many business layers and controlling the market, it is said to be advantageous for this actor (Adner & Kapoor, 2016; Kang & Downing, 2015). However, a strong network is a disadvantage when the value complexity is low, because even single organisations can disrupt the core ecosystem value with unilateral actions. As an example, in technological battles, networks have a locking impact as a source of inertia, and internalised R&D activities can supersede network-based advantages (Wessel et al., 2016). Based on these explanations, we conclude the section with the following propositions:

Proposition 5. In competing for the ecosystem leadership, the players with less resource power are more likely to enter alliances and increase their network capacities while powerful organisations tend to use competitive strategies such as increasing R&D spending.

Proposition 6. Value complexity increases the need for cooperation. As the value complexity diminishes, internal resources become more effective in determining competitive superiority.

2.4.3. Renewal and Decline

Ecosystems may renew due to external or internal dynamics, or may disappear over time. Internal dynamics of renewal in the form of slight modifications to the core value are largely controlled by the core organisation as discussed under the System Management code in the progress stage. On the other hand, studies belonging to this stage discuss the collapse of ecosystems or renewal of the core value in a way to disrupt the nature of co-creation and participation. There are only 16 studies recorded under renewal and decline as shown in Table 8, and only 8 are recorded solely under this theme, indicating relative negligence on the concern. Particularly in terms of the death or shrinkage of ecosystems - this is a topic scholars prefer to avoid, with only 5 articles. What is more interesting is that while only 28.6% of the included articles belong to 2013 or before, this rate is 50% in the renewal and decline group, showing that scholars are diverting from analysing the latter stages of the ecosystem lifecycle.

Table 8: Renewal/Decline Papers

Code	Item	Description	Papers
1 Renewal of the value	11	How core value radically renews	
1.1 Adaptation	6	Adaptation to changes in the environment	Auerswald & Dani, 2017; Koskela-Huotari et al., 2016; Gomez-Uranga et al., 2014; Rong et al., 2013a; van der Borgh et al., 2012; Bahrami & Evans, 1995
1.2 Disruption	5	How disruptions transform the entire ecosystem	Ansari et al., 2016; Adner & Kapoor, 2016; Taillard et al., 2016; Abdelgawad et al., 2013; Adner & Snow, 2010
2 Ecosystem decline	5	Contributors of ecosystem shrinkage	
2.1 Dissolution	3	Causes for dismantling of ecosystems	Huber et al., 2017; Adner, 2006; Iansiti & Levien, 2004
2.2 Exiting ecosystems	2	Why firms exit their ecosystems	Tiwana, 2015b; Pierce, 2009
Total	16		

2.4.3.1. Renewal of the Value: How Ecosystem Renewal is Managed?

This theme focuses on the adaptation of ecosystem value to the environmental changes (6 papers), and its disruption (5 papers).

Adaptation. The adaptation of ecosystems against the changes in the environment is characterised by the deployment of existing relationships into a new field, or reorganisation of elements against the changing demand (Rong et al., 2013a). The process starts with an external shock that destabilises the system. It creates energy and resource abundance exploited by some ecosystem elements using their dynamic capabilities, leading into the transformation of the ecosystem which is consolidated over time (Auerswald & Dani, 2017; van der Borgh et al., 2012). During the transformation, some elements in the

ecosystem are substituted by others that possess related resources to retain the function, because the existing relationships require keeping the tasks in the ecosystem (Bahrami & Evans, 1995).

The transformation has institutional, social, regulatory and economic dimensions which are controlled by constituents. For instance, the transition caused by institutional changes arising from technological shifts is implemented by simultaneously breaking, making and maintaining institutions in support of new technology (Gomez-Uranga et al., 2014; Koskela-Huotari et al., 2016).

Disruption. The disrupters transform existing ecosystems by continually shifting their positions to play the role of a connector that simplifies co-creation, using hard and soft methods to force compatibility, or positioning disruption as a sustaining innovation (Ansari et al., 2016). Such strategies can be applied by the execution of entrepreneurial capabilities to change the nature and domain of competition in the ecosystem (Abdelgawad et al., 2013). Downstream players can disrupt ecosystems based on shared intentions developed among peripheral actors. In time, with continuous interaction, these intentions stabilise at the core until movements from the periphery again change the cycle (Taillard et al., 2016).

The timing and success of external disruptions are determined by the technological strength of new and old paradigms (Adner & Snow, 2010). It needs to be accepted that old technology can develop and resist against disruption. In this case, the firms belonging to the old ecosystem have options to switch to new technology, battle against new technology, wait with old technology while benefiting from the new technology's spillovers, or turn back to the original technology if the new technology cannot achieve dominance (Adner & Kapoor, 2016).

2.4.3.2. Ecosystem Decline: Dynamics of Ecosystem Shrinkage

The last code of the synthesis is on the decline of ecosystems. There are only 5 studies classified under Dissolution and Exiting Ecosystems groups.

Ecosystem dissolution. Three studies are identified on the dismantlement of ecosystems, and all underline the detrimental practices of core organisations. After indicating that evolution drives the obsolescence of ecosystem niches, Iansiti and Levien (2004) argue that ecosystem leaders may be short term oriented such that they increase their value capture by undertaking the functions of their complementors, turning into a dominator. However, a single firm cannot be as resourceful as an ecosystem. Such actions lead to the complementors' exit and dissolution (Adner, 2006).

Another identified malpractice of ecosystem leaders is to break their own governance rules. Instead of sustaining complex relationships to keep the ecosystem in harmony, leaders might utilise closer relationships by establishing dyads with selected partners for efficiency. This discourages co-creation, and a vicious cycle starts that forces others to leave (Huber et al., 2017).

Exiting ecosystems. The emphasis of these studies is on the factors that motivate members to leave an ecosystem without focusing on their new destinations. First, significant changes such as product redesign or business model renewal cause shakeouts in various stakeholder groups, because their value offering for the customer becomes obsolete. The only way for these organisations is to use their dynamic capabilities to reposition (Pierce, 2009). Another reason for platform exit is the coordination costs necessary to keep an app's dependency with the core platform. These costs can be reduced through the standardisation of an app interface and delegation of decision rights to downstream organisations (Tiwana, 2015b).

2.4.3.3. Synthesising Renewal and Decline

There is a dearth of literature on the renewal and decline stage; therefore, radical renewal of the core value or ecosystem disintegration remain a promising research area. Existing studies are fragmented, but general conclusions can be drawn based on this small paper group.

Radical renewal in ecosystems occur because of technological battles or external shocks (Adner & Snow, 2010; Gomez-Uranga et al., 2014). Such events destabilise the balance among the elements, and change the resource distribution in the ecosystem. This makes the emerging resource power the main determinant of the new structure (Auerswald & Dani, 2017). Powerful organisations tend to use harder and structure-oriented techniques, and exploit their relevant capabilities and resources to drive other ecosystem elements to follow them during renewal (Abdelgawad et al., 2013; Ansari et al., 2016; Koskela-Huotari et al., 2016). The capabilities also allow downstream elements to adapt to the changes (Pierce, 2009; van der Borgh et al., 2012). Alternatively, as a bottom-up development, peripheral actors with less resource power may create shared intensions that spill over the entire ecosystem (Taillard et al., 2016). In the case of collaborative ecosystems, renewal occurs by building networks or shared intentions (van der Borgh et al., 2012).

The literature identifies several factors that negatively affect the fate of ecosystems. These are basically caused by central, powerful organisations. Competing with the complementors (Iansiti & Levien, 2004), favouring some complementors in cooperation (Huber et al., 2017), and introducing significant changes in the ecosystem (Pierce, 2009; Tiwana, 2015b) are among these activities. Only the organisations with adaptive capabilities can resist against such changes (Pierce, 2009). As another cause for exit, increased coordination costs for complementors can also be controlled by the central firm (Tiwana, 2015b). Hence, ecosystems decline parallel to the decline of complementarity, which may be defined as the ability to co-create with the contribution of specialized elements (Jacobides et al., 2018; Dattee et al., 2018). The reduction of complementarity may be caused by the leaders entering complementary fields with excessive competitive orientation, increases in coordination costs, or domination of dyadic relationships.

2.5. Discussions

2.5.1. A Summary of Ecosystem Management Research

This research provided us with the chance to overview the outlook of the ecosystem management literature. This subsection outlines the current state of literature, and discusses key trends.

Ecosystem management is a popular topic, demonstrated by the number of articles such that the studies published between 2016 and August 2018 are more than the studies published on or before 2015, dating back to 1993 (64 vs. 58). The increase is partly due to the popularity of entrepreneurial and service ecosystems, which diversify the stream that was previously dominated by business, platform and innovation ecosystems. Most studies on ecosystem management belong to strategy and entrepreneurship fields, but international business, organisational studies or marketing fields are not that strong. The consumer side reflects a development opportunity especially in non-platform ecosystems since one of the distinguishing characteristics of ecosystems is the addition of consumers within the analysis (Clarysse et al., 2014). Besides platforms, high tech industries, and the service sector receive more attention than traditional manufacturing industries or state services.

Although different ecosystem types exist, included studies point to similarities that define all ecosystems. The most apparent characteristic is the involvement of various stakeholders from different tasks around a common purpose (Ansari et al., 2016; Furr & Shipilov, 2018). These stakeholders connect and cooperate with others within the rules of the ecosystem. The shared purpose can be the production and delivery of values, or mutual development of opportunities that would make each element better off. The composition exceeds the boundaries of a supply chain due to the inclusion of complementary elements, contributing users, and supporting organisations (Jacobides et al., 2018).

On the other hand, ecosystems differ according to their purpose. In addition to the popular entrepreneurial, business or innovation ecosystems, the literature also emphasises specific types such as knowledge, supplier, or service ecosystems. Classifying this dispersion can help in producing stronger theories. The competitive orientation of ecosystems, which is determined by the core objective, may provide the basis.

The literature implies that collaborative ecosystems, such as entrepreneurial, social, service, knowledge, or some forms of innovation ecosystems have different dynamics than competitive or market-oriented platform and business ecosystems (Aarikka-Stenroos & Ritala, 2017; Clarysse et al., 2014). For

collaborative ecosystems to function, the dispersed actors need an aggregation mechanism, such as the geography, a university, or an accelerator locating at the centre, that links and binds the players within a network (Roundy et al., 2018; Wright et al., 2017). Most of these ecosystems form around specific stakeholders that are not dominant in business ecosystems, such as universities, incubators, or investors of entrepreneurial or academy-based ecosystems. The orchestration is mainly implemented by such intermediary organisations which facilitate connections to the business environment, resources, and stakeholder groups (Goswami et al., 2018). The elements appropriate value based on the connection to the external world rather than internal competition. Similarly, in knowledge ecosystems, actors do not capitalise on knowledge against themselves in a value sharing battle (Clarysse et al., 2014). Hence, the competition is weak in collaborative ecosystems, and it is observed in resource access instead of appropriation.

On the other hand, competitive ecosystems such as business, platform, and some forms of innovation ecosystems are usually organised around central orchestrators (Gawer & Cusumano, 2014; Wareham et al., 2014). Although the technological requirements and opportunities trigger cooperative behaviour in these ecosystems, competition exists between the actors of the same task (Ben Letaifa, 2014; Selander et al., 2013). Value appropriation reflects a zero-sum game among stakeholder groups (Li & Agarwal, 2017). Although the ecosystem value can be improved with the participation of various elements of the same group, the competition between these elements may constrain the appropriation opportunities for entrants (Cennamo & Santalo, 2013).

Specific attention should be paid to innovation ecosystems as they are sometimes used in a regional context (Brem & Radziwon, 2017), however some studies are not bound to geographical proximity (Adner & Kapoor, 2010). Besides, while some studies consider innovation ecosystems in the collaborative form, others are competitive (Aarikka-Stenroos & Ritala, 2017; Suominen et al., 2019). Such confusion constitutes a barrier against concept coherence.

With regard to the evolutionary stages, the ecosystem emergence studies explain the preparation of co-creation parameters. Value capture dynamics are shadowed by this emphasis. Platform and

collaborative ecosystems are studied more than service or business ecosystems. The complementor focus is weak at this stage. In the progress phase, appropriation becomes apparent in addition to cooperation. Co-creation is examined mostly from the perspective of participation motivations of complementors. Competitive ecosystems populate the stage. Finally, the renewal and decline of ecosystems is the least developed phase. Death or radical renewal of ecosystem value remains a promising research area.

2.5.2. The Ecosystem Management Framework

In this subsection, we outline the framework derived from existing research on ecosystem management, and briefly discuss theoretical and practical implications.

The thematic synthesis indicates that the managerial behaviour of constituting elements is affected by three main pillars in addition to the evolutionary stage: ecosystem type, value complexity, and resource power distribution between the elements. The extent to which ecosystem elements invest in networking or use unilateral techniques in managing relations with the ecosystem is based on these factors. Designing the ecosystem, positioning for value capture, and willingness to cooperate are determined by these pillars.

First, collaborative ecosystems are not governed by a central entity, but rather the environment is designed with the networking of less powerful partners, and with the cooperation of entrepreneurs and knowledge creators with external support providers to increase knowledge flow between stakeholders. The main objective is to expand the co-creation abilities by cooperating and integrating with others. In competitive ecosystems, market-oriented and unilateral techniques are employed to capture a greater value proportion. Powerful organisations have a greater stake in ecosystem design and management. Their decisions affect the motivations and performance of stakeholders as well as ecosystem rules.

Second, power distribution between the elements based on their resource strength determines the extent to which the ecosystem is managed individually or in a coalition. Powerful organisations capitalise on their resources to set the parameters of the ecosystem, and resource power decreases the importance of network management. On the contrary, for less powerful organisations or in homogenous power distribution conditions, network centric behaviour is the way to organise co-creators, improve resource access, and appropriate value.

The third important factor is value complexity. If the production or delivery of core ecosystem value requires the involvement of various complementors (i.e. value complexity is high), ecosystem elements tend to cooperate. When value creation or delivery can be implemented by a single firm, the tendency to use unilateral techniques increases. Designing participation incentives becomes more important than actively building a network.

There may be a tentative order between these factors such that the ecosystem type supersedes the impact of resource power distribution, which dominates value complexity. Thus, drawing on example cases, cooperative intentions are expected to be lower in powerful organisations, such as the platform leaders, which operate in an ecosystem that produces a complex value proposition. As discussed, these three factors are influential in many instances including the establishment activities, strategising for competition, coordinating other elements, or shaping the transformation pathway of the ecosystem.

The lifecycle stage also affects the managerial behaviours. During emergence, system building activities and designing the motivations for potential stakeholders are the major concentrations. The stage is led by a central organisation, central stakeholder group, or a supporting organisation. The involvement of complementors and appropriation objectives are of secondary importance. During the progress stage, each stakeholder group manages its appropriation and co-creation mechanisms. Opportunities and technical challenges evolve the ecosystem, and organisations adapt with their capabilities. The decline of ecosystems is characterised by the loss of complementarity. Thus, the renewal is based on the regeneration of co-creation opportunities.

The structure of relationships is encoded in the business model of the ecosystem. The model is characterised by the cooperative vs. unilateral management tendency of the elements influenced by the ecosystem type, value complexity, and resource power. In addition to these structural aspects which are difficult to change for organisations, interactional dynamics of the business model can be controlled by participating organisations such as knowledge sharing and capability development.

Once the shared knowledge of ecosystem members is processed by receiving organisations, the required cooperation in co-creation is implemented by the development of shared intentions that are backed by economic opportunities. After committing to the shared co-creation intentions, organisations determine their value capture conditions, and lead or adapt to the changes within the ecosystem through their capabilities. This is the point where the ecosystem relations formalise and the business model of the ecosystem stabilises. Government and supporting organisations feed this system when the value is complex, or when ecosystems are collaborative and network development is not effective.

The research identifies some practical insights for managers. First and foremost, in collaborative ecosystems, or complex value and limited resource conditions, cooperating within and across stakeholder groups should be an important objective rather than aggressive appropriation strategies. Second, ecosystem leaders should pay attention to preserving complementarity for the long run survival and co-creation abilities of the ecosystem. Third, as competitive movements quickly spread around the ecosystem, the members should design unique strategies based on their own network, knowledge, and resource positions.

2.5.3. Future Directions

In addition to our propositions, future research may address some missing or under explored considerations identified in this study. First, in competitive ecosystems, the openness of the ecosystem's business model for the contributions of stakeholders stands as an unknown issue while the current perspective attributes this function the ecosystem leader. Second, the competition in and between ecosystems is an underdeveloped theme. Although it is acknowledged that more than one ecosystem

can be in place in an industry, and that a platform ecosystem stream well identifies this case, non-digital ecosystems are not apparently investigated in terms of the dynamics of coexistence. Such attempts can clarify the boundaries of, and overlaps between, ecosystems and simultaneous participation of organisations to competing ecosystems. Besides, the switch between intra-ecosystem to inter-ecosystem competition due to splitting might be an interesting issue for strategy.

Context based investigations also require improvement. For instance, internationalisation is only examined from the leader's perspective, which establishes an ecosystem in a different country. The reaction of the players in the destination economy, the contextual characteristics of the home and host countries, and the position of all downstream actors during internationalisation have yet to be studied.

On the other hand, entrepreneurial ecosystems appear to lack the examination of B2B relations and competition dynamics. The link between competitive and collaborative ecosystems in terms of how participants simultaneously manage them also indicates opportunities for interesting research.

In terms of the disciplines, marketing field currently emphasises the co-creation and B2B networks, and can investigate the demand side actors, especially in non-platform ecosystems. Organisational studies are also under developed, which may shed light on the effect of organisational characteristics, resources, and structures on ecosystem management. However, no link can be detected between intra-organisational factors and ecosystem management.

In terms of the lifecycle, the renewal or decline of ecosystems have not been popular among scholars. Issues such as the indicators of ecosystem death, the resistance against renewal, and the interpretation of the signals of major environmental change by ecosystem members necessitate more attention. Furthermore, the exit decision of the platform core and its effect on downstream actors is another possible research focus.

The coherence of the stream may be improved by testing the assumptions and insights of resembling concepts such as platforms or value networks under the ecosystem lens.

2.6. Conclusion

This research synthesises the literature on ecosystem management within a lifecycle perspective. The main contributions of 122 papers on ecosystem management are integrated, which are distributed around the emergence, progress and renewal/decline stages. In the analysis, ecosystem type, value complexity, and resource power distribution are found to structure the nature of relationships in ecosystems. The shared intentions that bind members defuse via a knowledge flow between elements. Within the rules of an ecosystem's business model, organisational capabilities ensure the adaptive and managerial behaviour of the organisations subject to these shared intentions.

As a result of the analysis, we offer 6 propositions on how ecosystems are managed, which could guide future research. In addition, we identify the strengths and weaknesses of ecosystem management research, and propose directions for future studies.

This study is subject to notable limitations. First, although inclusion and coding decisions are re-evaluated after a time gap, decisions reflect the interpretation of a single author which may be subject to biases (Durach et al., 2017). Second, 12 potential articles could not be reviewed. Although the ratio of these articles to the accessed 182 papers is not high, they might decrease the relevance of future research proposals. Third, we did not include concepts such as value networks, platforms or clusters which may have important insights on ecosystems. Considering the conceptual focus and timing, this decision was reasonable. Finally, although the papers are coded according to their most apparent themes, they could hold implications on other themes as well, which should be taken into consideration.

3. The Impact of Institutional Voids and Ecosystem Logics in the Spread of Ecosystems in Emerging Economies

3.1. Introduction

Business ecosystems are formed under a dominant business logic that interplays with the environmental conditions (Goncalves et al., 2019; Lepoutre & Oguntoye, 2018). This interaction requires elaboration since ecosystems, which capture a very high market share in their home economy against rivals, may not dominate the destination markets under different conditions. A popular example of such a case is the performance of mobile platforms where iOS and Android dominate developed economies with their business logics such as real time connectivity or strong modularity. However, as late as 2015 when iOS and Android were already dominant in developed economies, the Symbian ecosystem, with its logics of simplicity and cost effectiveness, was still strong in developing economies such as India, Indonesia, and many African countries (Gichamba et al., 2015; Kapoor & Agarwal, 2017; Mirani, 2014; Puspitasari & Ishii, 2016). The stronger performance of losing ecosystems of a developed economy in an emerging economy attracts attention on what creates appropriate conditions for the spread of ecosystems in emerging economies, and how these conditions interact with the ecosystems.

The ecosystem is a popular metaphor in management research, in which several upstream and downstream stakeholders co-evolve around a central solution for the joint production of a set of interdependent values (Adner, 2017; Autio & Thomas, 2014). The stable interdependent operation among actors is maintained by business logics shared by the key elements, otherwise ensuing chaos may prevent the formation of a unit out of such a collection of actors (Autio et al., 2014; Lindgren et al., 2015). These logics, which are mainly determined by the preferences of the ecosystem leader, are crucial for the competition outcome of different ecosystems within an industry, because they reflect the approach to value creation (Anderson & Tushman, 1990; Iansiti & Levien, 2004; Prahalad & Bettis, 1986).

Business ecosystems have been widely explored from an economic perspective with respect to complementary relations among the actors or how to make a profit while managing co-opetition (Adner, 2017; Adner & Kapoor, 2010; Hannah & Eisenhardt, 2018; Hong & Snell, 2013). However there remains underexplored areas. For instance, diffusion of the core value and market appearance of complementors (i.e. spread performance) of ecosystems, of which the market leader can be termed as the dominant ecosystem, while others can be called alternative ecosystems, may be a factor that impacts market success of ecosystem stakeholders. Overlooking the context, the main implication in this perspective is that belonging to the dominant ecosystem is beneficial for partners due to market access and network effects (Anderson & Tushman, 1990; Autio & Thomas, 2014; Ceccagnoli et al., 2012; Gawer, 2014; Kang & Downing, 2015).

Unlike the strength of the economic perspective, the literature lacks an institutional treatment of business ecosystems in terms of their interactions with the macro environment. Since ecosystems can be formed with the contribution of actors from various countries, the same ecosystem may exist in different institutional contexts which affect the spread performance (Lepoutre & Oguntoye, 2018). The insights obtained from economic studies regarding the performance of dominant ecosystems have been tested in developed economies where there are strong market institutions and powerful customers (e.g. Adner & Kapoor, 2010; Ceccagnoli et al., 2012; Gawer, 2014; Kapoor & Lee, 2013). However, we lack understanding of their generalisability to the competition in other contexts with regard to market structure and leadership (Sarma & Sun, 2017).

This is an important omission because, in contrast to developed economies, emerging economies are typically characterised by institutional voids (Khanna & Palepu, 2010). This augments the entrepreneur's impact because of the activities towards filling the gaps in market formation (Harrison et al., 2018; Mair et al., 2012; Selander et al., 2013). Thus, due to ecosystem characteristics and entrepreneurial activities, the dominant ecosystem in a developed market may give way to an alternative ecosystem in an emerging market context. In order to understand the spread performance difference of the same ecosystem across borders, it is important to discover the interplay between the ecosystem logics and the behaviour of local actors in filling institutional voids. At present this gap has not been addressed.

Based on these arguments, with a focus on the entrepreneur, our research question is “How do institutional voids impact the spread of a business ecosystem in emerging economies?” Studying a context-dependence in the ecosystem research, this question aims to shed light on the spread of the same ecosystem in countries with different institutional environments, and requires an understanding of the processes involved during an industry's formation in an emerging economy. Clarifying the institutional conditions affecting an industry and comparing competing firms based on their preferences, strategies and logics allow for the identification of theoretical mechanisms underpinning performance. Since it enables testing and developing existing theoretical clues on an under-explored concern, we conduct an abductive case study on the assistive technology industry for the blind in Turkey where the US-based dominant and alternative screen reader ecosystems are represented, making it possible to compare the spread performance differences of these ecosystems in different economies (Dubois & Gadde, 2014). As an emerging economy, Turkey has strong factor and weak institutional conditions that increase the impact of local actors on shaping the market (Hoskisson et al., 2013; Mair et al., 2012), enabling the analysis of how entrepreneurs cope with institutional voids.

This paper makes the following contributions to the literature. First, we contribute to an economic perspective in the ecosystem literature by studying international competition between business ecosystems, currently being paid scant attention despite representing a common case in practice (Sarma & Sun, 2017). This is an important step towards predicting the spread of competing ecosystems in a given context. Second, we suggest that ecosystems operate on a dominant logic which is highly determined by their leaders. The logic creates blueprints in the ecosystem and outlines its operating principles, influencing its international spread performance based on the interaction with the institutions. Third and most important, we introduce a macro-institutional perspective in approaching business ecosystems. This implies that institutional voids create a condition in favour of specific ecosystem logics, explaining why alternative ecosystems may have a stronger chance in succeeding in emerging economies contrary to the insights obtained from studies conducted in developed economies with an economic orientation. Local entrepreneurs can shape their environment by managing institutional voids, and affect their ecosystem's performance. Finally, we distinguish between country-level and contingent institutional voids, and discuss the implications.

3.2. Literature Review

We begin this section by outlining the literature around business ecosystems with a focus on the impact of core firms on shaping ecosystem logics, and reviewing the assumptions on the spread performance of ecosystems. Next, we discuss the literature on institutional voids that make emerging markets, and the role of entrepreneurs in shaping the institutional context for forming ecosystems in emerging countries.

3.2.1. Business Ecosystems

The ecosystem perspective is in line with the view that the success of a firm is closely related to other actors in the environment due to interdependence in value production (Kapoor & Agarwal, 2017; Moore, 1993). Ecosystems form through the participation of upstream partners and downstream buyers and complementors, co-specialised around a core solution or innovator, which orchestrates the entire ecosystem (Autio & Thomas, 2014; Iansiti & Levien, 2004). They include any stakeholders that contribute to the production and delivery of interrelated values regardless of direct or indirect business relations, thereby having a wider coverage than the value chain or supply chain because of including contextual actors such as financers, economic infrastructure, and various stakeholders within the analysis (Adner & Kapoor, 2010; Autio & Thomas, 2014; Furr & Shipilov, 2018).

In order to co-create an interrelated set of values, direct ecosystem partners commit to a business logic that characterises the ecosystem and ensures stability (Goncalves et al., 2019; Sarma & Sun, 2017). The harmony that binds ecosystem members around the same objective is largely maintained by the ecosystem leader. It coordinates many stakeholders to enrich the ecosystem value, and motivates them to adjust for the core value in addressing promising markets (Gawer & Cusumano, 2014; Iansiti & Levien, 2004). The close ecosystem stakeholders stay compatible with the logic to benefit from existing opportunities and avoid uncertainties (Anderson & Tushman, 1990; Kapoor & Agarwal, 2017). In addition to the force of complementarity, empirical evidence suggests that peripheral actors conform to, and support, central leaders because of their strategic importance for the entire group (Gubbi et al., 2015), that is, avoidance from negative consequences of the leader's failure stimulates conformity. In

time this behaviour becomes routine, and creates path dependencies while learning, coordination and adaptive expectation effects further exacerbate the tendency to be bound by the logic (Schreyoegg & Sydow, 2011).

The performance of a firm is suggested to increase through collaboration with large ecosystems. This preference is advocated with attributions to different theoretical perspectives, of which most are related to an economic view. For example, an opportunity-based argument is that accessing large complementor and customer networks in dominant ecosystems is advantageous (Porter, 1985). The organisational ecology perspective implies that the dominance of an ecosystem can be explained by its fit with environmental conditions. The successful ecosystem operates under a logic that properly meets market expectations. This rationalises taking part in such ecosystems (Hannan & Freeman, 1984). The industry lifecycle stream also points to the same direction. Most complementors of a technology follow the standard of the dominant design not to miss a key proportion of the market while alternative designs and their associated ecosystems are pushed to compete at the periphery until a probable industrial disruption (Anderson & Tushman, 1990). This creates a condition where the winner of the initial competition grows further. A similar effect is predicted in the studies concentrating on economic opportunities (Iansiti & Levien, 2004; Moore, 1993), network externalities (Clarysse et al., 2014; Gawer & Cusumano, 2014; Lepoutre & Oguntoye, 2018), or uncertainty management (Alexy et al., 2013).

However, generalising such conclusions to address different economic environments may be deceptive. These insights are gathered from stable, predictable, and developed markets with strong institutions and customers. Scholars approach the problem of ecosystem spread without paying attention to market since the operational conditions are properly defined (Rong et al., 2017; Sarma & Sun, 2017). Nevertheless, spread performance can be affected by many factors including the legal and institutional environment of the region, financing infrastructure, or economic parameters of the country (Autio et al., 2014; Chen et al., 2016). Such differences create various contingencies, especially in emerging economies, which have been overlooked to date (Rong et al., 2017).

3.2.2. Institutional Voids in Emerging Economies

The institutionalists see the economy as a collection of human-made institutions consisting of belief systems, norms and activities -, and differences between economies can be understood with respect to the formation of the institutional environment (Hollingsworth, 2000; North, 1991). In this sense, the differences in the organisation of emerging and developed economies cannot be captured by superficial factors such as geography or income levels (Hoskisson et al., 2013; Khanna & Palepu, 2010). Rather, institutional voids are the fundamental differentiating factor between emerging and developed economies, that is, emerging markets may lack some proper functioning institutions that shape developed markets (Khanna & Palepu, 2006; 2010). The voids may be caused by absence, weakness, imperfection or ineffectiveness of institutions forming the market (Rodrigues, 2013), including the components such as the legal environment, intermediaries, factor markets or infrastructure (Harrison et al., 2018; Inoue et al., 2013; Khanna & Palepu, 2010; Luiz & Ruplal; 2013). Such problems with the institutional infrastructure causes additional uncertainties in making business, increases costs, and constrains resource access (Ghoul et al., 2017). For example, heavy regulations in firm entries and labour markets cause people to oppose internalising formal rules, which increases transaction costs (Doh et al., 2017). Similarly, the radical variations in the quality of educational institutions in India make it harder for multinational firms to access the talent pool as effectively as the local firms (Khanna & Palepu, 2006). Not only the absence or inefficiencies, but also the multiplicity of institutions on the same purpose creates voids as they cause conflicts and contradictions (Mair et al., 2012). As such problems may result in unexpected relational structures or value diffusion outcomes, These environments require consideration before establishing or representing an ecosystem. Effectiveness in managing institutional voids through institutional entrepreneurship is important to determine the spread performance of ecosystems in these economies (Harrison et al., 2018; Rong et al., 2017).

Institutional entrepreneurship literature argues that entrepreneurs may transform the institutional environment with their actions such as bridging diverse stakeholders, introducing new practices and getting others familiarize with these practices at the early phases of institutional change (Chen et al., 2017; Maguire et al., 2004). Especially emerging environments require more creativity and efforts from institutional entrepreneurs, because they need to convince many stakeholders for a purpose without benefiting from established legitimacy (Fligstein, 1997). Despite poor market functioning, uncertainty

and adaptation concerns (Gubbi et al., 2015; Inoue et al., 2013), institutional voids perspective considers these challenges as an advantage for the entrepreneurs in local emerging economies since voids can provide opportunities to structure the environment, and local entrepreneurs have the necessary experience and capabilities in such chaotic environments (Luiz & Ruplal, 2013; Mair et al., 2012; Selander et al., 2013; Tracey & Phillips, 2011). The theory identifies a few options which entrepreneurs can follow to strategise on the voids. They either fill the void by undertaking the function of the institution, or create alternative solutions by using substitute institutions (Khanna & Palepu, 2010; Tracey & Philips, 2011). Research also highlights that entrepreneurs may create alliance networks to mimic the behaviour of a functioning network, or collaborate with partners from other countries that may undertake the function of the missing institution (Ghoul et al., 2017).

Our review demonstrates that the literature on ecosystems with economic orientation suggests joining larger ecosystems, however the boundaries for such suggestions are not properly defined, especially in the international context (Autio et al., 2014; Sarma & Sun, 2017). In addition, the literature does not clarify the relationship between dominant logics and ecosystem spread performance in different contexts. Finally, institutional examination of business ecosystems, specifically in terms of the effects of institutional voids in managing ecosystems seems to be lacking at the macro level. These concentrations may help in explaining the performance differences of the same ecosystem across borders such that an ecosystem might spread better in a different context compared to its stronger rival in the home country.

3.3. Research Setting

We first introduce the research context for studying international competition among dominant and alternative ecosystems from the perspective of the entrepreneurial complementor in the emerging economy. Next, we reveal our methodology, and describe the application phase of the research.

3.3.1. Context

Ecosystems can be formed with a contribution of elements from various countries with different conditions. In order to understand how ecosystems in the same industry compete in other contexts, we chose the US as the developed home economy and Turkey as the emerging destination economy. As the biggest economy of the world, the US is the centre for many industries due to economic diversification (Hall & Soskice, 2001). It is not uncommon that US-based ecosystems compete in international business, and complementors in other economies participate in US-led ecosystems. On the other hand, Hoskisson et al. (2013) classify Turkey as a rapidly growing emerging economy. It is considered as one of the mid-range economies that represents a condition between newly developed and traditional developing economies with its relatively high well-endowed infrastructure and factor markets, and its inadequate institutional development (Hoskisson et al., 2013; Khanna & Palepu, 2010). This makes Turkey an appropriate research context because factor and infrastructure availability reduces the risk of failed competition due to scarcities in essential requirements such as capital, skilled labour or distribution facilities. On the other hand, institutional voids allow tracking entrepreneurial behaviour that may yield unique ecosystem spread outcomes (Mair et al., 2012; Wright et al., 2005).

We study our research question in the assistive technology industry, specifically in the ecosystems around the screen reader software that reads aloud text on the screen for the blind. The assistive technology industry delivers specialised solutions for the blind and visually impaired. Screen reader and magnifier software, digital magnifiers, book readers, Braille printers and other such enabling technologies are produced by few SMEs, and distributed globally by local entrepreneurs. The US constitutes the biggest market as the pioneer country of the industry since the 1980s. It hosts the world's first and second dominant paid screen reader ecosystems, Jaws for Windows and Window-Eyes, which have various distinct or overlapping stakeholders (Oswal, 2014). Competition in the industry also takes place between these ecosystems in most other countries (Brown et al., 2012). We narrowed our focus of analysis to Windows-based paid screen readers, which are not subject to heterogeneous competition dynamics due to non-profit actors. In addition, the same country of origin eliminates the concerns about the home country difference in explaining performance outcomes in destination economies. Therefore, the industry provided us with an opportunity to properly investigate our research question in relevant contexts.

Screen readers are the main assistive technology components as the core accessibility tools for most blind individuals who need a solution for accessing information. They influence the entire industry architecture and competition strategies in the industry, and form ecosystems around them including many stakeholders such as script developers for making 3rd party software accessible, Windows applications, dealers, user communities, financers, complementary assistive technologies, and legal or institutional elements of the country. These elements exist in both ecosystems but evolve via distinct paths. For example, scripts that add functionality to the screen reader are developed in different language platforms, and cannot be converted for rival ecosystems. Jaws places no central control on the scripts while Window-Eyes offers a controlled repository, impacting developer behaviours and the attracted users. On the user groups, high switch costs arise because educational materials, experience sharing, and usage habits diverge the communities. Software and hardware items may only be accessible to one ecosystem. Dealers generally sell only one screen reader, and this choice affects their entire product portfolio. In addition, country-specific conditions affect the diffusion of screen readers by interacting with ecosystem logics. Although there are inevitable overlaps among ecosystems due to operating in the same industry, such conditions distinguish between two ecosystems.

In this research, we focus on the entrepreneurs in Turkey who are in the form of dealers within their international ecosystems, but establish the local ecosystem by introducing the core value and setting up links with the stakeholders in the local economy. Thus, this choice allows tracking the adaptations for introducing the ecosystems and their spread performance in Turkey. Since developing the technology requires large capital and know-how investment, and the target group has strong budgetary constraints, the entrepreneurs joined US-based ecosystems for setting up the local industry. In order to respect the entity of the firms and secure the confidentiality of the informants, we refer to the firms as Alpha, Beta and Gamma; and do not disclose informant names. The first firm of the industry, Alpha, was established in 1996 by three family members. It distributed the dominant core solution, Jaws for Windows, and joined in its ecosystem. In 2005, Beta was established by two blind, two visually impaired and one sighted friends who were previously dealing with blindness issues. This entry initiated competition, expanded the market, caused reductions in sales prices, and introduced diversity to product lines. This was a step towards the rise of a non-monopolistic market and introduction of new business practices in Turkey. By the beginning of 2010, Gamma joined the competition as a separation from Beta after three

owners of Beta resigned due to managerial conflicts. The split intensified competition, and brought new practices to the industry such as purchasing from competitors. By 2014, aside from the providers of low-tech solutions such as white canes or talking watches, three firms were competing to distribute assistive technology in Turkey, all taking part in US-based screen reader ecosystems. Table 9 presents an overview of the ecosystems in Turkey.

Table 9: An Overview of the Market Formation

Element	Jaws	Window-Eyes
Est. market status in the US	Dominant with a market share around 80%	Secondary with a market share around 15%
Emphasised features	Most used, functional superiority	Local fit, customisability
Distributed by in Turkey	Alpha, Gamma	Beta
Reason to Distribute in Turkey	Superior worldwide sales performance and functional advantages	Exclusivity of Jaws; growth expectations on the forerunner; flexibility for local adaptations
Distribution years	1999 (for Gamma 2010) onwards	2006 onwards
Est. market share in Turkey	55-65%	35-45%
Marketing approach in Turkey	Capitalising on the brand name, benefitting from existing user networks, emphasising innovative functionality	Proactive and firm-centred marketing, emphasising localisation, adaptability and after sales service

The entrepreneur profiles of these three companies do not differ according to many background characteristics including education, relation to the target group, age, prior professional and entrepreneurial experience, social class, experience with the international industrial community, initial financial capital, or technology use. This situation reduces the concerns in individual skills in explaining the performance differences of entrepreneurs.

3.3.2. Data Sources and Analysis

We conducted an abductive qualitative case study on the entire local industry to understand how dominant and alternative ecosystems spread in Turkey. On one hand, international competition between ecosystems, and the impact of business logics and macro level institutions on the spread performance are underexplored. However, our initial review provides a possible framework which might be improved. An abductive case study offers an opportunity to use data to expand theories on an under-explored phenomenon in light of a preliminary reasoning based on a point of departure with a limited theoretical background (Chandler et al., 2019; Danneels, 2011; Dubois & Gadde, 2002, 2014). With this method, we sharpened our initial reasoning and observations in a framework through continuous iterations between theory and data (Chandler et al., 2019; Dubois & Gadde, 2002). Besides, studying multiple firms enabled a comparison between firm strategies, actions and choices in discovering context dependencies (Ozcan & Eisenhardt, 2009), and outlining the causes of spread performance differences of ecosystems across borders.

We conducted our study on Turkish firms which are the local dealers of US-based screen readers. Our sources cover all three direct Turkish partners of screen reader ecosystems to get a complete view of the industry. The data covers the period from the establishment of the firms until 2014, which enables us to track the evolutionary process (Danneels, 2011). We used several data sources in our analysis to limit possible informant bias and to increase the confidence of our findings (Ozcan & Eisenhardt, 2009).

At the beginning of the data collection, we searched for background information through news articles, product brochures, academic papers, company web pages, and other secondary sources such as third-party survey data. Besides, the archives of two popular independent e-mail groups of Turkish blind users where they exchange information about assistive technology were also monitored. This was helpful in developing insights on customer preferences and perceptions. Besides, informal discussions with employees and opinion leaders provided a stronger sense of the industry. Together with the literature, the collected information helped in formulising the questions for the formal stage.

In the first formal stage of the study, we accessed 5 founders from the firms - Alpha 1, Beta 1, Beta 2, Gamma 1 and Gamma 2 - who were still working for their firms at the time of the interviews, and expected to possess the most accurate information about their companies since their founding. A basic questionnaire was prepared to guide the semi-structured interview, and was e-mailed to the interviewees before meeting to reduce pressure and time spent during the interviews. The questionnaire aimed to gather information about many subjects, including but not limited to, company and product profiles, screen reader logics, competition and marketing management, benchmarks, and contextual conditions. During the interviews, additional open questions were asked to discover causal links and underlying logics. The recorded meetings took place in Turkish as the mother tongue of the interviewees. At this stage, memo creation, coding, and iteration with the theory began. We contacted the entrepreneurs about our follow up questions, and the responses clarified confusion that appeared during the iteration.

The collected data indicated that the alternative ecosystem which is formed around Window-Eyes showed a considerably stronger performance in Turkey than the home market. Consistent with an abductive approach, we decided to place more emphasis on its distributor, Beta, to clarify the reasons of this interesting case in detail. After obtaining permission from the company managers, we accessed Beta's archived company e-mails from 2006 to 2013. We recorded our observations on 143 relevant e-mail subjects. Being real business data, these e-mails contained communications between employees of the firm as well as correspondence with outsiders, such as suppliers and customers. The contents ranged from order processes to negotiations, or from strategic discussions of employees to managerial instructions about the promotion of a product. They provided valuable information about industry evolution, competitors, and employee ideas about market occurrences. Hence, we sharpened our framework and propositions with real business data, which was not significantly prone to informant biases (Chandler et al., 2019).

The data sources table showing the material used in our formal analysis is as follows:

Table 10: Data Sources

Source	Firm	Quantity
Formal Interviews	Alpha	130 Mins/32 pages
	Beta	161 Mins/59 pages, 102 mins/39 pages
	Gamma	97 Mins/44 pages, 94 mins/33 pages
Viewed e-mail subjects	Beta	2912
Analysed e-mail groups	Beta	Memos from 143 e-mail groups
Secondary Data		
Brochures	Alpha	16
	Beta	31
	Gamma	7
Academic articles		13
News articles		11

As indicated, we used memos while walking through the data during the analysis, which contained brief analytical insights inferred from the raw data (Danneels, 2011). As required by an abductive approach, we selectively interpreted the data in terms of our constructs on the spread of ecosystems and their relation to the institutional environment and business logics (Dubois & Gadde, 2002). We constantly updated the forming framework with the data, so the data analysis went hand in hand with the data collection (See Appendix B for the sources of inferences) (Chandler et al., 2019; Dubois & Gadde, 2014). As it appeared that Alpha and Gamma did not use conflicting strategies in the diffusion of the Jaws ecosystem in Turkey, we analysed inputs from these two firms on the same side, which is consistent with the research question that aims to capture the ecosystem performance rather than that of the firms.

The following table presents the key concepts and their sources, which are partly derived from the data and partly from published studies (Danneels, 2008).

Table 11: Key Concepts

Concept	Description
Dominant ecosystem	The term is adapted from the dominant design concept which comes from industry lifecycle literature (Anderson & Tushman, 1990) to describe the ecosystems in which the core firm has a significantly higher market share together with its complementors and network breadth than the rivals. We compare its performance with alternative ecosystems.
Alternative ecosystem	A fabricated term to address the ecosystems that are not dominant in an industry, binding their complementors within an alternative set of relationships.
Spread performance	This newly developed term is about competition between ecosystems. It is related to the dominance, and indicates the comparative spread of an ecosystem's core value and the visibility of complementors in an economy. As our dependent variable, this is qualitatively evaluated.
Ecosystem logic	An application of the business logic term coined by Prahalad and Bettis (1986) used to describe the informal principles of ecosystems that complementors must follow. Its interaction with the context and effect on the spread performance are explored.
Institutional voids	Borrowed from the literature to describe the missing or ill-functioning institutions in emerging economies (e.g. Doh et al., 2017; Khanna & Palepu, 2010). Its effect on the spread performance is explored.
Flexibility logic	Excerpted from the data by capitalising on the strategy stream (Schreyoegg & Sydow, 2011); in the study context, this term describes the adaptability of the ecosystem for the institutional requirements in a country. It refers to the extent to which the ecosystem logic is appropriate for localisations and connecting to stakeholders.
Functionality logic	Appearing in the data, the ecosystem logic that emphasises the technical orientation of the ecosystem and its skills to create capabilities for its complementors.
Country-level voids	These institutional voids embed in the entire economy, and can be seen in almost all the industries inside the country. They have more to do with the politics and macro indicators. The concept is derived from Ghoul et al. (2017) and sharpened by the data.
Contingent voids	Defined differently than Rodrigues (2013) and streamlined in the data, contingent voids are institutional voids that are not present in the entire economy, rather, they exist in a specific industry. Such voids are crucial for accessing the target group.

3.4. Results

This section begins with a description of the US and Turkey regarding the conditions for the assistive technology industry and the screen reader ecosystems, especially in terms of institutional voids in Turkey, which need to be addressed by local entrepreneurs. We examine how the ecosystem logics, with the involvement of entrepreneurs, interact with the institutional voids to determine market outcome. We conclude the section with a framework and a process model that describes the steps taken towards ecosystems becoming transferred to emerging countries.

3.4.1. Institutional Void Management in Turkey

The US and Turkey have different market conditions in terms of the assistive technology industry, which includes the screen reader ecosystems at the core. In the US, the industry is at maturity with a proper functioning market. The country hosts many producers including the leaders of screen reader ecosystems, whose products are sold all over the world. Strong competition results in lower prices and innovative differentiations. On the customer side, individual purchases account for most sales. The income level of individuals, awareness of their specific needs, and a culture motivating the blind to spend for their needs strengthen the market. Labour force participation is high among the blind, further increasing the sales and demand for differentiated solutions. Although there are differences according to individual states, assistive technology for the workplace is partly subsidised by the insurance. The coverage of the remaining cost strengthens the users' bargaining hand against firms. For screen readers, there is a diverse complementor network of script developers and dealers.

On the other hand, Turkish firms did not have the chance to do business with US practices because of institutional voids that require different practices. The market has voids in several areas which the entrepreneurs had to take into consideration before trying to prepare the conditions for the diffusion of the core ecosystem value and to establish links with local stakeholders. Areas that are shaped by

institutional voids and the attempts of the entrepreneurs to fix them during the ecosystem establishment (which effectiveness of their execution is affected by ecosystem logics as described in section 3.4.2) are inducted from interviews, e-mails, and open sources as below.

Consumer finance. A functioning market exists where supply and demand are linked through the price. However, the purchasing power of consumers in Turkey is around three to four times lower than the US, and prices exceed budget limits of the blind and visually impaired who have higher unemployment rates. The market cannot adjust an efficient price based on individuals' willingness and reasonable costs, because the entrepreneurs are price takers. This prevents assistive technology consumers from being customers. Furthermore, unlike most developed countries including the US where assistive technology is partly or fully subsidised by various insurance institutions for fostering the individuals' integration to society, such support is missing in Turkey. The lower per capita income makes this absence more detrimental. Besides, borrowing opportunities as well as the awareness of, and willingness to, use existing finances on the customer side are limited.

“In the US (...) if they can prove that the product is a need, the government and insurance support them. The support is stronger in the EU countries such as Germany that European made products are more expensive, because producers know they can sell their products to their government.” (Gamma 1)

The entrepreneurs did not have the power to fill these voids which characterise the entire country environment. Thus they bypassed the improper financial institutions with the alternatives, or coordinated several stakeholders for overcoming the voids. They redesigned their revenue model in a way to involve the donators, social policy and CSR as alternative institutions, and motivated the state and private firms to provide assistive technology for both individual and public use. Creating bundle packages from several different assistive technologies facilitated this attempt. In the new business model, the purchaser was not the user, and assistive technology packages competed, instead of single items. Thus, inadequate consumer finance was balanced with the involvement of state institutions, municipalities, and donators including NGOs, firms or individuals.

“Various big firms in Turkey, say in construction, communications or clothing, (...) to increase their visibility for their own sake, organise social responsibility projects with us. (...) As a result this is one of the fields where we can earn money. Since they spend, we exist in some degree.” (Gamma 2).

“What we do is to promote these solutions to the government. Because the state has some political objectives, they need to make their citizens happy and integrate these people. They have financial resources to pay instead of the users.” (Beta 2)

User education. An important difference between the US and Turkey is the education level of users due to the under-utilisation of education institutions in Turkey, which causes variability among the target group (Khanna & Palepu, 2010). The Turkish blind and visually impaired community has a lower schooling rate. This affects the socialisation, status, employment and resource access of the target group. In addition, most do not receive any training on accessibility. Fewer consumers know what the technology can offer them, reducing their demand. It also has a negative impact on labour force participation, which constrains a consumer's income and work-related demand, and the corporate demand for assistive technology.

“When I was a student ... approximately 50 thousand blind people should have been students. However, if the capacity of the blind schools had been one over 50 of this number, we should have loved this. (...) The others could not benefit from the educational opportunities.” (Gamma 2)

To overcome the voids in education which are of fundamental importance in the spread of the ecosystem value in the target group, the entrepreneurs mobilised existing training institutions and incentivised NGO's on blindness to explain the importance of screen readers to their members, which provided mutual opportunities for all involved parties. Besides, they directly taught the technical opportunities of assistive technology and their benefits to the community via free training materials, sponsorships, conferences and advertisements.

“We invited the CEO of our screen reader, and he provided a ten-day course to the opinion leader blind participants from each region of Turkey.” (Beta 1)

“If someone needs to use one of our solutions, we provide the necessary education about it. We supply them with our cards. We share our personal phone numbers. We encourage them to ask any questions when they have.” (Gamma 1)

Application of the Turkish Disability Law. The integration of the disabled to social life is a big concern, and attracts the attention of decision makers. In 2005, the Turkish government passed legislation to support the disabled with financing, accessibility, and employment. The legislation brought many responsibilities for numerous stakeholders such as the municipalities, state institutions and public service firms. Nevertheless, inefficiencies in its enforcement caused institutional voids (Rodrigues, 2013). Many stakeholders could not fulfil the requirements of the law. Reflecting this, the deadline to make the external environment accessible is postponed from 2012 to 2015, and then to 2018.

Although the application of this specific law which directly concerns the industry was not under the control of entrepreneurs, its application would benefit various stakeholders. Thus, to ensure effective operation of the law, they used their resources to provide guidance to the users about their rights. Besides, they informed the officials and relevant parties with their obligations. They also supported such activities with leveraging their network ties to make business based on opportunities provided by law.

“The disability legislation is an important step, but many people do not know what to do. We have to warn universities or municipalities about their obligations. Many do not act on their own.” (Beta 2)

Cultural compliance. Both cultures and institutions have shared components such as belief systems or norms, and cultural tools such as languages or analogies also serve as institutional mechanisms in creating legitimacy (Mair & Marti, 2009; North, 1991). Therefore, cultural elements which constrain

market participation also cause institutional voids (Mair & Marti, 2009). As users are one step away from foreign developers, the local customer needs, tendencies and demands are not fully reflected in the products. Not only the technical aspects of culture including the language which requires more than a translation to be comprehensible and local standards such as the keyboard layouts are different, but also other institutional elements of the culture reflect variations. Contents of education, the dominance of being open to receive support over independent living, and avoidance of the blind to spend on their needs are among such areas creating voids for the technology which is produced in the US. These factors influence what is expected from technology, how technology should be presented, and the tendency to spend money on assistive technology. Without necessary communicational and technological adaptations, the software would not effectively spread and function in the Turkish context.

"(...) Even if they have money they do not want to spend." (Beta 1)

To overcome the industry-specific voids in culture which may limit the spread of the ecosystem among the target group, Turkish entrepreneurs heavily invested in complete localisation of the software for the market conditions, prepared specific marketing and communication plans, emphasised compatible features with the educational differences such as underlining the advantages of listening over braille, and actively used appropriate cultural elements such as arranging donation campaigns. These adaptations included a full translation of software and supporting documentation in terminology that local customers would understand, a localised marketing plan and reconsideration of the target group that exploits the donation mechanism, software-related adjustments on the product such as keyboard adaptations and inclusion of a Turkish synthesiser to give the impression that the product is produced for Turkish users, and setting up special information exchange facilities such as Turkish e-mail groups. Such activities also helped overcoming the voids in consumer education.

"We set this target: Regardless of where it is produced, the product should be Turkish just as it is produced in Turkey." (Beta 1)

A closer look at these void areas and their management demonstrates that institutional voids can be classified as country-level and industry-contingent, and depending on the void type, the strategies to overcome are 1) to fill the void directly, 2) coordinate externals to fill it based on mutual interests, or 3) bypass it by using a different institution. This distinction has implications in establishing an ecosystem and determining an ecosystem's logical fit in the economy. First, although all discussed voids affect the assistive technology industry, some are in relation to the country, and have a wider scope across the entire economy. For example, the consumer finance and insurance systems are affected by financial practices, country-level regulations, or economic development level. They are not tied to the core ecosystem value, are experienced by many other industries in the country, and hence have systematised alternatives. Entrepreneurs are not able to fill these country-level voids as they are limited in power. Instead, they use already systematised institutional alternatives or coordinate key stakeholders for overcoming such problems. On the other hand, cultural compliance, application of the disability law and education of the target group are tied to the industry. They do not have to be present for other industries, and are related to specific conditions and consumer groups. . Neglecting these voids is not an option, because they were of fundamental importance in making business around the core offering of the industry, and can constrain the delivery of ecosystem value to consumers when they are not addressed. Entrepreneurs should fill or get someone fill these voids which may not affect other industries, thereby not having systematised alternatives since the ecosystem is newly being established. Therefore, industry contingent institutional voids are filled by entrepreneurs or those coordinated by them, whilst country level voids are avoided by substituting them, or are filled by an external based on mutual interest. The strategies can be bundled in addressing a single void; for instance, while directly investing in education, firms also benefitted from the foundations working in the field.

The effectiveness of these discussed strategies which the entrepreneurs used to overcome the voids does not only depend on their strategic skills, but also are strongly affected by the ecosystem logics as described in the next subsection.

3.4.2. Impact of Ecosystem Logics on Ecosystem Spread

The ecosystem logics that interact with the environment strongly influence how effectively the institutional voids are filled since immediate stakeholders look for consistency with the logic. Hence, script or complementary assistive technology software developers, as well as the dealers and their customers, are bound by technological standards and general business logics of the core firm. In table 12, we compare the Jaws and Window-Eyes ecosystem logics directly set by the policies of their producers, Freedom Scientific and GW Micro.

Table 12: Ecosystem Logics

Jaws	Window-Eyes
Exclusivity in dealership	Conditional exclusivity
Valuing economies of scope	Allowing flexible dealer portfolios
Innovation orientation	Stability orientation
Higher price	Slightly lower price
Strong compatibility for other programs	Benchmarking competitors
Limited and slow localisations	Full flexibility and support for local adaptations
Having dedicated script coding platform	Compatibility to existing scripting platforms
Decentralised user-provided support	Heavy central technical support incl. dealers
Focus on becoming a monopoly	Late mover - Focus on customer transfers
Standardised solutions	Strong personalisation
Numerous out of the box features	Simplicity by default

Table 12 shows that Jaws has a business logic that emphasises functional superiority. Supporting as much software as possible, introducing sensational innovations, and offering numerous features in the core product are reflective of this approach. Window-Eyes, on the other hand, is flexibility-oriented. Strong customisability for the user, a flexible scripting platform, ease of localisation, and adaptable features for the comfort of old Jaws users reflect this orientation. We figure that despite its lower functional focus, the customisability of Window-Eyes is more appropriate for the Turkish market.

The functionality driven logics work in favour of Jaws to stimulate demand. On top of such a superiority, the first mover advantage creates positive network externalities for the Jaws ecosystem. Consequently, Alpha and Gamma leverage the brand strength without heavily investing in many concerns. For example, they coordinate the users to carry on technical support and localisations. Among the identified ecosystem logics, Window-Eyes only has a slight advantage in pricing as a functional element.

“Well, Jaws sells itself. I mean it has a name. Since it has a well-known name and since it is of good quality, it determines the market as it is known by more people.” (Gamma 1)

On the contrary, with the solution having functional disadvantages, Beta follows a more proactive approach which is backed by the ecosystem's flexibility. It seeks ways to spread the technology by making use of localisation flexibility, customisability, and customer support mechanisms of the ecosystem. Just as the core firm, Beta looks after the marketing material production, script coding, localisation, product education and technical support. Based on the flexibility of the ecosystem logic, the responsible team is effective especially in addressing the contingent voids.

The flexibility of Window-Eyes helps Beta in three ways. First, ecosystem logics shape the product portfolios of the dealers. Window-Eyes does not motivate the dealers to bundle with any specific brand, letting Beta build a rich portfolio consisting of different assistive technologies of various producers in each product category. The strength of the entire portfolio enables Beta to create competitive bundles. In this dominant revenue model of the industry which appears as a response to the institutional voids, screen reader is one of the items in a bundle despite its significance, and is distributed as a companion to other solutions. As its only identified functional advantage, the lower price of Window-Eyes supports Beta in the tenders. This helps to include alternative institutions and motivate the support of partners by preparing Taylor-made solutions, which is the most important strategic tool for managing the institutional voids. On the contrary, with its exclusivity and close integration policies, the producer of Jaws prefers its distributors to sell its other product lines as well, resulting in a portfolio predictability in the competition.

“Think about a package. There are various product types on it. And these solutions are satisfactory for the purchaser. Window-Eyes is also in the package. They (customers) tell us that 'OK, all of them are good but is it possible to obtain Jaws instead of Window-Eyes?' We tell them why this is not possible, and how Window-Eyes will also address their needs. They make the purchase, maybe with unhappiness at the beginning; but later on, they use and get accustomed to it.” (Beta 1)

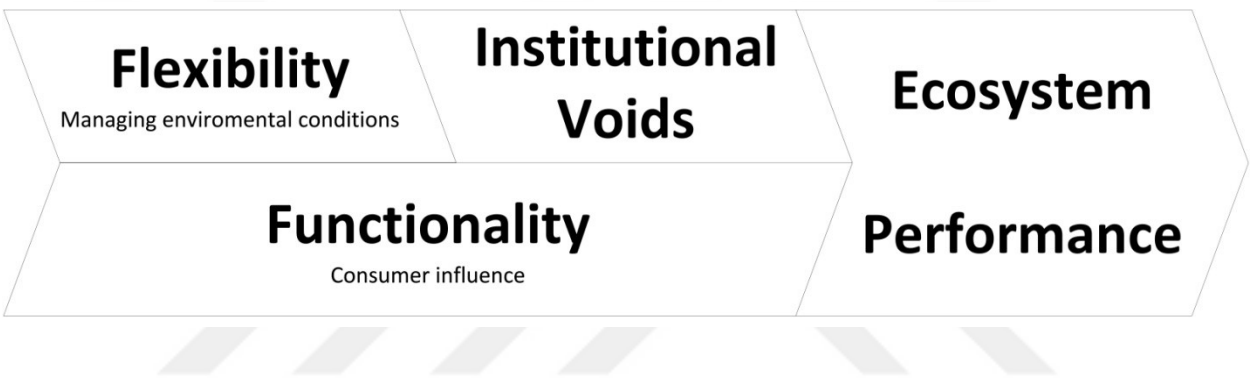
The second angle of flexibility is the localisation capability which enables making any necessary amendments on the software such as disabling unused features, preparing a Turkish interface and compatible background, changing the hotkeys to comply with Turkish keyboards, and country specific script inclusion. Window-Eyes is very flexible for such adaptations which are useful to deal with cultural and educational voids, whilst Jaws has some constraints. Reflecting this, although Alpha begins translation of Jaws two years before Beta, it finalises the process four years later, leading towards a clear differentiation for Window-Eyes.

“To translate Jaws, it is necessary to know how to use another program. There should be Visual Studio. Plus, it is not enough, for the translation another software is necessary...” (Alpha 1)

The impact of logic is also observed in the market development approach. Jaws is equipped with the logic of monopolising, which is exemplified by two lawsuits against other screen readers due to claimed copyright infringements. On the contrary, Window-Eyes is designed to transfer users of Jaws. As an example, it offers a keyboard layout that reflects the shortcut keys of Jaws. Beta, as the second mover, promotes this feature to convince users that they would be able to use Window-Eyes as if they were using Jaws. Reducing the switch cost for the Jaws users accounting for the entire market at the beginning is important, and Beta could reduce its costs for addressing the voids in education by free-riding the efforts of Alpha, emphasising that the switch would cause no inconvenience or training requirement.

As these explanations show, the functionality and flexibility logics reflect different patterns in affecting spread performance. Functionality such as performance, pricing, innovations, or network effects directly influences consumer preferences. Entrepreneurs focus on the characteristics of the solution before selecting one to promote. As functional advantages are easy to detect, such products are preferred by firms and consumers. On the other hand, flexibility helps in shaping the environment, and provides space so that entrepreneurs can manage voids. Figure 1 demonstrates this reasoning.

Figure 1: Impact of Ecosystem Logics



As a result of these interactions between ecosystem logics, entrepreneurial activities and the institutional voids, the spread performance of the dominant and alternative ecosystems in Turkey is not like the US. Although the industry reached maturity, no dominant screen reader ecosystem appeared. Table 13 includes quotations that compare Turkey to the US market in terms of the prevalence of competing ecosystems. We evaluate Alpha's and Gamma's adoption strategies in the same group for Jaws as they were reflecting the same logic, and their activities were not cannibalising.

Table 13: Diffusiveness of Screen Reader Ecosystems

TURKEY	US
"I think the industry volume is around 300-400 a year." (Alpha 1) "Now Jaws is an old program in Turkey. Let's say somebody is giving a computer course, or Excel course, since JFW is installed on the computer the education is given by using Jaws." (Gamma 1) "In Turkey Jaws has its own market. You do not need to make an effort to sell it. It has its own demand." (Gamma 2) "I expect that Jaws had around 2/3 of the market share." (Gamma 2) "Our screen reader volume may change due to bulk sale projects. Without these projects concerning distribution of hundreds of products, we sold around 150-200 copies a year." (Beta 1) "In Turkey the scissors became much smaller. Maybe we can talk about 55% (for Jaws) - 45% (for Window-Eyes) sales percentages which are very closer than the world rates." (Beta 1) "There are users who coded scripts for Window-Eyes. This is important. They use the program, like it, and become a developer in a different level." (Beta 2) "It was motivating for us to hear the European distributor of Window-Eyes saying Turkey makes the second highest volume in Europe. This is bright because Turkish market is much smaller than England, France, Netherlands, or Poland." (Beta 1) "We increased the spread of our product by coding scripts to ensure compatibility with local solutions as call centres. This was a successful attempt, and we made many sales to call centres. (...) We prepared tutorials showing how third-party software is used with Window-Eyes." (Beta 1) "Screen readers improve the sales of our other products. I mean, as we can provide the screen reader in our packages, other items are also sold. So, our products become known and demanded." (Beta 2) "We had a dedicated user group. For example we received several upgrade enquiries from our users who got the product from donations. They loved and wanted to invest on it." (Beta 1)	"This (strong compatibility with Windows) arouse the belief that a blind person with a computer uses JFW. Longer demo time also convinced people to use JFW." (Alpha 1) "We talk about the rate of 80% and 20% in the world. That is, probably 80 out of 100 people are using Jaws in the world. 15% for Window-Eyes and maybe 5% for others." (Beta 1) "In the past I think JFW could develop a different relation with Microsoft. Or somebody in Microsoft provided clues to them. They create a strong infrastructure and still using it. This is advantageous for Jaws." (Alpha 1) "Jaws is more popular in the US, so software developers take them as the first point of contact. Adobe, Java etc. But for most of the solutions Window-Eyes can catch." (Beta 1) "There are some American products which only work with Jaws. (...) Because most individuals use Jaws there. Even some Window-Eyes users have Jaws as a secondary alternative." (Beta 2) Despite its methodological problems such as being an online survey or asking Windows and IOS-based screen reader use in the same question, US-based Web AIM screen reader surveys conducted between 2009 and 2014 show that JFW was around 4 times more popular than other paid Windows based screen readers. Academics also acknowledge the dominance of Jaws (Brown et al., 2014; Oswal, 2012; WebAIM, 2014).

As the quotes show, the Jaws ecosystem is dominant in the US while Window-Eyes is the secondary paid screen reader ecosystem. On the contrary, in Turkey, Window-Eyes is estimated to capture one-third to one-half of the market against Jaws. Not only the sales volume, but also the accompanying ecosystem structure on user groups, distribution network and compatibility dimensions show that there is no dominant ecosystem in Turkey. Despite being the second mover, being promoted by only one firm against two firms, and its functional disadvantages, Window-Eyes shows a considerably better performance, and the Jaws ecosystem does not dominate the Turkish market as in the US.

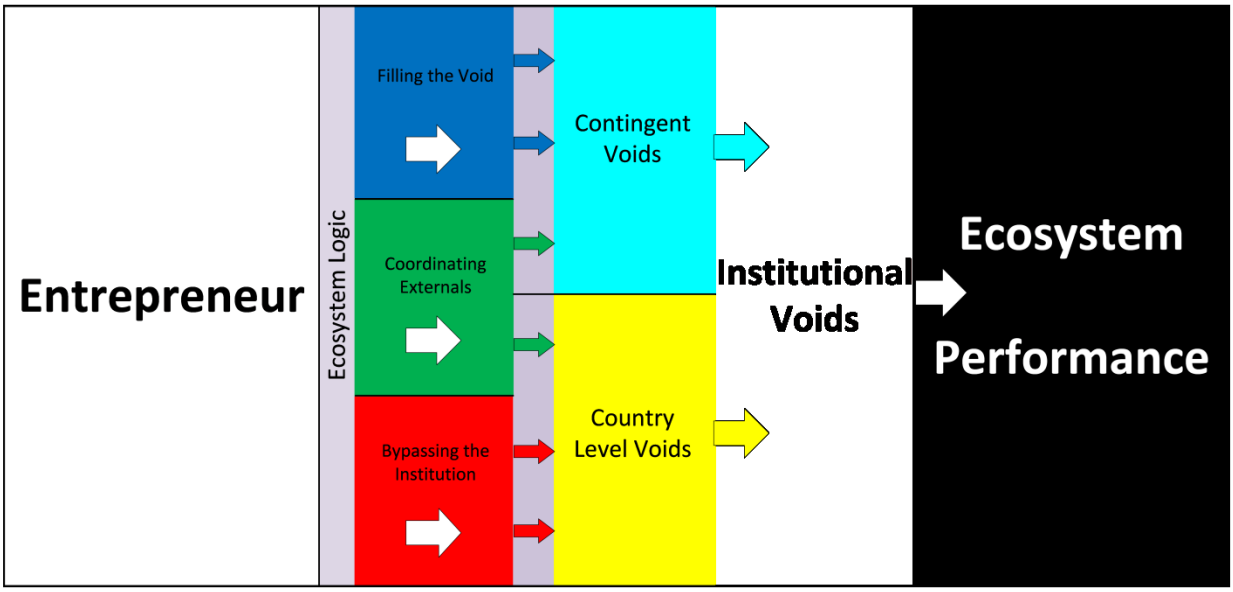
3.4.3. Synthesis and Process Model

Unlike developed economies, emerging economies have various institutional voids, and the income constraints of households hinder spending in some industries. Although their impact mechanisms are different, two interdependent factors determine the performance of an ecosystem in such economies. First, taking the perspective of the local entrepreneur, management of the institutional voids is crucial. We identify three strategies that entrepreneurs use to manage the voids. First, if they have enough power, they directly fill the institutional void. Second, they convince the capable externals to address the voids based on mutual gains. Third, they simply bypass the void by substituting it with an alternative mechanism. These strategies are dependent on the void types: industry contingent voids are generally filled by the entrepreneur and the ones coordinated by them, and country level voids are either bypassed or filled by an external.

Interacting with the first factor, the second factor influencing an ecosystem's spread performance is the ecosystem logic. Driven by the leaders, these logics have effects in two ways regardless of the home market dominance. First, they directly interact with the customer preferences and economic conditions in the emerging economy. Functionality oriented logics such as pricing, innovation orientation or compatibility exemplify this effect. Second, the ecosystem logics moderate the management of institutional voids. Especially flexibility-oriented logics such as supporting localisations, consumer transfers and customisability equip entrepreneurs with the necessary action space that enables them to develop and implement strategies for mitigating institutional deficiencies.

Figure 2 visualises how an ecosystem's performance is jointly determined by ecosystem logics and the management of institutional voids as described:

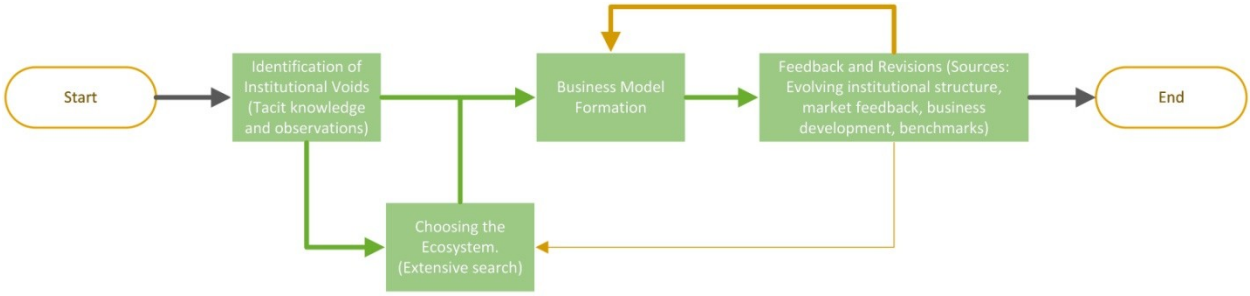
Figure 2: Management of Institutional Voids



Our case fits with these explanations, suggesting that functional superiority and dominance of the ecosystem do not guarantee success in emerging economies. Rather, ecosystem logics and management of institutional voids determine spread performance. The functional advantages of Jaws and its first mover status foster its penetration in Turkey. However, the market requires adaptations because of improper functioning institutions. In our case, functional-orientation of the dominant ecosystem puts adaptability at secondary importance. The flexibility of the alternative ecosystem is more effective in managing the institutional voids, making the secondary ecosystem of the home market comparatively successful.

At the end of this section, we derive an exploratory process model shown in Figure 3 that captures entrepreneur behaviour in choosing ecosystems and dealing with institutional voids.

Figure 3: How Local Entrepreneurs Manage Ecosystem Competition



As shown, the model consists of four stages as explained below.

1. Identification of Institutional Voids. When local entrepreneurs decide to transfer a certain business, they face several sequential decision problems. Prior to choosing an ecosystem, they evaluate the preliminary conditions in their countries in terms of the industry they would represent. This is the stage where major deficiencies in the market are identified. Entrepreneurs walk through a matching process between the developed home economy and the emerging destination economy. Since institutional voids can be contingent, the comparison is made according to industry. As an example, customer education is a strong institutional void in assistive technology while it might not necessarily exist in other industries.

"Copying the business from America was not possible. For example, in the US you provide choices, people do their research and then buy if they want. In Turkey you need to find the best for him/herself, and say this works for you." (Alpha 1)

In our case, the entrepreneurs evaluate their countries based on their tacit knowledge and experience. Each entrepreneur is somehow involved in blindness related issues before establishing their companies. This helps in formulising schemes on their minds based on experience and observations. Thus, they do not initiate formal research to detect institutional voids in the country and industry. This is not usually

problematic since institutional voids are not hidden for someone who has previous relations with an industry (Luiz & Ruplal, 2013).

"No, we did not make a serious market research to compare countries. I mean we were in the sector for a long time. We knew more or less what we would face." (Gamma 2)

2. Choosing the Ecosystem. After determining the differences between countries, in line with their business ideas, entrepreneurs decide on the ecosystem they want to represent. They consider the alternatives primarily according to market positions of the core solutions, and secondarily the ecosystem logic fit with the conditions of the country.

The entrepreneurs carefully consider the market performance of the core firms in their home economies. Alpha and Gamma are affected by the diffusiveness and functional orientation of the Jaws ecosystem while Beta works with Window-Eyes over other alternatives due to its lead market origin as the US. In addition, as a secondary consideration, local entrepreneurs pay attention to the ecosystem logics that can respond effectively to institutional conditions in their countries. Tacit knowledge loses its relative importance at this stage, and deep explorations are conducted such as meeting with suppliers, testing the solutions, and observing home and host markets for potential differences.

"Jaws is enough, I say, Jaws is enough even alone. Why? Because when the dominance of Windows continues, Jaws stays." (Alpha 1)

"First, we tried selling Jaws, but we could not access it. Our competitor was distributing it exclusively. We had to choose another alternative. So, we looked at it. We realised that we could translate Window-Eyes easily. That could have been a differentiation. And we could sell it by promoting that users can adapt the software as they wish. These were discussed in the conversations with the supplier." (Beta 2)

3. Business Model Formation. Once entrepreneurs decide on the ecosystem, they switch to the phase of formulating a business model addressing the requirements detected at Step 1. At this stage, they identify the necessary tools and strategies to manage the context, and embed them in their business models. The decision to address the void, coordinating externals for this purpose, or substituting it with alternative institutions is executed at this stage.

Turkish entrepreneurs in the industry develop a business model that reflects significant diversions from the US way. The most apparent difference is on the buyer component. Rather than pushing the product to individual end users who have insufficient resources and knowledge, they distinguish between the consumer and the customer by welcoming state institutions, donators, and firms which serve for or employ the blind, as a strong ecosystem element in the customer form. This is a diversion from US practice where B2C value delivery is a significant part of the business, and education of consumers is not a priority. Another modification is in the value composition. The products are marketed in a bundle, and complete solution packages for the blind and visually impaired compete.

The effectiveness of the business model is influenced by the interaction of economic and institutional conditions of the country with ecosystem logics. Functional orientation improves the ecosystem spread due to performance expectations, while flexibility provides advantages in addressing the requirements of the context such as bundle creation and localisations.

4. Feedback and Revisions. The formalised business model receives continuous feedback from various sources such as the market, business development activities, and benchmarks. Therefore, a dominant but evolving business model appears in the industry. First, the market context continuously changes. For example, when educational conditions improve, firms need to use different strategies to convince these knowledgeable customers. Similarly, the purchasing power of consumers slightly increases parallel to the improvements in the per capita income and education. In this case, firms reconsider accessing the end users in addition to the donators and the public sector.

“There is a rising customer group too. For example, I have some friends who buy something for their own use. They do not wonder about the price, but just concentrate on their needs. Existence of firms educate these people.” (Gamma 1)

Second, business development activities introduce new practices and modifications on the original business model. As the market is at the establishment phase during the transfer of a business, there is enough space for the entrepreneurs to develop and test novel strategies. Whether working with alternative ecosystems motivates proactivity remains as a question, but in our case, most of these activities come from the firm which works with the alternative ecosystem. Besides, benchmarks also trigger revisions. Under the uncertainty of the establishment phase, one player may introduce an innovative practice that motivates others to follow, such as localisations and bundle sales. Therefore, adaptation to competition is a dynamic for industry evolution.

“We initiated online sales in the industry in Turkey. So, the user can access the information about available technologies with ease, and can sometimes buy inexpensive and simple products from this site. Gamma also followed us in this model when they separated.” (Beta 1)

3.5. Discussions

The ecosystem lens is instrumental in investigating a broad set of contextual factors interacting with a core business value, having a wider coverage than the traditional terms, such as value chain, supply chain, or industry level studies, as it includes indirect stakeholders (Autio & Thomas, 2014). However, the literature is currently insufficient in addressing the context dependencies and macro level effects on managing ecosystems, which this research attempts to address.

While industries are becoming global, ecosystems form with the contribution of international partners which may reside within different market conditions. One possible instance is that an entrepreneur in an

emerging economy may act as a partner, such as a distributor or supplier of an ecosystem based in a developed economy. This is not a rare case since diverse markets of big economies host many rising industries (Hall & Soskice, 2001). However, multiple ecosystems may exist in the same industry, and it is a decision problem for local entrepreneurs. We focus on this problem by comparing the dominant and alternative ecosystems, which are identified based on the market share and the network of stakeholders.

The literature, especially the studies with an economic perspective, assumes that dominant ecosystems are in an advantageous position for their further spread from several angles such as complementary opportunities and network externalities (Adner & Kapoor, 2010; Gawer, 2014; Iansiti & Levien, 2004). Nevertheless, this perspective misses the effect of institutions which shape the macro context. International business scholars acknowledge that developed economies have proper institutions which form a functioning market. The immaturity of such institutions is the fundamental characteristic of emerging markets (Doh et al., 2017; Hoskisson et al., 2013), leading into different outcomes than what economic ecosystem studies expect. This situation impacts the local entrepreneurs due to the value absorption abilities of the customers, appropriateness of the infrastructure for the value diffusion, or managing cultural conditions.

Existing theory suggests that the institutional voids which affect the performance of ecosystems in emerging economies can either be filled or bypassed (Khanna & Palepu, 2010). In addition, networks and collaborations serve to fill these voids (Chang & Hong, 2000; Ghoul et al., 2017). From the perspective of the entrepreneur, we sharpen these suggestions, and offer three activity categories: directly filling the voids, coordinating externals, and bypassing by substituting. In determining the strategy, the resources and networks of the entrepreneurs are of utmost importance in the sense that first, if they are powerful, they can fill the void by themselves. Second, in line with their networking power, they coordinate other entities to deal with the void based on mutual gains. The third alternative is to substitute the missing or improper function with another institution. These activities are not mutually exclusive, and multiple strategies can be operationalised on a single void. Besides, the activities are applied according to the level of the voids. Thus, an important contribution is segmenting the voids (Doh et al., 2017), which have previously been examined at an entire economy level (Ghoul et al., 2017;

Inoue et al., 2013; Mair et al., 2012). Despite being paid scant attention, institutional analysis can be conducted in a wide or narrow scope, i.e. over country and industry levels (Gubbi et al., 2015). Institutions for a well-functioning market may be present in some industries, and lacking in others.

This segmentation has implications in the management of institutional voids. Entrepreneurs do business in the fields in which they can address the industry-contingent voids by their resources or networks. This is because resolving the malfunctioning of such voids is necessary to then deliver the value. On the other hand, entrepreneurs may not have the necessary capacity to deal with the country-level voids that characterise a set of industries on the deep layers of market infrastructure. In this case, they either create alternatives by playing around the void and replacing it with a substitute, or motivate the externals to fill these voids based on mutual gains. The success in application of such strategies influences the spread of ecosystems.

The second way in which the institutional voids affect ecosystem performance is the interaction with ecosystem logics. Driven by their leaders, ecosystems are governed by their dominant business logics that control their operation. The logic keeps all the peripheral players in line with the core value, and determines the ecosystem's fit with the environment based on its relevance with the institutions in the economy. Since contingent institutional voids may favour varying logics, not only the entire country, but also the dynamics of specific industries affect the logic-context fit (Gubbi et al., 2015).

Ecosystem logics that emphasise flexibility equip the entrepreneurs with managerial freedom to shape the environment and institutional conditions. Although functionality-driven ecosystem logics directly attract consumer choice, the institutional instability may hinder the delivery and utilisation of the functional value, thereby favouring adaptive logics. Thus, who wins the competition in emerging economies has little to do with the home market dominance of the ecosystems, rather - it is based on the fit of their logics, their interaction with the environment, and how effectively the voids are managed.

The process of transferring ecosystems to emerging economies starts with a consideration of the macro environment. Entrepreneurs identify institutional voids in their countries by comparing them with other markets, especially the home country. They develop ideas about their future business model. This step is followed by an extensive search on the ecosystem they would represent. Ecosystem logics provide inputs to the selection decision. In the third step, the identified institutional differences guide business model creation. The decisions at this stage prepare the institutional footprints for the laggards in the industry. In the fourth step, inputs are considered for the business model, and revisions are applied, so that the process model cycles between the third and fourth steps. This is because the institutions may change due to factors that are not under the control of entrepreneurs, or practices of entrepreneurs may turn into new institutions themselves. There is also a link from the forth step to the second, because the conditions may require rethinking the ecosystem selection.

In practice, dominant ecosystems are suggested to open doors for big market shares, and they attract more participants since their market success reduces uncertainty for the potential stakeholders (Anderson & Tushman, 1990; Gawer, 2014). However, the losing ecosystems of the battle may still offer opportunities as the world consists of varying contexts. Such ecosystems, with the leadership of their core firms, might update their logics to address contingencies in other contexts. On the contrary, committing to a logic that brings success in the home market may cause inconsistencies between the logic and the context requirements in other countries. Under this circumstance, working with alternative actors may be preferable for the partners in emerging economies provided that their logic is appropriate for the local requirements, or is at least flexible for making local adaptations. Since flexibility leaves the adaptation to the local entrepreneurs, it creates strategising opportunities for obtaining a context fit.

3.6. Conclusion

This study focuses on international competition between different ecosystems of the same industry. It highlights the role of institutional voids in the spread performance of competing ecosystems across different contexts. We suggest that institutional voids in emerging markets may favour specific ecosystem logics. As the lack of proper institutions empowers entrepreneurs in shaping the

environment, their management of institutional voids affects the ecosystem's performance. Hence, alternative ecosystems of the home market may take the lead in emerging economies if their logic is more compatible and their local partners properly manage the institutions. In this sense, flexibility for adaptations may suppress functional superiority of ecosystems.

Practitioners may find several insights in this study. First, for ecosystem leaders, losing the battle in the home market does not mean a final defeat. An ecosystem logic which supports customisations in different contexts can sustain the ecosystem or at least grant it extra time. Second, entrepreneurs in emerging economies may concentrate on the institutional differences in their countries compared to the home country of the ecosystem, and choose the most suitable option by avoiding the myopia caused by the technical or market-based success in other conditions. Third, policy makers in emerging economies should support alternative institutions until the market institutions mature, because they are vital for many industries to take part in the economy.

The study is subject to limitations. First, this is a single and context-dependent case study on a small industry with qualitative data that incorporates the opinions of informants. Although we accessed real business data to triangulate our findings, the data might be industry-specific and affected by subjective opinions of informants. Another shortcoming is that we only considered the entrepreneurs working as distributors in emerging economies. A forethought is necessary before generalising the findings to other ecosystem roles.

The study opens doors for further research. First, the extent to which the core firm and the partners determine ecosystem logic can be explored, especially from the perspective of the complementors. Furthermore, how a core firm changes an ecosystem's current logic is another interesting related issue. Second, we studied only a single instance where the ecosystems were centred in the same developed economy and represented in emerging economies. Different combinations can strengthen the perspective. Finally, resource levels of the ecosystem leaders are not significantly heterogeneous in our case. Although the mechanisms we offer here can be expected to hold, whether the dominant

ecosystems effectively mobilise their resource advantage for gaining superior performance in the destination economy can be studied.

4. The Road from the Micro to the Macro: How Lower Level Members Shape an Organisation's Ecosystem

4.1. Introduction

Employees are valuable assets of companies in the mainstream HR perspective (de Bussy & Suprawan, 2012), and it is acknowledged that lower levels can impact the development and application of a firm's strategy (Reitzig & Sorenson, 2013; Wales et al., 2011). Nevertheless, the strategy and entrepreneurship literature is insufficient in identifying the contributions of lower level members to the fate of the company about its embeddedness and strategising in the external business environment. The formation of external relations is generally examined from the perspective of upper hierarchical levels (e.g. Greer et al., 2017; Heyden et al., 2017; Ritala et al., 2013). This indicates a weakness in understanding the relational evolution of a company within regular organisational mechanisms in terms of the contribution of the employees who account for most company populations.

Not surprisingly, this scholarly negligence is also observed in the emerging ecosystem literature. Being the broad external environment of companies, business ecosystems need more academic attention from the perspective of micro influencers, especially in the form of subordinates and lower level management (Cunningham et al., 2019; Hong & Snell, 2013). The task of developing a firm's ecosystem is attributed to top-level initiatives (Alexy et al., 2013; Williamson & De Meyer, 2012). Despite the exceptional study of Goncalves et al. (2019) who acknowledge that individuals can affect a firm’s ecosystem through their cognition and behaviour which interact with institutional logics; the directions and organisational-demographic sources of employee contributions to the evolution of a company's ecosystem remain open questions. This silence reflects an important theoretical potential for widening the perspective on the evolution of ecosystem strategies of organisations towards a more holistic view.

This research intends to study the impact of bottom-up forces on the evolution of a company's ecosystem relations. We investigate three interrelated research questions that address the impact of

subordinates and lower level managers on ecosystem change: 1) Who are more likely to be concerned with changing the organisation's ecosystem? 2) Who are more likely to apply their ideas on ecosystem evolution? and 3) What type of ecosystem changes suggested by the lower level employees are more likely to be implemented? In order to study this set of questions, we conducted our research on the suggestion database of a Turkish airline company which employs around 28,000, and drew 16,800 employee ideas submitted over two years, of which 2,711 were offering an evolution on its ecosystem relations. While the size of the company population and the suggestion database allowed for comparisons based on various employee and idea characteristics, the industry context enabled us to study several aspects of ecosystem evolution because of having relations to many industries, complementors and stakeholders. The preference of conducting a quantitative case study based on multiple hierarchical regressions let us test the hypotheses derived from the integration of the plethora of diverse literature. We find that ideas that offer a change in the business ecosystem are more likely to come from operational or customer related departments, employees with less tenure, and more prestigious positions. When it comes to implementing these ideas, support and administration departments and upper hierarchical positions are more successful while no impact could be found on the tenure. In terms of the nature of suggestions, ideas that contain or offer process-related modifications, a minor workload on the firm, limited evolution on the ecosystem, and changes regarding adjacent industries are more likely to be applied. The findings point that interorganisational and intra-organisational networks, task embeddedness and relative authority influence suggesting and implementing of ecosystem change initiatives. Incremental, internal and conforming changes have a greater chance of becoming live. We also figured that the intensity of upper management appreciation increases the likelihood of implementation, even when they target more serious changes in the ecosystem, but not in internal processes.

The paper offers two notable contributions to the literature. First and foremost, drawing on the organisational learning, innovation development and inertia literature, we enhance the understanding of bottom-up effects in company management by studying lower level managers and subordinate employees, accounting for the largest proportion of the organisational human resources. We suggest contingencies on the sources, directions and the degree to which lower level members can contribute to the embeddedness and business relations of big companies. This introduces micro level investigations to strategic company management. Second and related, we enrich the ecosystem literature by involving

the individual as a determinant of a firm's relational evolution in its environment. Therefore, the research links the most micro element in the business environment, the employee, and the broadest form of the environment, the ecosystem, through the organisation. The study also classifies and ranks the degree of ecosystem evolution.

The rest of the paper is organised as follows. In the next section we provide a brief overview of the literature around the effect of the lower level members on company management and ecosystem evolution, and build hypotheses. Section 4.3 outlines the research design, section 4.4 lays out the results, and section 4.5 discusses the findings in terms of their meaning for theory and practice. Section 4.6 concludes the research.

4.2. Theory Development

Although much effort has been put on understanding the evolution of an organisation's ecosystem with regard to the activities and decisions of top management (Adner & Snow, 2010; Alexy et al., 2013; Ansari et al., 2016; Li, 2009; Williamson & De Meyer, 2012), the impact of lower levels is paid scant attention aside from the exception of the service ecosystem stream which inevitably addresses employees due to the person dependence of services (Randhawa et al., 2018; Taillard et al., 2016; Wajid et al., 2019). Similarly, studies that take personnel as a unit of analysis in exploring ecosystems focus on upper hierarchical positions, such as top managers and entrepreneurs (Abdelgawad et al., 2013; Nambisan & Baron, 2013; Overholm, 2015; Pitelis, 2012; Roundy et al., 2018). However, the operational managers and ordinary employees also support the strategic development of firms (Hong & Snell, 2013; Reitzig & Sorenson, 2013; Wales et al., 2011), and the conditions that give rise to value creation depend on the lower layers in the hierarchy (Wajid et al., 2019). Thus, for a more complete understanding of the positioning of a company, the literature should be strengthened regarding the contributions of lower levels on the ecosystem evolution (Taillard et al., 2016).

Existing research points to a few links between employees and ecosystem-related decisions. First, individuals who represent their organisations in B2B relations are in a two-way interaction with dominant institutional logics of an ecosystem such that while institutional logics influence individuals' cognitive and behavioural processes, individuals assimilate and enrich these logics with their background, and use them to form business interactions (Goncalves et al., 2019). Second, the tacit knowledge of employees becomes a passive resource in shaping firm level decisions by strengthening the path dependencies and the development processes in the firm (Lamberg & Tikkanen, 2006; Siren et al., 2017; Vecchiato, 2015). Third, entrepreneurial capabilities in the organisation affect the establishment of relations with externals (Abdelgawad et al., 2013; Overholm, 2015). Consequently, the background, skills, networks, and cognition of individuals provide input for external oriented decisions (Cunningham et al., 2019; Wajid et al., 2019). This reasoning supports the conclusion that personnel from all levels is a resource in guiding the ecosystem evolution. But the characteristics of the employees who can achieve this performance, and the types of possible changes remain under-explored. The following subsections discuss who intends to change the ecosystem, who achieves this, and which directions the ecosystem can evolve.

4.2.1. Who is Concerned with Suggesting Changes to the Organisation's Ecosystem?

Organisational learning and inertia streams imply that several organisational-demographic characteristics of the employees might affect the degree to which they are concerned with modifying the relations of the firm and external inputs to its value proposition. Especially affiliation, tenure and hierarchical position diverge organisational members in terms of task routines, in turn affecting the degree to which they are exposed to ecosystem related knowledge and concerned with evolving it (De Lange et al., 2010; Engen & Magnusson, 2015; Huber, 2013; Liu et al., 2017; Schreyoegg & Sydow, 2011; Vecchiato, 2015). The routines also influence the relational capital of the personnel according to these demographic characteristics, and therefore the employees differ in their knowledge sources which shape their cognition and subsequent intentions (Goncalves et al., 2019; Greer et al., 2017; Kraatz, 1998; Lazear, 1998; Wajid et al., 2019). Hence, task routines, the exposition to external stimuli and access to knowledge resources act as differentiating factors in determining ecosystem-related change intentions which depend on hierarchy, affiliation and tenure.

First, the employees' cognition, learning and ideation resources vary according to organisational tasks. The variation can be attributed to the openness and breadth of employee networks and task routines. This is because the individual and organisational resources evolve, subject to interactions with the network and routines. Idea generations, beliefs, and co-creation behaviour of employees take their forms within these interactions (Liu, 2013; Wajid et al., 2019).

Frontline employees, sales staff, and operational workers either have direct interaction with customers, or observe the value offering of the company subject to complements and components. Their networks and observations activate them as powerful sources of exploration. Frontline workers in general, and operational workers of service-based firms serve as information brokers of the firm by capturing innovative ideas and feedback from customers, industrial contacts and the field for introducing inside (Engen & Magnusson, 2015). These people are found to fish innovative ideas from their networks, gather and synthesise them in an applicable form, and advocate them within their firm (Woisetschlager et al., 2016). Besides, operational workers in product-based firms identify the deficiencies within components and operations which they observe, motivating them to suggest modifications (Frese et al., 1999). Field observations also help in discovering opportunities, and stimulate intentions to adapt to dominant practices (Kraatz, 1998). Voicing ideas on such concerns is legitimised by the task relevance of the employees (Goncalves et al., 2019).

On the contrary, the personnel in the internal support and administration departments has a dense intra-organisational network with limited relationships with the customers, components, and operational partners. The knowledge sources of these people are not very diverse while they deepen in their task related and intra-organisational networks (Gilsing et al., 2008; Rhee & Leonardi, 2018). Consequently, their closed networks direct their attention towards the internal processes rather than the external embeddedness of the firm (Hemphala & Magnusson, 2012). Although we acknowledge that there may be exceptional subdivisions such as procurement departments; because of the general differences in the openness to external stimuli and nature of the organisational task, we suggest the following hypothesis:

Hypothesis 1A. Employees working in customer and operation related departments are more likely to be concerned with proposing changes in the ecosystem of the firm when compared to those in internal support and administration departments.

The relative position of lower level personnel depending on their titles diverges employees in terms of their sensitivity to relations with the external environment. Greer et al. (2017) identify that while going up in the hierarchy, relational capital increases the concern in external relations and embeddedness of the firm. We can point to three mechanisms leading to this outcome in the low levels. First, lower level managers tend to act as a bridge between different levels, and across departments. The diversity of their network in comparison to their subordinates opens them up to ecosystem-related concerns that depend on the knowledge flow in the company (Venkataramani et al., 2014). Second, as the expertise accumulates, the hierarchical position and skills for adapting to external information increase (Greenwood et al., 2019; Greer et al., 2017). The higher level of interest in the external environment may motivate suggesting related modifications in comparison to the lower levels. Third, the depth in day to day work introduces dissimilarities in the task routines. Lower level employees are more likely to accumulate strong tacit knowledge and to be locked into their routines (Vecchiato, 2015). Supporting this, Huber (2013) finds that lower level R&D personnel are employed in operational jobs, reducing their exposition to external knowledge. Their learning is driven by internal resources in comparison to those in more prestigious positions. Based on such reasons, we offer the following hypothesis:

Hypothesis 1B. Employees with a relatively higher position in the organisation are more likely to be concerned with proposing changes in the ecosystem of the firm in comparison to their lower level counterparts.

A third factor that distinguishes employees on ecosystem change intentions is organisational tenure. This effect depends on cognition and knowledge sources. First, from the perspective of cognition, tenure is associated with decreased novelty, lower motivation for learning, and less mastery in strategic abilities (De Lange et al., 2010; Hirschfeld & Thomas, 2011; Kanfer & Ackerman, 2004). People with more

experience in the company focus their attention towards deepening their specialisation, and it constitutes a barrier against understanding and evaluating the external environment (Tien et al., 2019). Experienced personnel fail in counterfactual thinking and offering changes in the company's role in the ecosystem (Mateu & March-Chorda, 2016). As a result, tenure is associated with increased exploitation versus exploration of external knowledge (Tschang & Ertug, 2016).

In addition to the decreases in creativity and learning orientation, tenure and age diverge individuals in their sources of knowledge. Newcomers can enrich the organisation with knowledge they bring from outside, and enable firms to leverage this external knowledge which is the outcome of their high exploration capacity (Conrad & Meyer-Ohle, 2019; Tschang & Ertug, 2016). Younger personnel have higher growth aspirations that motivate them towards using external knowledge since their firm-related knowledge is limited (De Lange et al., 2010; Lazear, 1998). These factors distinguish employee orientations about the ecosystem, resulting in the following deduction:

Hypothesis 1C1. Employees with a shorter tenure in the organisation have a stronger tendency to propose changes in the ecosystem of the firm.

An alternative expectation for the effect of tenure on tendency to propose ecosystem changes can be a curvilinear relationship instead of a direct one. This is because learning may take a while for the employees to suggest a change for the ecosystem until they get familiar with the relationship structure, and gain minimal expertise in the firm for being able to propose changes. Supporting this reasoning, learning orientation is found to be higher in middle-age employees (De Lange et al., 2010). Hence, we offer the following alternative hypothesis:

Hypothesis 1C2. The tendency to propose changes in the ecosystem follows a curvilinear relationship such that it starts with a lower tendency, increases over time, but decreases after a threshold.

4.2.2. Who Apply Their Initiatives on Ecosystem Evolution?

The intention to change the ecosystem of a company is a product of the ideation process. It is cognition and learning driven behaviour which has more to do with an individual's exposition to external knowledge. On the other hand, getting those suggestions implemented, i.e. application of the innovation, is a different issue (Kankanhalli et al., 2015). Even the implementation of sound ideas is subject to barriers rising from the absorptive capacity, attention allocation, individual and organisational resources and network relations (dos Santos & Spann, 2011; Laursen & Salter, 2006). This subsection discusses employees who are more likely to apply their suggestions that cause a change in the firm's ecosystem - again, based on their department, hierarchy and tenure.

Innovation scholars put forward that broad external networks provide advantages in terms of creativity and knowledge access; however, being subject to a large amount of external knowledge jeopardises the implementation capabilities (Gilsing et al., 2008; Laursen & Salter, 2006). In this sense, intra-organisational networks of externally constrained units tend to play a more positive role in the completion of initiatives (Chen et al., 2015; Kleinbaum & Stuart, 2014). Intra-organisational networks simplify accessing decision makers, obtaining support from different functions of the organisation, and developing skills for recombining existing knowledge for implementation (dos Santos & Spann, 2011; Huber, 2013; Singh et al., 2016). Such closed networks give birth to many incremental changes as opposed to the open external networks that are suitable for radical innovations which rarely emerge (Hemphala & Magnusson, 2012; Kapoor & Klueter, 2015). Therefore, intra-organisational networks provide support for accessing the necessary tools for actualising innovation as opposed to interorganisational networks (Kankanhalli et al., 2015).

The division of tasks among organisational departments is another cause of variations in the likelihood of implementing ecosystem evolution. In most organisations, corporate level administrative departments have superior organisational power as they manage internal procedures and decide on setting up the relationships (Kleinbaum & Stuart, 2014). Considering that people are biased towards applying ideas belonging to themselves or their departments, this may increase the implementation rate of initiatives from the internal administrative departments (Reitzig & Sorenson, 2013; Van Damme et al.,

2019). The implementation capabilities in such departments are improved by the fact that in their moderate workload, the dependence of employees on their routines can increase their innovative performance by providing the slack for creative problem solving (Ohly et al., 2006). On the other hand, employees in operational departments face challenges with their ecosystem evolution initiatives that require corporate level support, because of lacking expertise, access to decision makers, strong intra-organisational ties, and autonomy for the implementation decisions (Chasanidou et al., 2018). Based on these concerns, we deduct the following hypothesis:

Hypothesis 2A. Employees working in support and administration departments are more likely to get their ecosystem change intentions implemented, compared to employees in customer and operation related departments.

The effects of the drivers of ideation discussed about the prestigious positions mostly reflect on the implementation of the initiatives. The breadth of the vertical and horizontal intra-organisational networks, the accessibility of organisational resources, and the level of expertise which all exist in prestigious positions are positively related to getting things done (dos Santos & Spann, 2011; Greer et al., 2017; Huber, 2013; Venkataramani et al., 2014). On top of these, previous experience with similar changes which may be greater in prestigious positions improves the skills and follow up motivation for applying one's own projects (Kim et al., 2011). Therefore, we formulate the following:

Hypothesis 2B. Employees with a relatively higher position in the organisation are more likely to implement their suggestions on changing the ecosystem of the firm in comparison to their lower level counterparts.

Because of the increased problem solving abilities and the development of intra-organisational networks over time, we predict a positive relationship between the tenure and implementing ecosystem change. Although creativity and promotional goals decrease with age (De Lange et al., 2010), the tenure in a field is associated with improved job performance and abilities to solve task related problems (Furlan et al.,

2019; North, 2019). Extending this, previous experience with change, which logically increases with tenure, raises the tendency to participate in and implement future change activities (Kim et al., 2011; Schreyoegg & Sydow, 2011). This is because experience acts as a learning mechanism for employees, creates path dependencies, and equips people with related problem-solving skills (Zwick et al., 2017). We expect these abilities to reflect on implementing changes regarding the ecosystem.

Tenure is also associated with a stronger intra-organisational network for accessing resources for actualising initiatives. Improvements in the intra-organisational network depend on employees having worked in different departments in the past (Parise & Rollag, 2010), learning how to solve problems with peer workers (Bercovitz & Feldman, 2011), and experience in creating informal problem solving mechanisms which are not available to newcomers (Dougherty & Hardy, 1996). Thus, the accumulated firm-specific human capital of tenured employees improves their organisational skills, in turn reducing the innovation-to-organisation challenges (Dougherty & Hardy, 1996).

Hypothesis 2C. Employees with a longer tenure in the organisation are more likely to implement their ideas that propose a change in the ecosystem of the firm.

4.2.3. Type of Ecosystem Change Initiatives Most Likely to Be Implemented

After looking at the demographic sources of ecosystem evolution, we turn our attention to examine the types of likely ecosystem changes. Under the assumptions of bounded rationality and limited absorptive capacity, not all kind of initiatives belonging to lower level personnel can be applied (Lamberg & Tikkanen, 2006). Drawing on innovation development and organisational change literature, this subsection discusses the nature of ecosystem changes more likely to be implemented. By identifying the contingencies from the perspective of lower level personnel, we have a chance to enhance the network inertia theory that contends that firms experience difficulties in dissolving old relationships, adding new ones, or modifying relationship quality (Kim et al., 2006).

In this sense, the first aspect we will look at is the product and service vs. process-based changes as the evolution of the ecosystem might entail product or process-based operational modifications in the firm. Dougherty and Hardy (1996) put forward that product-based changes are subject to various problems associated with understanding the market, developing internal capabilities and processes, and the modification of existing relationships with other partners. The effective networks for implementing product-based innovations are largely personal, posing a big risk for the continuation of such initiatives. Besides, the necessity to inform the customers on top of the personnel creates additional administrative burdens (Kuester et al., 2012). Although most product-based innovations require support from many departments and upper hierarchical levels as they may affect the firm's value proposition, due to such reasons, the decision-making authorities in organisations are more tolerant for the application of process based innovations which have a stronger internal orientation (Judge et al., 2015; Roy & Sivakumar, 2010). Due to such constraints, even the positive effect of creativity on innovation outcomes cannot be observed on product-based changes as opposed to process innovations (Sarooghi et al., 2015). Regardless of the radicalness of the suggestions, the additional difficulty of modifying the value propositions for the customers and adaptation to the technical transitions in the internal operations leads into the following:

Hypothesis 3A. The ecosystem change initiatives of the personnel which offer process-based changes vs. product or service-based changes are more likely to be implemented.

Second, the workload caused by the implementation of the initiative results in differing degrees of resistance in the organisation. This means that as the project scope and the level of required effort for the implementation increase, involvement or creation of various organisational functions, human resources and hierarchical levels trigger coordination problems and inertial behaviour, even though the organisation is experiencing performance declines (Miller & Chen, 1994; Roy & Sivakumar, 2010). The involvement of various departments constitutes a major obstacle against the implementation of projects that entail a larger workload since a sporadic flow of ideas between internal departments is common (Chasanidou et al., 2018). Managerial support is also lower for such intentions since an increase in the workload results in a growth in costs, risks, and uncertainty of the outcome (Raisch & Tushman, 2016; Siren et al., 2017). Therefore, the firms engage in more incremental innovations by avoiding the burden

of major changes (Judge et al., 2015; Verhaal et al., 2017), which we expect to see in the likelihood of initiative realisation regarding the firm's ecosystem as indicated below:

Hypothesis 3B. Ecosystem change initiatives of personnel which place a minor workload on the firm rather than a moderate or major burden are more likely to be implemented.

Third, ecosystem change ideas reflect varying degrees of evolution on the firm's ecosystem. We propose a three-level ordinal classification of ecosystem evolution. First, effectiveness-based initiatives that propose a change within the existing relations indicate little movement in the ecosystem structure of the organisation. These initiatives may be opening knowledge flow channels between different stakeholders, incentivising partners for more efficient cooperation, or modifications on the received value from an existing partner. Although such initiatives aim to improve the input derived from the ecosystem, they do not have a direct effect on its structure. The second level includes tie-based evolution. Adding partners or complementors, integrating to an open system, replacing or restricting partners, internalisation of previously outsourced tasks, or outsourcing a task all affect the partnership network of the firm. Such initiatives have a greater impact on the structure of the ecosystem in comparison to the first category. The third group represents the most radical evolution on the firm's ecosystem which changes the entire role of the focal company, and has the potential to span new stakeholder groups. Such changes require a new positioning for the firm on top of new partnerships. Starting a new business operation and innovating the business model are among these changes that affect the ecosystem structure at the highest degree.

With the probable exception of platform-based ecosystem leaders which can easily control their complementors (Gawer & Cusumano, 2014), the degree of ecosystem evolution classified under the effectiveness-based, tie-based and role-based change groups is applicable in predicting which initiatives of employees will be implemented. In business ecosystems, the highest level of evolutionary changes, that is, business model innovations and entering different business areas, create significant costs, highly uncertain outcomes, and the necessity to break existing routines (Mateu & March-Chorda, 2016). Such activities entail extensive external learning and creating new organisational structures, capabilities and

business relationships (Roy & Sivakumar, 2010). Therefore, these widespread changes need the support of top management and employees from other departments, who would generally be unwilling and inert for such changes (Heyden et al., 2017; Kapoor & Klueter, 2015; Mateu & March-Chorda, 2016; Miller & Chen, 1994; Van Damme et al., 2019). On the other hand, the tie-based changes of the second level are subject to network inertia. Firms are unwilling to modify the partnership structure due to intra-organisational and relational constraints regarding the network (Kim et al., 2006). Such changes create transaction costs due to exploring the partners, and require re-evaluating the network position of the firm which triggers organisational resistance powered by the routines (Gomes et al., 2018; Kraatz, 1998; Wajid et al., 2019). However, the evolutions in this level do not require extensive reorganisation and uncertainty. Finally, the first level of ecosystem evolution based on existing ties introduces no change on the network and the repertoire of the company. Firms can manage these relationships with their existing capabilities and knowledge. Top management involvement is not always necessary to activate such incremental modifications (Hemphala & Magnusson, 2012; Verhaal et al., 2017). Therefore, we offer the following hypothesis:

Hypothesis 3C. The degree of evolution in a firm's ecosystem is negatively related to the probability of implementing the associated initiatives by employees.

Another dimension of the ecosystem evolution can be examined in the level of industry distance. Depending on the relation to its value proposition, a firm interacts with firms in other industries at a different rate such that it has closer and more frequent relationships with adjacent industries. The ties with the firms in such industries strengthen and give rise to the emergence of routine interactional patterns which help employees to develop cognitive proximity for the interactions (Kraatz, 1998). This proximity provides tools to identify and address problems and opportunities in these relations (Molina-Morales et al., 2014). Dealing with problems within these relations has stronger legitimacy and support in the firm. As industries get closer, the inefficiencies, compatibility problems and competitive threats in the relations bare the risk of damaging stable operations of the organisation, and attract managerial support in rectifying the problems (Gawer & Cusumano, 2014; Lepoutre & Oguntoye, 2018). On the contrary, distant industries lack this impact on the performance. Hence, lower level managers abstain from dealing with the issues and industries they find irrelevant to their immediate tasks (Ramus, 2001).

Hypothesis 3D. Increasing the distance of an industry to the focal firm reduces the likelihood of implementing initiatives of personnel regarding that industry.

As discussed, the positive role of higher hierarchical levels is well established in applying strategic decisions. Difficult initiatives such as radical innovation, widespread change in the organisation, and decisions regarding the firm's embeddedness are attributed to the upper management (Jones & Pitelis, 2015; Lassen et al., 2006; Nambisan & Baron, 2013). Therefore, the involvement and support of upper management can increase the likelihood of realising ecosystem evolution objectives. In addition to signalling the possible quality of the lower level initiative, positive feedback from upper levels may be considered as the initiative belongs to the discretion of such upper levels. Thus, managerial appreciation and support for lower level initiatives provide legitimacy for implementation (Hermano & Martín-Cruz, 2016). This condition mobilises the organisational resources to support the realisation of associated initiatives since managers may back ideas that they appreciate, which otherwise may get lost in the workflow (Heyden et al., 2017). Furthermore, managerial appreciation is a source of motivation and improved performance (Frese et al., 1999). We expect that as the level of support increases, the implementation possibilities also increase due to an intensification of the discussed effects based on authority, legitimacy and motivation. We offer the following hypothesis to test this reasoning:

Hypothesis 4. The intensity of upper management support is related to an increased likelihood of implementing initiatives from lower levels.

Finally, the relative position of lower level personnel may moderate the effect of the degree of ecosystem evolution on the implementation of ecosystem change initiatives. As higher levels of evolution, the tie structure and the external role of the company highly depend on the decisions of the managerial levels rather than employees (Greer et al., 2017; Overholm, 2015). Growth aspirations, connections to upper management, and the bias for one's own ideas empower and motivate lower level managers to get their initiatives applied in comparison to their subordinates, and hence these people

may relatively be less subject to constraints on implementing tie and role change initiatives (Frese et al., 1999; Venkataramani et al., 2014). We conclude the section with the following hypothesis:

Hypothesis 5. The relative hierarchy of the personnel moderates the relationship between the degree of evolution and the implementation of initiatives.

4.3. Context and Methods

The bottom-up contributions to strategy can be enlightened by examining the intentions of the personnel and their actualisation (Goncalves et al., 2019). Employee suggestions capture these intentions since employees demonstrate their initiatives by voicing ideas (Frese et al., 1999). The ideas reflect information about how personnel evaluate opportunities and problems in their areas of specialisation while completion of these suggestions indicates their achievements (Pandher et al., 2017). In order to study the nature of bottom-up contributions and the impact of different employee demographics on the evolution of ecosystems, this quantitative case study was conducted on the suggestion management system of a large airline company in Turkey. The investigated firm had around 28,000 employees organised under a traditional hierarchical structure, and therefore constituted an appropriate basis to study demographic effects, i.e. who is concerned with, and successful in, changing the firm's ecosystem.

The firm launched a company-wide idea management system in February 2017 to collect, select and implement ideas from personnel. Within the scenario, employees and lower level managers such as the supervisors and operational managers, submit their personal ideas which are strongly encouraged to be about their own departments. The director of the department either rejects, or allows the idea to pass to the next stage where the submitter prepares a feasibility report for the idea. If the report is accepted by the director, the idea enters the project portfolio which contains the projects to be implemented. The implementation of ideas is motivated by departmental goals assigned by the top management, and lower level and middle managers decide on whether an idea deserves to be applied. Idea submissions

are encouraged by quarterly-distributed rewards to three personnel of each division, who are acknowledged by the middle management to provide the best ideas in the division. Next, these ideas compete in the C-level and then the company level at each quarter. Although it is possible to communicate the suggestions to the top management via the lower and middle managers, the application of the suggestions generally occurs in the level of the operational department or the middle management, without reaching C-level.

An important part of the scenario is that the suggestions are only recorded as completed if the idea owner finishes them. If a suggestion is independently completed by someone else, it is archived.

Some 6,061 employees submitted 16,800 suggestions between 23 February 2017 and 5 April 2019. We read all these suggestions, and excluded 730 submissions which were dummies without meaningful content, duplicate suggestions from the same person, or belonging to exiting personnel without a final completion or rejection status. Consequently 16,070 ideas constituted the basis for our study with 1,341 completed suggestions. Employing a conservative approach, among these submissions, 3,062 suggestions were evaluated to have a possibility of evolving the company's ecosystem at the first place. After re-reading these submissions, 2,711 entries of 1,926 employees were concluded to be about ecosystem change. These selected suggestions offer a qualitative change in the nature of relations or input derived from the ecosystem rather than quantitative changes, thus ideas such as increasing the purchase amount, cutting costs by negotiations, or integrating the already owned solutions with each other for operational efficiency are excluded. A total of 180/2,711 of these suggestions was applied until the operationalisation of the study.

In line with our hypotheses, the selected suggestions are coded according to four dimensions: nature of intended change (which would be the basis for our degree of ecosystem evolution code), workload of implementing suggestions for the firm, type of change (product/service vs. process based), and the affected industry. The codes are reviewed by innovation department staff, in charge of the suggestion system in the company and knowledgeable in the areas of coding. In the case of disagreements which were less than 1.5% in all four code groups, the coding is finalised following a discussion with the author,

the reviewing staff, and another member of staff from the innovation department. In addition, the ordinal distance of the 35 identified affected industries is discussed and finalised with three experienced practitioners from the department. In order to limit the subjectivity evaluations regarding the relative distance of each industry, they are grouped under 5 ordinal steps, each including 7 industries. The industry classification is presented in Appendix C.

The raw system data is processed for calculating variables and controls including gender, department, tenure, hierarchical position, submission date, whether the submitter recently changed department, or reward status. Besides, we calculated that on average, recording the completion of an ecosystem change initiative took 342 days. We allowed 391 days for updating the completion status information, and recorded the changes until 30 April 2020. Table 14 describes the variables included during the operationalisation of our study, along with their possible values and frequencies.

Table 14: Variables and Descriptives

Variable	Description	Values & Descriptives
Department	Binary: accounts for the functional department of the employee where the idea was submitted	0=support/admin (1260; 8695), 1=customer/operation (1451; 7375)
Hierarchy	Ordinal: indicates the prestige based on the current titles of employees	0=office services (41; 347), 1=clerk (914; 5319), 2=specialist (607; 4060), 3=engineer (218; 1382), 4=project manager (164; 904), 5=supervisor (623; 3394), 6=dept manager (144; 664)
Tenure	Ratio: annual tenure of personnel when the idea is submitted	Range: 0-30, mean: 8.80, std: 7.33
TenureSq	Ratio: Squared value of the tenure variable for testing curvilinearity	Range: 0-900, mean: 131.23, std: 163.33
Workload	Ordinal: indicates the possible workload for the firm caused by the idea implementation	1=minor (1247), 2=moderate (1328), 3=major (136)
Industry Rank	Ordinal: indicates the relation of the industry that is referred in the idea, to the focal firm	1=most adjacent (785), 2 (591), 3 (498), 4 (490), 5=most distant (347)
Process/Product	Binary: reflects whether the ecosystem change affects products/services or processes of the firm	0=process (1110), 1=product/service (1601)
Evolution Degree	Ordinal: indicates the degree of evolution on the firm's ecosystem with the implementation of the suggestion	1=effectiveness-based change (880), 2=tie change (1575), 3=role change (256)
RewardRank	Ordinal: indicates the reward status of the submission, distributed quarterly	0=no rewards (2545), 1=3rd in the division (54), 2=2nd in the division (48), 3=1st in the division (47), 4=1st in the c-level (16), 5=1st in the company (1)

modEvolXHierarchy	Ratio: Produced by Hayes Process Model 1 by multiplying Evolution degree with Hierarchy to test moderation	Range: 0-18, mean: 4.80, std: 3.59
Gender	Binary: The CV controlling the gender of the submitter	0=male (1783, 9608), 1=female (928, 6462)
Benefits	Ratio: The CV that stores the number of benefit categories (e.g. cost cut, revenue increase, CX, quality, process improvement) offered by the idea as reported by the submitter	Range: 1-5, for all ideas - mean: 2.42, std: 1.15. For ecosystem ideas only - mean: 2.62, std: 1.21
Dept change	Binary: The CV that looks for whether the submitter of the idea has changed department in the last two years.	0=no (2437, 14650), 1=yes (274, 1420)
Relevance	Binary: the DV that controls whether the suggestion intends to introduce a change in the firm's ecosystem	0=no (13359), 1=yes (2711)
Completion	Binary: the DV that controls whether the suggestion on ecosystem change is implemented	0=not implemented (2531), 1=implemented (180)
Note 1: Frequencies are in brackets. If there are two numbers, the first indicates the frequency in ecosystem-related suggestions and the second shows the frequency in entire suggestions.		
Note 2: The tenure variable had 534 unaccessed missing values (67 for ecosystem submissions). This data is excluded from the analyses.		

The department, hierarchy, and tenure variables are used to determine the sources of ecosystem change intentions and achievements. The workload, evolution degree, process vs. product, and industry distance variables intend to measure the type of changes likely to be applied. We control the managerial support behind an initiative with the variable on reward status. Rewards are effective ways to convey support and appreciation (Huber et al., 2017; Ramus, 2001). Within the scenario of the suggestion system, the degree of hierarchical appreciation increases as the source and rank of the reward

increases. The level of analysis, as indicated by our dependent variables, is the ideas of the personnel. Since the dependent variables are in binary form, logit models are chosen for conducting our analyses (Kapoor & Furr, 2015; Wessel et al., 2017).

As our covariants were not adopted from an existing scale, and are developed based on our research interests, it could be possible that they overlap. To understand whether there is a major association between variables in a way to cause multicollinearity in our regression models, Heterogeneous Correlations between the covariants are explored using the polychoric correlation method which is the only suggested tool for analysing interdependence of categorical and ordinal variables (Mol & Birkinshaw, 2014). The results presented in Appendix D show that the most interrelated covariants are the degree of evolution in the ecosystem and the workload on the firm, which have a coefficient at .444. This rate is generally considered to be below the threshold for multicollinearity risk. Despite these variables being ordinal, to strengthen our confidence, we applied a VIF test based on a linear regression using these variables, and arrived at a VIF value of 1.126. Hence, the coefficients indicate that our hypothesised predictions do not overlap a great deal, eliminating the need for omitting or combining variables. They also validate that there are different theoretical mechanisms behind variables which we intend to measure the effects on completion. Based on this check, we operationalised our study.

4.4. Results

We constructed 5 logit models to test the hypotheses derived in section 4.2. First, model 1 and 2 look for the effects of the department, tenure and relative position on the concern for evolving the organisation's ecosystem, with model 1 looking for a linear and model 2 for a curvilinear relationship between tenure and proposing ecosystem suggestions. Since we did not have access to the hierarchical position at the time of submission, we had to use the current hierarchical level in these models. Nevertheless, as we do not find any evidence of a correlation between ecosystem change intentions and promotion in the firm, and the effect sizes and significance levels are strong, this should not be a major problem. We used the entire suggestions database to build these models with 16,070 submissions.

Model 3 and 4 are organised as a hierarchical regression, which has the completion status of the ecosystem-related ideas as dependent variable. We used the database of ecosystem related ideas in constructing these models. The regression begins with testing who is likely to implement their ideas in model 3, again based on the department, tenure and relative position. Although it takes time to implement a suggestion, we decided to use the tenure when the ideas were submitted instead of our cut-off date. This is because ideas that would not be implemented may strongly bias the results in favour of the younger personnel in our models which look for completion status.

In model 4, which builds on model 3, the department, tenure and hierarchy are control variables in testing for the effects of variables developed for understanding the nature and managerial appreciation level of implemented changes. This is our most comprehensive model with 8 variables being studied in addition to the control variables.

Model 5 builds on the Hayes Process Model 1 to test the moderation effect predicted in Hypothesis 5, i.e. whether the relative hierarchy in lower levels increases the likelihood of completing the suggestions at higher levels of evolutionary change.

Gender, the number of intended benefit categories as reported by the submitter, and whether the submitter recently changed the department are included as control variables in all these models. The coefficients and significance levels of the variables are presented in Table 15.

Table 15: Logit Models

Variable	1	2	3	4	5
Department	.435 (.000)	.433 (.000)	-.997 (.000)	-.996 (.000)	-.995 (.000)
Hierarchy	.034 (.013)	.033 (.017)	.098 (.050)	.092 (.073)	.124 (.365)
Tenure	-.010 (.003)	-.001 (.961)	-.007 (.540)	-.011 (.379)	-.011 (.381)
TenureSq		.000 (.464)			
Workload				-.515 (.001)	-.515 (.001)
Industry Rank				-.135 (.026)	-.136 (.026)
Process/Product				-.377 (.025)	-.377 (.025)
Evolution Degree				-.306 (.046)	-.243 (.401)
Reward Rank				.330 (.001)	.331 (.001)
modEvolXHierarchy					-.021 (.799)
Gender	-.227 (.000)	-.226 (.000)	.202 (.246)	.243 (.171)	.243 (.171)
Benefits	.183 (.000)	.184 (.000)	-.001 (.985)	.042 (.538)	.042 (.544)
Dept change	.107 (.139)	.108 (.138)	.115 (.647)	.064 (.803)	.064 (.803)
Constant	-1.961 (.000)	-1.985 (.000)	-2.741 (.000)	-1.098 (.017)	-1.195 (.047)
Nagelkerke R2	.026	.026	.043	.094	.094
Observations	15536	15536	2644	2644	2644
Note: significance levels are in brackets					

Model 1 demonstrates that switching from ecosystem irrelevance to relevance has a positive relationship with switching from administrative departments to customer/operation related departments. The same effect persists for relative hierarchy, and the prestige of the low level personnel strengthens the concern in intending to introduce a change in the firm's ecosystem. As expected, tenure is negatively related to giving ecosystem change suggestions. The significance levels indicate strong support for hypotheses 1A, 1B and 1C1. These results show that exploration in the interorganisational area, diversity of accessible resources, and closer relations to the core value improve the concern in the firm's ecosystem, in turn triggering intentions to change it. Considering the variable scales and coefficients, the effect size is big for the department.

Nevertheless, model 2 does not provide support for a curvilinear effect of tenure as indicated by the TenureSq variable, resulting in the rejection of hypothesis 1C2. This may be because learning about the business model and relations of the firm may not take long for the newcomers, and their fresh external knowledge may motivate them to suggest changes in the company's ecosystem.

Model 3 aims to identify the effects of the department, relative hierarchy, and tenure on completing ecosystem-related suggestions. Switching from administrative departments to operational departments has a negative and significant relationship with completing the suggestions, providing strong support for Hypothesis 2A. The coefficient associated with the relative hierarchy reflects the expected direction of effect, and supports Hypothesis 2B. Although the variables are ordinal, and hence the distance between the steps is not fixed, the effect sizes roughly indicate that possessing the highest hierarchical degree (.098*6) may account for little more than half of the department's effect. On the other hand, tenure does not have a positive and significant impact in the completion of the suggestions contrary to our prediction, resulting in the rejection of Hypothesis 2C. This situation entails a re-examination of our deduction. One explanation can be that the loss of cognitive skills depending on age may reduce the interest in the environment contrary to the immediate tasks, and the performance and motivational increases related to tenure can only be observed in one's own routines, but not with managing external relations and innovative changes (De Lange et al., 2010; Kanfer & Ackerman, 2004). However, such arguments need to be elaborated.

All coefficients added in model 4 except the Reward Rank have negative signs, which indicates that while the suggestions transition from process-based to product-based, minor workload to major workload, limited evolution in the ecosystem to a higher degree of evolution, and adjacent industries to distant industries, the implementation of ideas is unlikely. The workload appears to be the most dominant determinant with its effect size implying that the effect of going from a minor to major workload (2*-0.515) is greater than the joint effect sizes of product-based changes in the farthest industries (-0.377 + 4*-0.135), keeping in mind that the variables are ordinal and this evaluation is not conclusive. All effects are significant at the 5% level, leading to the conclusion that hypotheses 3A, 3B, 3C and 3D receive strong support. The results indicate that the level of ecosystem changes that arise from bottom-up

initiatives in big companies are incremental, largely internal, and close to the current operational area, thereby supporting the current business model of the firm.

Model 4 further evaluates our prediction on the effect of managerial support on initiative completion. The coefficient and significance level of Reward Rank indicates that Hypothesis 4 receives strong support from our data. This confirms that the higher the intensity of support in the organisational hierarchy for initiatives, the more they are implemented. The magnitude of this effect is stunning. As a 5-step ordinal variable, a 1 step increase in the appreciation level almost cancels out all negative effects associated with the binary Process/Product variable in the same regression.

The coefficients and significance levels for the demographic variables do not radically change while transitioning from model 3 to 4. Thus this model verifies our conclusions on model 3.

Contrary to our expectations, model 5 does not confirm the moderation of the relative hierarchy between the degree of ecosystem evolution and completion. Even the coefficients of the degree of evolution and the interaction terms are negative, not pointing to the predicted direction of interaction. Therefore, we reject Hypothesis 5. This result demonstrates that although Hypothesis 2B confirms the positive effect of relative prestige in low levels on the ability to apply the initiatives, the effect does not span on getting support for more widespread changes on the firm's relations. Low-level positions, regardless of their prestige, can modify the ecosystem in incremental steps.

The positive effect of the intensity of managerial support on implementation is confirmed in Hypothesis 4. It might be expected that more serious and radical suggestions receive a higher level of appreciation. Hence, for exploratory purposes, to understand whether receiving upper management support improves the likelihood of implementing greater changes as well, we conducted an additional regression on rewarded ecosystem change suggestions, since they include already supported initiatives. The coefficients derived from this regression is demonstrated below.

Table 16: Exploratory Model on Rewarded Ecosystem Change Initiatives

Variable	Coef.	Variable	Coef.
Department	-1.174 (.075)	Hierarchy	-.009 (.958)
Tenure	.056 (.149)	Process/Product	-1.170 (.034)
Evolution degree	-.142 (.762)	Workload	-.951 (.058)
Industry rank	-.245 (.208)	Dept changer	.959 (.166)
Gender	-1.219 (.109)	Benefits	-.129 (.599)
Constant	2.554 (.125)	Nagelkerke R2	.282
Note: Sig. levels are in brackets, N=165.			

Keeping in mind that this exploratory test may be firm-specific, this regression shows that under the conditions of managerial appreciation, the statistically significant effects of evolution degree and industry distance on initiative completion disappear. However, the positive tendency towards implementing process-based and relatively minor scope changes persist in the 5% significance level. This may indicate the dominance of the upper levels in more serious decisions regarding the interorganisational networks of the company such that their support enables lower level personnel to realise more comprehensive modifications in the ecosystem. On the other hand, inertial tendencies still exist in the intra-organisational level as process-based and easier initiatives are still preferred. Even receiving upper management support may not overcome organisational resistance against tiring internal changes.

In the main models, the pseudo R2 values are lower than usual: all below 10%. This seems to be a weakness of the models at first glance. However, in logit models, obtaining lower R2 values is quite common, and may not measure actual goodness of fit since they only compare various predictions with the constant-only model. For such reasons, R2 values are criticised in assessing the goodness of fit in logit models, and many scholars prefer not to report them (Hoetker, 2007; Hosmer & Lemeshow, 2000, pp. 167).

In order to control for the possibility that the data may be sensitive to the performance of individual employees such that success in an idea may trigger future success for its submitter, we excluded the submissions of 67 individuals (3.5% of entire population) who send in more than 3 suggestions, and hence can be an outlier in the data. Reconstructing model 4 under this condition still keeps all of our findings applicable in 10% significance level despite losing 13.2% of the data (For the results see Appendix E).

4.5. Discussions

As the broadest unit that surrounds a company, the business ecosystem is subject to influences from many layers. Contrary to the widely explored macro and meso-level influencers such as the firm, platform, supporting organisations or the government; this study discusses a micro level influencer: the employee. We identified some important contingencies that enlighten the nature of the contribution of the employees and lower level managers to the evolution of a company's business ecosystem. Thus, the study shows the limits of bottom-up contributions to company strategy on its external positioning.

The business ecosystem includes many stakeholders which impact the value proposition and delivery of the focal firm (Iansiti & Levien, 2004). For this reason, ecosystem evolution has a strong strategic preponderance as it affects the embeddedness and external contributions for shaping the value composition of the firm (Adner & Kapoor, 2010). In strategy research, the general tendency is to attribute the organisational embeddedness and radical strategic changes on the decisions of the upper levels, whilst low-level personnel are a valuable resource with under-explored contributions to a firm's network (Goncalves et al., 2019; Heyden et al., 2017). Hence, this research addressed the role of the lower levels in ecosystem evolution. We specifically asked who is concerned with, and capable of, introducing a movement in ecosystem relations.

Confirming the predictions of the exploration and learning-based reasoning, in proposing changes, openness to external stimuli and embeddedness to multiple networks are influential. These factors shift

employee attention to explore the outside world, and help to detect problems and opportunities through the observations on the actual or potential partners which may contribute to the value proposition of the firm (Liu, 2013; Venkataramani et al., 2014; Woisetschlager et al., 2016). In addition, accessing organisational resources and working in less routinised tasks increase the tendency to propose ecosystem-based changes for the company (Huber, 2013; Vecchiato, 2015). As a result, we find that customer and operation-related departments that directly deal with the ecosystem partners and their effect on firm value, newcomers that bring external knowledge to the company, and relatively prestigious employees that have fewer routinised tasks and multiplex networks are more likely to propose changes in an organisation's ecosystem.

As indicated, inter-organisational networks are important in developing intentions to introduce change in the ecosystem. However, implementing intentions require a strong internal network as the most important tool (Chen et al., 2015; dos Santos & Spann, 2011; Gilsing et al., 2008). Such networks support employees with formal and informal resources and relations that help in getting things done (Dougherty & Hardy, 1996; Parise & Rollag, 2010; Venkataramani et al., 2014). Hence, support and administration departments such as accounting, innovation, IT services, quality and alike are more successful in changing a firm's ecosystem, being also supported by a legitimacy that builds upon the task relevance that allocates the decision-making rights across departments (Reitzig & Sorenson, 2013). The authority possessed by employees has a moderate role in the application of the ideas. Contrary to our expectations, no effect of tenure is found, but a positive effect of the prestige that builds upon the title is confirmed. This shows that organisational sources of authority rather than personal sources are more influential in contributing to the external placement of big firms. In addition, as a reflection of decreasing novel thinking, the positive effects of expertise that come with tenure may be limited to simply realising routines rather than the motivations for change (Kanfer & Ackerman, 2004).

More importantly, our study uncovers the kind of ecosystem changes that bottom-up initiatives can implement, indicating the capabilities and limits of lower levels in contributing to a firm's ecosystem management. The findings suggest that organisational inertia strongly holds in the changes introduced by employees, going against the belief that bottom-up change can be an alternative to top-down initiatives in widespread strategic change. Lower levels are less capable of introducing product

innovations, radical change in the firm's embeddedness, or movements that cause extensive reorganisation or workload in a company. Incremental, simple, task relevant, and process-based changes are applied at a higher rate. Therefore, the contribution of the employees to the company's external relations is generally minor in scope in big companies. Their intra-organisational networks are not powerful tools for applying significant changes. Furthermore, although authority tends to play a role in getting initiatives implemented; interestingly, relative hierarchy in low levels is not important in introducing stronger degrees of ecosystem evolution. In order to diversify the sources of important changes in the embeddedness of a firm such as business model innovations, alternative mechanisms to voicing ideas should be developed to feed back to upper levels.

We also find that depending on the organisational legitimacy and motivational reasons, the intensity of positive evaluation of upper levels on employee initiatives is a strong predictor of implementing ideas (Frese et al., 1999; Hermano & Martín-Cruz, 2016). Interestingly, we find exploratory evidence that the implementation of supported initiatives is independent of the industry distance or degree of change in the ecosystem. The backing of legitimate authorities can be enough in modifying external relations of the firm regardless of its scope, softening the effect of network inertia. Yet, the tendency towards applying process-based and minor changes persist for managerially supported initiatives as well, indicating that the resistance against widespread organisational change can be strong enough to counterbalance managerial support (Mateu & March-Chorda, 2016).

As one of the contributions of this study, we propose a classification of the degree of evolution in a firm's ecosystem structure as having three ordinal levels: effectiveness-based change, tie-based change, and role change. The classification appeared influential in predicting the implementation of ecosystem change initiatives. Besides, the result arising from the investigation of the industry distance is also noteworthy as it indicates that the criticality of the complementary relations increases the likelihood of proposing and implementing modifications. In addition to confirming the path-dependent change arguments, this shows that to protect the competitiveness of the core value, organisations effectively make use of their employees as a source of learning.

The study provides several practical insights. First, in order to equip subordinates with the ability to participate in a firm's ecosystem strategies, organisations may increase communication between operational and internal departments. This strengthens the ambidexterity of the organisation such that the effective sources of exploration can be linked to the exploitation-oriented departments. A similar effect can be obtained by shifting frontline or operation workers to administrative departments for actualising their ideas powered by field observations, or aligning the employee composition of the administrative departments between the newcomers and tenured individuals with strong intra-organisational networks. Another implication is that rather than the traditional mechanisms of organisational hierarchies, opening alternative channels for collecting exploration outcomes of lower levels should be supported, especially in turbulent situations where the firm needs to re-orientate itself in its ecosystem. Traditional mechanisms are not powerful enough to communicate such initiatives to the top, causing a waste in the knowledge resources of personnel. Finally, the study shows what not to expect from lower levels as managerial support is required in implementing greater changes in ecosystem relations.

4.6. Conclusion

This paper deals with an underexplored but important issue in the strategy field by investigating bottom-up forces in shaping a firm's relations in its ecosystem. We approach this problem by focusing on the effect of employees and lower level managers, and explore the direction of probable changes. Thus, we build a bridge between the micro and macro levels in a company strategy.

The findings indicate that personnel from the operation and customer related departments, new entrants, and relatively prestigious lower level members are more likely to be concerned with evolving the firm's ecosystem, underlining the importance of learning from external and multiple networks. However, when implementing suggested ideas, support and administration departments and prestigious positions are more successful while the tenure loses its importance. Process based changes, ideas with minor managerial burden, lower degrees of evolution, and ideas about adjacent industries are applied at a higher rate. This shows that the relative authority, task relevance, and stronger ties within the

company are instrumental in gaining incremental and internal changes. However, radical changes such as business model innovations or new operations, are unlikely to arise from lower levels, leaving the responsibility on the shoulders of upper level management. In addition, managerial support can remove obstacles against the implementation of more serious ecosystem related changes.

The study is subject to limitations. Although this is an inductive study powered by existing theories on organisational learning, innovation and inertia, it is prone to generalisability issues as a single case study on a service firm. Second, although we kept coding the completion status changes until 13 months after the date of the last included submission, and no radical suggestions were implemented during this period - radical ideas may require more time to be applied, which may slightly skew our data towards minor suggestions. Besides, the effects we measured are controlled by single categorical variables based on the most apparent characteristic of the ideas. Although coding decisions are validated, the suggestions might be concerned with multiple layers of change. Thus, the findings may be validated using multiple variables or factors. Finally, since our data did not allow measuring the effects of tacit knowledge, entrepreneurial capabilities, and cognition which are found to be effective mechanisms in changing ecosystem relations in previous research (e.g. Abdelgawad et al., 2013; Goncalves et al., 2019; Lamberg & Tikkanen, 2006), our models may be subject to omitted variable bias.

The paper encourages further research on a few issues in addition to validating our exploratory findings on upper level support. First, whether the nature of ecosystem change intentions depend on the organisational demography is an interesting consideration. It could be possible to learn which organisational members intend to change the business model or introduce radical changes. Besides, conducting qualitative analyses on people who could implement rather radical changes can give birth to interesting theories. Also, we did not delve into the difference of intrinsic or extrinsic motivational factors which could have strong positive or detrimental effects on suggesting or implementing ecosystem changes among lower levels, thereby standing as a promising research interest.

5. Conclusions

This research provides a response to general future research calls in interaction of various stakeholders in the co-creation of ecosystem value (Pera et al., 2016), and the micro and macro effects on ecosystem governance (Huber et al., 2017) as well as calls on ecosystem lifecycles (Thompson et al., 2018; Wareham et al., 2014), conditions leading to co-creation (Chen et al., 2016; Marcos-Cuevas et al., 2016), and contributions of individuals to ecosystem management (Hong & Snell, 2013; Taillard et al., 2016). Having contributed to several diverse literatures including institutional voids, co-opetition, innovation development and organisational change, the thesis mainly aims to understand the effects of various layers on ecosystem management activities. As the most inclusive unit of analysis, ecosystems describe the actual and potential relationships that could impact the value proposition of a firm, and depend on the integration of complementary contributions (Furr & Shipilov, 2018; Parente et al., 2018). Unlike biological counterparts and rather than being a static constraint on firm activities, business ecosystems can be managed by the behaviours of its constituents and intentional decisions of its direct and indirect influencers from different levels. This thesis aims to synthesise these influences in a way to create a sound framework for both theory and practice that leads to a more holistic perspective on ecosystem management.

The research presented suggests that institutional and economic conditions in the macro environment affect the adaptive behaviours of organisations, the ecosystem level value complexity and resource distribution affect the competitive and cooperative tendencies, and employee demographics affect the links with partners and the nature of ecosystem change. More specifically, macro level institutional conditions interact with the ecosystem logics, and influence the spread of the value proposition. Complex values and a homogenous resource distribution among members stimulate cooperative and network-centric behaviour for both co-creation and appropriation, whilst the opposite conditions support unilateral and competitive behaviour. The micro level actors, based on their networks and authority, form and shape the specific relationships in the ecosystem. Thus, a core contribution of the thesis is to approach ecosystem management from a holistic perspective, as different sources play a role in determining different aspects of ecosystem management.

In this sense, Chapter 2 detailed ecosystem-related effects in setting the boundaries of ecosystem management activities. Drawing on existing research, it concludes that comparative resource power of actors, the lifecycle stage of the ecosystem, the reason for clustering, and value complexity determine the extent to which managerial activities shift towards competing or cooperating. Existence of complementarity is the most important factor that gives rise to the emergence and sustainability of ecosystems, and improves their attractiveness for potential partners. Nevertheless, it is a U-shaped effect of the ecosystem population such that intensified competition causes too-much-of-a-good-thing. The study defines a boundary condition for unilateral strategies. In complex value and weak resource positions, ecosystem elements increasingly prefer inclusive networking strategies using their resources and dynamic capabilities. This is a key factor in introducing significant change in a value-centred ecosystem, otherwise single organisations can only change their firm-centric ecosystem.

Chapter 3 investigated the boundaries of ecosystem management subject to macro conditions in the economy. The logic of the ecosystem, which is largely determined by the core firm, should be consistent with macro level conditions for the spread of value. This is important in selecting an appropriate ecosystem for potential partners. Based on the logic-environment fit, the presence of country-level and industry-contingent institutional voids determines the extent to which firms make effort towards establishing a favourable environment for an ecosystem's operations. The power of organisations affects cooperating with potential partners or exercising unilateral strategies for preparing favourable conditions for appropriation.

Chapter 4 focuses on the micro influencers on ecosystem management. Even employees should be considered in understanding ecosystem evolution. In this sense, external networks are related to intentions to evolve ecosystem relationships, but intra-organisational networks are more important in actualising initiatives of subordinates, especially with minor workload and limited structural changes. The source of the initiatives determines the degree of evolution in the ecosystem such that upper management support allows for the realisation of more serious changes in the relations of a company.

Hence, in a sentence, these chapters build up an overall conclusion that ecosystem management can be understood in macro, ecosystem-level and micro dimensions, which respectively build the fit of the value to the environment, the tendency to cooperate with others, and the nature of the evolution of embeddedness.

Other than improving ecosystem literature, the studies also support the management domain in a few aspects. Chapter 2 provides a resolution to the well-known problem of cooperating with the partners that an organisation is competing at the same time. It evaluates the co-opetition as a function of the lifecycle stage, objectives and value complexity of ecosystems, and resource power of the actors. Chapter 3 contributes to the international management domain by illuminating the types and effects of institutional voids, and how they determine organisational level performance. By clarifying country-level and industry-level voids, we highlight the criticality of the level of deficiencies and their resolution for value diffusion. Chapter 4 delved into a significant but under-explored strategic concern in understanding the bottom-up effects in a company's management in terms of its relations with the externals. From the perspective of the lower level personnel, it shows the sources, nature, and degree of ecosystem change. The chapter also extends the organisational learning and inertia theories in a way to demonstrate that diversity of knowledge sources increases the concern in the environment for individual workers, and organisations are subject to network inertia, such that unless powered by upper management support, the changes in the ecosystem are likely to occur in improving the efficiency within existing relations.

The thesis presents some managerial implications in shaping ecosystems. First, ecosystem-level factors affect strategies in choosing an appropriate ecosystem and determining competitive behaviours. For instance, for less powerful organisations, building alliances is a sound strategy to position in the core, but powerful organisations that impact the modularity in a system can unilaterally improve their appropriation if they do not extinguish the complementarities to cause exits. At the macro level, functionality offered in an ecosystem does not guarantee a superior performance across different contexts. If the logic of the ecosystem does not comply with the environmental conditions, it is advisable to choose an ecosystem with more flexible logics. In addition, to increase the effectiveness of micro-level contributions to ecosystem management, companies should open up mechanisms for their upper

level management to listen and support their employees, otherwise knowledge sources of the employees would not be used in their utmost potential. Besides, the employees with exploration and exploitation abilities can interact for improved innovative performance.

Based on the three papers, this thesis suggests directions for future research under three titles, which are the context, evolutionary progress, and interaction of ecosystems. First, future research should consider the formation and spread of ecosystems across various conditions. Working on different contexts would support ecosystems as a theory rather than a unit of analysis, and define more coherent boundaries for the concept (Autio et al., 2014). In this respect, although this research could point to several roles in managing ecosystems, many questions remain unanswered such as the impact of peripheral elements and customers on ecosystem logics, the reflection of leader's logic shifts on partners, the stake of supporting organisations in competitive ecosystems, or demographic sources of radical ecosystem change. Second, unanswered questions exist in the lifecycle of ecosystems such as downstream contributions during emergence, ecosystem splits, or the decline stage in general. Finally, as also put forward by Jarvi et al. (2018), an important research avenue would be about the link between different ecosystem types. As an example, exploring the interaction between entrepreneurial and business ecosystems can show how the type of received support affects the competitive position of entrepreneurs.

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Appendices

Appendix A: Bibliography of Unaccessed Articles

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Appendix B: Contributions of the Theory and Data

Arguments from the Theory (Note: Question marks indicate that the argument is inferred, but not conclusive).

?1. Ecosystem logics are determined by the leaders (Gawer & Cusumano, 2014; Iansiti & Levien, 2004; Moore, 1993).

2. Ecosystem logics affect the stakeholders' behaviour (Anderson & Tushman, 1990; Iansiti & Levien, 2004; Moore, 1993).

?3. Ecosystem logics determine an ecosystem's fit with the environment (Goncalves et al., 2019; Lepoutre & Oguntoye, 2018; Prahalad & Bettis, 1986).

4. Ecosystems operate in different countries (Jones & Pitelis, 2015; Rong et al., 2015).

?5. For stakeholders, it is advantageous to participate in dominant ecosystems (Anderson & Tushman, 1990; Ceccagnoli et al., 2012; Gawer, 2014; Kang & Downing, 2015).

6. Institutional voids create different macro conditions in emerging economies than developed economies (Khanna & Palepu, 2010).

7. Entrepreneurs can control the institutional voids (Inoue et al., 2013; Mair et al., 2012; Tracey & Phillips, 2011).

8. Institutional voids can be filled or bypassed (Khanna & Palepu, 2010).

?9. Some institutional voids are in the country level, but some can be minor in scope (Ghoul et al., 2017).

?10. Subject to its interaction with the ecosystem logics, the entrepreneurial behaviour in filling the institutional voids determine the spread outcome of an ecosystem. (Inference from points 3, 6 and 7, which needs validation.)

Contributions of the Data:

- Points 1, 3 and 10 are validated.

- Point 5 is updated: Institutions define a boundary condition.

- Point 8 is updated: Entrepreneurs directly fill the void, coordinate others to fill the void, or substitute them.

- Point 9 is updated: Institutional voids can be classified as country level and industry-contingent.

- Industry-contingent voids should be filled somehow. Country-level voids can be bypassed.

- Ecosystem logics can be classified as functional oriented and flexibility oriented in terms of international diffusion.

- Functional logics are instrumental in convincing people. Flexibility oriented ecosystem logics are effective in empowering entrepreneurs to fill the institutional voids in emerging countries.

- Process model: identifying voids, choosing the ecosystem, setting up a business model, feedback and revisions.

Appendix C: Classification of Industries

Group 1: Travel agencies, handling, IT services, IT infrastructure, airline industry, accommodation and real estate, food

Group 2: Finance, energy, cargo, industrial solutions, transportation, supplies, Media/PR

Group 3: Communication, social media, airport operators, any, education, regulation, comfort

Group 4: security, culture/tourism, customers (as partners), entertainment, healthcare, professional services, digital equipment

Group 5: government, retail, textile, academy/research, special people, NGO/social business, assistive technology

Appendix D: Correlation Table

The following table lists the correlations for each variables used in the main models 2-3 of Chapter 4.

Key: V1=Evolution degree, V2=Workload, V3=Industry rank, v4=Process/product, V5=Hierarchy, V6=Tenure, V7=Department, V8=Reward rank, V9=Dept change, V10=Gender, V11=Benefits

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
V1	1 (0)	.444 (.021)	.271 (.022)	.376 (.025)	-.029 (.023)	-.043 (.023)	-.075 (.027)	.013 (.043)	.020 (.038)	-.027 (.028)	.020 (.022)
V2	.444 (.021)	1 (0)	.033 (.024)	.297 (.027)	.045 (.024)	-.032 (.023)	-.041 (.028)	.102 (.043)	-.041 (.038)	-.086 (.029)	.164 (.022)
V3	.271 (.022)	.033 (.024)	1 (0)	.135 (.025)	-.047 (.021)	-.037 (.021)	-.045 (.026)	-.013 (.040)	.029 (.035)	.065 (.026)	-.052 (.020)
V4	.376 (.025)	.297 (.027)	.135 (.025)	1 (0)	-.010 (.026)	-.036 (.025)	.034 (.030)	-.028 (.047)	-.084 (.041)	.041 (.031)	.094 (.024)
V5	-.029 (.023)	.045 (.024)	-.047 (.021)	-.010 (.026)	1 (0)	.241 (.019)	-.213 (.024)	.138 (.040)	.185 (.034)	-.288 (.024)	.101 (.020)
V6	-.043 (.022)	-.032 (.023)	-.037 (.021)	-.036 (.025)	.241 (.019)	1 (0)	.142 (.024)	-.052 (.039)	.158 (.031)	.177 (.024)	.023 (.019)
V7	-.075 (.027)	-.041 (.028)	-.045 (.026)	.034 (.030)	-.213 (.024)	.142 (.024)	1 (0)	-.250 (.045)	.007 (.041)	.061 (.031)	-.083 (.024)
V8	.013 (.043)	.102 (.043)	-.013 (.040)	-.028 (.047)	.138 (.040)	-.052 (.039)	-.250 (.045)	1 (0)	.059 (.062)	-.160 (.049)	.068 (.037)
V9	.020 (.038)	-.041 (.038)	.029 (.035)	-.084 (.041)	.185 (.034)	.158 (.031)	.007 (.041)	.059 (.062)	1 (0)	-.068 (.043)	.166 (.031)
V10	-.027 (.028)	-.086 (.029)	.065 (.026)	.041 (.031)	-.288 (.024)	.177 (.024)	.061 (.031)	-.160 (.049)	-.068 (.043)	1 (0)	-.102 (.025)
V11	.020 (.022)	.164 (.022)	-.052 (.020)	.094 (.024)	.101 (.020)	.023 (.019)	-.083 (.024)	.068 (.037)	.166 (.031)	-.102 (.025)	1 (0)

Notes
Standard errors are in brackets.
Correlations including tenure and Benefits are polyserial, correlation between these 2 are Pearson, other correlations are polychoric.
N=2711 for each variable except tenure (2644) due to missing variables.

Appendix E: Model Without Mass-Submitters

Variable	Coef	Variable	Coef
Department	-.847 (.000)	Hierarchy	.112 (.044)
Tenure	-.025 (.066)	Reward	.315 (.003)
Evolution degree	-.300 (.076)	Workload	-.580 (.001)
Industry rank	-.109 (.099)	Product/Process	-.449 (.016)
Gender	.258 (.181)	Benefits	-.014 (.849)
Dept changer	-.242 (.466)	Constant	-.954 (.065)
Notes: Sig. levels are in brackets. N=2353. Nagelkerke R2: .092.			