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The Dynamic of Platform Positioning Strategies in a Nascent Ecosystem and The Role of Managerial Cognition

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Abstract

Established firms increasingly engage in the development of a new digital platform to capture new growth opportunities presented by digital technologies. Prior research on platform strategy has generally examined the process of platform creation in the context of established ecosystems. However, less is known about platform strategy development in nascent ecosystems. Nascent ecosystems are interdependent networks of firms, in the early stage of formation, characterized by a lack of blueprints that define the value propositions and the associated structure of governance and interaction. This characteristic presents strategic challenges for managers since they must determine the platform positioning (i.e. the platform's technical design and platform scope) under extreme ambiguity and uncertainty.

This thesis aims to understand the dynamics of platform positioning strategies of an established firm in a nascent ecosystem by answering two interrelated questions: *How does an established firm develop platform positioning strategies for a nascent ecosystem?* and *Why the positioning strategies shift over time?* These questions are addressed by investigating the journey of TELECO, a global telecommunication producer, in developing a new digital platform in the nascent Internet of Things ecosystems over a period of 9 years.

I introduce an alternative pathway of platform positioning that consists of three distinct platform positioning strategies: (1) *Analogous positioning*, (2) *Expansionary Positioning*, and (3) *Downward positioning*. The first strategy entails positioning the platform analogous to the firm's position in its legacy, non-platform ecosystem. This strategy is shaped by an *Evolutionary* strategic frame which entails managers' belief on the continuity between the legacy and the nascent ecosystem. The second positioning strategy involves expanding the platform's position to maximizes potential value creation and capture. I find that this strategy is shaped by a *Proactive* strategic frame which entails managers' belief on the transformative nature of the nascent ecosystem and vision to shape the ecosystem's evolution. The last positioning strategy entails calibrating the platform's position to the point that minimizes contestations and better corresponds with the firm's capabilities limitations. This strategy is shaped by an *Adaptive* strategic frame which entails managers' belief on the need to adapt to the changing ecosystem dynamic and adjust their prior assumptions. Overall, this thesis offers rich theoretical insights into the research of platform strategy in nascent ecosystems by explicating the interplay of platform strategies, managerial cognition, and ecosystem dynamics.

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Abbreviations

Abbreviation	Key term
AI	Artificial Intelligence
App	Applications
BSS	Business Support System
BU	Business Unit
CEO	Chief Executive Officer
F2F	Face-to-Face
GF	Group Function
IoT	Internet of Things
LMA	Layered Modular Architecture
MA	Market Area
PC	Personal Computer
R&D	Research and Development

CHAPTER 1. INTRODUCTION

This thesis investigates the process of developing platform strategies by an established firm in a nascent ecosystem. Advances in digital technology and the rise of platform economy encourage firms to pursue growth by developing new digital platforms that bring together users and complementors to create novel value propositions (Gawer and Cusumano, 2008; Evans and Gawer, 2016; Cusumano et al., 2019). Digital platform is a bundle of digitized resources that serve as a technological foundation where outside parties can develop interrelated products or services, and get benefit from the presence of the platform's users and complementors (Tiwana et al., 2010; Gawer, 2014). In the last decade, the creation of digital platform becomes a primary option for firms to capture opportunities of emerging digital technologies due to the platforms' ability to enable network effects (Rochet and Tirole, 2003), reduce transaction costs (Parker et al., 2016), and stimulate innovations (Gawer and Cusumano, 2014). The platform phenomenon has also attracted considerable scholarly attention which results in a growing body of research on platform leadership and innovation (Gawer, 2009; Gawer and Cusumano, 2014; Cusumano et al., 2019), platform competition (Eisenmann et al., 2011; Cennamo and Santaló, 2013; Cennamo, 2019), and platform governance (Ceccagnoli et al., 2012; Wareham et al., 2014; Hagiu, 2014).

Research on platform strategy generally draws on the example of established ecosystems such as PC (Gawer, 2009; Baldwin and Woodard, 2009), video games (Zhu and Iansiti, 2012; Ozalp et al., 2018), mobile phones (Tiwana, 2015; Parker et al., 2017), and software system (Ceccagnoli et al., 2012; Wareham et al., 2014). In established ecosystems, the activities, actors, roles, positions, and interactions between actors are largely known and relatively stable (Adner, 2017). Therefore, the strategic challenges in this setting revolve around achieving a strategic position through network effects (McIntyre and Srinivasan, 2017), resolving technological design and market trade-offs (Cennamo and Santaló, 2013; Cennamo, 2018), and governing interactions among users and complementors (Wareham et al., 2014). Nevertheless, in the last few years, firms increasingly engage in the platform creation in nascent ecosystems to secure a strategic position in new markets early on (Anthony et al., 2016; Eggers and Moeen, 2018; Dattee et al., 2018). Nascent ecosystems are networks of interdependent firms, which are in the early stage and still in the process of formation. Unlike established ecosystems, nascent ecosystems are characterized by extreme ambiguity and uncertainty concerning technology, competition, demands, and alignment structure between partners (Santos and

Eisenhardt, 2009; Hannah and Eisenhardt, 2018; Moeen et al., 2020). Nascent ecosystems generally lack "*ecosystem blueprints*" that define the value propositions (i.e. what value to create and how) and the associated structure of governances (i.e. who does what and who gets what) (Dattee et al., 2018, p.467). These characteristics introduce strategic challenges for platform creators that are the focus of this thesis.

One central decision to be made by platform creators is to determine the platform positioning. Platform positioning is at the heart of the platform's competitive strategy (Gawer and Cusumano, 2008; Cennamo and Santaló, 2013). Platform positioning entails the choice of technical functionalities (i.e. platform architecture) and the range of markets and applications (i.e. platform scope) a platform would address (Cennamo, 2019). The positioning strategy is essential because it determines the share of the value created in the ecosystem that the focal firm will command (Teece, 2018), and the ability to influence the course of the ecosystem evolution (Gawer and Cusumano, 2008). Extant research offers guidelines on determining positioning strategy in an ecosystem. For instance, Adner (2006; 2017) suggests performing a thorough analysis of activity configurations and interdependence among actors. Other studies emphasize certain market characteristics including the heterogeneity level of complementors and customers (McIntyre and Srinivasan, 2017), customer preferences (Zhu and Iansiti, 2012), and competition dynamics (Seamans and Zhu, 2017) as factors that must be considered in developing positioning strategy. However, the applicability of these insights is limited since in nascent ecosystems the interdependence structure does not yet exist and information on market characteristics is ambiguous (Dattee et al., 2018).

As mentioned earlier, in nascent ecosystems the roles of actors, the system activities, value creation, and value distribution are unclear and contested (Santos and Eisenhardt, 2009; Anthony et al., 2016), which make otherwise simple decisions complex and challenging. In this context, a platform creator develops platform positioning strategy while the ecosystem is still in flux and with limited understanding regarding which platform functionalities are matters and which markets are the most lucrative (Dattee et al., 2018). Therefore, the strategy development can be difficult as it requires the creator to appeal not only to potential users, but also to complementors that may have divergent perspectives about how value should be created, and conflicting interests when it comes to value capturing (Ansari et al., 2016; Adner, 2017; Shipilov and Gawer, 2020). Established firms face unique challenges in this endeavour since they need to also incorporate constraints of their organizational legacy and resource dependencies in their decision making (Gawer and Phillips, 2013; Cozzolino et al., 2018).

Moreover, the inherent ambiguities of nascent ecosystems also create a strategic dilemma for a platform creator. For instance, the firm may take a more conservative approach by positioning the platform as a specialist for a narrow market niche and then incrementally expand as the ecosystem progress (Cennamo and Santaló, 2013; Snihur et al., 2018). While this approach enables evolutionary adjustment (Rindova and Kotha, 2001), it implies constraining the firm's choices early (Seamans and Zhu, 2014), which minimizes growth opportunity and latitude to influence the ecosystem formation to the firm's advantage. Similarly, the firm may follow a more aggressive '*get-big-fast*' approach to build network effects and secure early domination in multiple strategic domains (Eisenmann et al., 2006). Yet, such approach can prematurely lock the firms in a suboptimal investment and hamper flexibility to adapt to changing environments (Murray and Tripsas, 2004). These risks and dilemmas make the development of platform positioning strategy in nascent ecosystems far from straightforward.

In addition, prior research tends to portray platform positioning strategy as a *static* choice in which once decided the firm marches its resources to scale the platform and to occupy the targeted position (e.g. Adner, 2012; Zhu and Iansiti, 2012; Hagiu, 2014). Nevertheless, recent research suggests that strategizing for nascent ecosystems entails a dynamic process since in nascent ecosystems, changes and development are more likely to occur (Hannah and Eisenhardt, 2018; McDonald and Eisenhardt, 2019). For instance, new technological innovations or unanticipated firms' actions may cause bottlenecks to emerge and change the course of the ecosystem evolution (Adner and Kapoor, 2010; Hannah and Eisenhardt, 2018). Similarly, what constitutes a strategic position within a nascent ecosystem may likely change since the positions are still up for grabs and contested (Ozcan and Santos, 2015). In the context of platform creation, these researches imply that the evolving competitive landscape of nascent ecosystems requires a dynamic approach to platform positioning strategy. Developing a sustainable platform strategy will be difficult since firms are unlikely to withstand their position across different milestones of the ecosystem's evolution (Moeen et al., 2020). Therefore, the main challenge for platform creators is to decide which positioning strategy may be more fruitful at a certain point in time. However, how firms develop platform positioning strategies in nascent ecosystems over time remains to be addressed.

As noted above, the ambiguous nature of nascent ecosystems makes it difficult for decision makers to fully know *ex-ante* the ecosystem structures and to anticipate all the potential changes and the dynamics upfront (Dattee et al., 2018). In this situation, managers rely on their subjective interpretations of the environment when making

strategic decisions (Walsh, 1995). Thus, the strategy developments in this context are mainly influenced by how managers make sense and cognitively frame ambiguous information (Gavetti and Rivkin, 2007; Kaplan and Tripsas, 2008; Eggers and Kaplan, 2009). Rather than making optimal decisions among technological or economic trade-offs (Cennamo and Santaló, 2013), managers in nascent ecosystems *envision* the future of the ecosystem since they lack information about the role and positions of other actors and their interdependencies (Adner and Feiler, 2019). Similarly, the decisions about platform design are influenced by managers' beliefs and assumptions since there is no dominant category that stakeholders adhere to when referring to a similar type of platform (Benner and Tripsas, 2012; Grodal et al., 2015). Moreover, the strategy literature has underscored the role of managerial cognitions such as strategic frame in shaping firms' strategic actions toward ambiguous opportunities (e.g. Tripsas and Gavetti, 2000; Gilbert, 2006; Gavetti and Rivkin, 2007). For example, prior studies suggest that managerial cognitions influence how emerging opportunities are perceived (Gilbert, 2006) and how capability gaps are estimated (Eggers and Kaplan, 2013), which then guide a firm's strategic actions. These studies imply that managerial cognitions become particularly salient in a highly ambiguous environment. Despite its prevalent impact on strategy development, platform research rarely considers the cognitive dimension in platform creation (Tiwana, 2015; Khanagha et al., 2020).

The literature on strategic cognition also highlights the role of managerial cognition in instigating strategic changes which necessary to respond to the changing environment. Prior studies show that strategic changes occur when managers redefine their belief on the causal relationship between the changing environment and its impact on the firm's performance (Barr, 1998; Eggers and Kaplan, 2009). This research implies that the dynamic of platform strategy in a nascent ecosystem can be influenced by managers changing beliefs. Given the evolving nature of nascent ecosystems, managers may revise their prognosis and assumptions as the ecosystem progress and the realities unfold (Garud and Rappa, 1994). Nevertheless, current research mostly focuses on platform strategy at a given point in time rather than examining its processual dynamic over time (McIntyre and Srinivasan, 2017). The few scholars who took a processual perspective (e.g. Eisenmann et al., 2011; Teece, 2017; Khanagha et al., 2020) have focused around technology and market lifecycle over the platform's evolution, but did not examine the cognitive processes and strategic frames that guide decisions on platform positioning. As such, it is necessary to go beyond the rational technological or economic considerations

to incorporate the cognitive dimensions of platform positioning to understand the dynamic process of platform positioning strategies in nascent ecosystems.

Thus, understanding how a platform creator, especially an established firm, develop strategies in a nascent ecosystem over time and the cognitive process that underlies the strategy emergences are theoretically and practically relevant. Based on the above considerations, this thesis asks two interrelated questions:

How does an established firm develop platform positioning strategies for a nascent ecosystem? and *Why the positioning strategies shift over time?*

These research questions are addressed using a longitudinal single case study (Pettigrew, 1990; Langley, 1999) of TELECO's (pseudonym) journey in creating a new digital platform in the IoT ecosystem. The IoT ecosystem comprises of multiple actors across different industries that exhibit complex interdependencies. Despite its enormous potential, the IoT ecosystem is nascent and still emerging since there are a lot of variations in terms of technology architecture, value propositions, and the structure of value creation and value capture (Gartner, 2018). TELECO is a global network equipment producer that was among the first firm introducing an IoT platform on a large scale. The firm has dynamically changed its platform architecture and subsequent market scope to eventually occupied a strategic position in the IoT ecosystem. Multiple sources of data, including field observations, analysis of internal strategy documents, and formal and informal interviews, were utilized to investigate the phenomenon. The longitudinal analysis of TELECO's platform strategy over a period of 9 years while the IoT ecosystem was gradually taking shape, reveals the dynamic of platform positioning strategies and the internal cognitive process that trigger strategic changes. Hence, TELECO was a revelatory case (Siggelkow, 2007) that enable for theory development about the platform positioning strategies in a nascent ecosystem.

This thesis offers contributions to theory and practice. The central contribution of this study is a processual framework that explains how an established firm develops and positions its new platform in a nascent ecosystem over time. In particular, I introduce an alternative pathway to achieve a strategic position in a nascent ecosystem, which has been overlooked by prior research. The framework consists of switching between the three platform positioning strategies at different milestones of the ecosystem's evolution. In doing so, this study extends the research on platform positioning and ecosystem strategy (e.g. Cennamo and Santaló, 2013; Adner, 2017) by bringing a processual and dynamic view of platform strategy. Moreover, this framework explains *why* certain positioning

strategy emerges and shift by explicating the cognitive dimensions underlying strategy development. As such, this study adds to the platform strategy research by elucidating the cognitive dimensions of platform creation as opposed to purely technological or economic aspects that dominate platform research (McIntyre and Srinivasan, 2017). By revealing the dynamic and emergent nature of an established firm's strategies in a nascent ecosystem, this study also contributes to a broader literature of incumbents' adaptation to technological changes (Ansari and Krop, 2012; Eggers and Park, 2018). Finally, this study offers managerial insights for managers of established firms engaging in the platform creation initiatives in the increasingly common setting of nascent ecosystems. My processual framework can be used as a guideline for managers in positioning their new digital platform to successfully navigate challenges in different phases of a nascent ecosystem's evolution.

This thesis is organized into seven chapters. A review of the literature informing this research is provided in Chapter 2. The aim of this chapter is to explore three research streams that are central to this thesis, namely: Platform strategy, Incumbent's adaptation, and Strategic cognition. This chapter describes current insights within these literature streams, which motivate and justify this study. In Chapter 3, the research design and methods are introduced. This chapter also explains the philosophical stance of the researcher, data collection methods, as well as data the data analysis. In Chapter 4, the research setting of this study is presented. In particular, I introduce the IoT ecosystem and TELECO as an appropriate case study for addressing the research question. In Chapter 5, the empirical findings which describe the dynamic of platform positioning strategies at TELECO. This chapter conceptualizes three platform positioning strategies and the underlying strategic frames in the main phases of the ecosystem's evolution. I present a detailed narrative in outlining platform strategy development at TELECO. Then, In Chapter 6, the empirical findings are discussed with respect to the research questions and the extant literature. In this chapter, the emergent positioning strategies and their dynamics are theorized. The theoretical and managerial contributions of this study are also discussed in this chapter. Finally, in Chapter 7, the conclusion which summarizes the main contributions and implications of this research is presented. It also outlines the limitations of this research and the avenue for future research.

CHAPTER 2. LITERATURE REVIEW

This chapter provides reviews of the literature that informed and motivated this thesis. The following review covers three research fields that relevant for understanding the phenomenon under investigation, namely: Platform Strategy, Incumbents' Adaptation, and Strategic Cognition (See Figure 1 for illustration). This literature review chapter aims to discuss the relevant insights concerning platform strategy and incumbents' response to emerging technologies such as digital platforms. The literature on strategic cognition also consulted to understand the role of managerial cognition in strategy development under uncertainty and ambiguity. Three sections of this chapter describe current insights and issues that exist within these literature streams. Finally, the last section discusses the interplay of these separate literature that justifies the research questions which this thesis address.

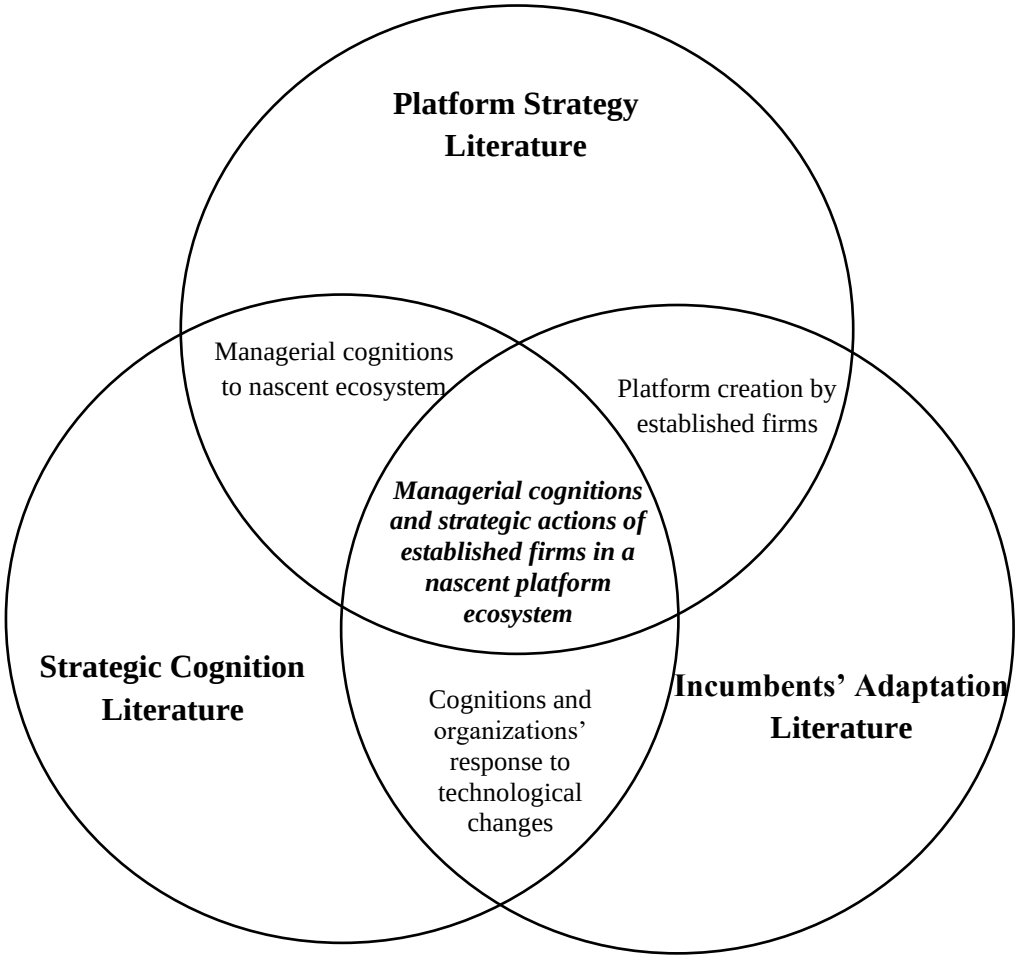


Figure 1: Overview of the Literature

The review starts with the introduction of the platform literature which describes the definition of platform and the value creation and value capture logic of digital platforms. Research on platforms has been conducted from multiple perspectives, which

results in a diverse definition and terms of platforms (Gawer, 2014; Parker et al., 2017). The first part of this section clarifies the concept and definition applied in this thesis. Then, previous works on platform strategies are consulted to identify several key strategic decisions to be taken when developing a platform (e.g. Gawer and Cusumano, 2008; Parker et al., 2016). These studies highlighted four key strategic decisions concerning platform positioning, technical design and architectures, scope and ecosystem membership, and governances. Platform literature has also underlined the unique nature of competition in a platform-based ecosystem, which challenges the widely accepted Porter's five forces model of competition (van Alstyne et al., 2016). As such, studies on a platform-based competition are reviewed to provide insights on the strategies to compete in a platform-based ecosystem.

The review then moves to the incumbents' adaptation literature, which has investigated established firms' responses toward emerging technologies, including digital platforms. This literature has examined the challenges confronted by established firms in the face of emerging technologies (e.g. Christensen, 1997; Tripsas and Gavetti, 2000; Day and Schoemaker, 2000). Research has also noted that emerging technologies often result in the creation of nascent fields (i.e. industries, markets, ecosystems). Several studies on this stream have acknowledged firms' effort in shaping the nascent fields to their advantages, despite extreme uncertainty and ambiguity surrounding the environments (e.g. Santos and Eisenhardt, 2009; Eggers and Moeen, 2018). Lastly, recent studies investigating platform creation effort by established firms are reviewed (Gawer and Phillips, 2013; Svahn et al., 2017; Khanagha et al., 2020). These studies provide initial insights toward the approaches an established firm may consider when developing a digital platform.

The literature on incumbents' adaptation has highlighted the role of managerial cognition in influencing firms' attitudes toward emerging technologies. These studies have reported cognitive processes that play a crucial role in shaping firms' strategic actions to technological changes (Kaplan, 2008a; Eggers and Kaplan, 2009; Benner and Tripsas, 2012). Given the ambiguity and uncertainty of nascent ecosystems, it is reasonable to assume that cognitive processes, in which managers make sense and interpret emerging situations, may influence strategy development in a nascent platform ecosystem. As such, I consult the literature on strategic cognition that has investigated the role of managerial cognition in strategy development and strategic change.

These three independent bodies of literature provide essential building blocks to investigate the phenomenon of interest – platform creation in a nascent ecosystem by an

established firm. The platform strategies literature informs the key decisions to develop a digital platform and strategic aspects to compete in a platform-based ecosystem. The literature on incumbents' adaptation reveals the challenges and strategic issues faced by established firms when confronting with emerging technologies. Lastly, the strategic cognition literature informs how managerial cognitions shape strategy development and may triggers strategic changes within an organization. Overall, the intersection of the three literature informs the relevance of the research question of this thesis, which discussed in more detail in the last section.

2.1 Platform Strategies and Competitions

Platforms have been increasingly featured in today's businesses and transformed a range of economic and social fields. A platform typically uses technology to connect users, organizations, and resources in an 'ecosystem' to create and capture values (Cusumano and Gawer, 2002; Iansiti and Levien, 2004a). Platform provides building blocks (products or technologies) that act as a foundation where a variety of firms in the ecosystem can develop complementary products, technologies, or services (Gawer, 2009). The platform owners benefitted from the *network effects* i.e. the increased value of the platform according to the increased value of users and the platforms, as well as from the *complementary innovations* i.e. derivative products which result from value co-creation of other firms (Eisenmann et al., 2006; Gawer and Cusumano, 2008; McIntyre and Srinivasan, 2017). These characteristics enable platform companies including Google, Amazon, Microsoft, and Uber gain strong competitive positions in the market.

This section is organized into three parts. The first part is dedicated to identifying different platforms recognized by strategy and management scholars and clarified the type of platform and its ecosystem that become the focus of this research. The second part discusses the strategic decisions involves in platform creation. Lastly, research on platform competitive strategies are discussed.

2.1.1 Definition of Platform and Platform-based Ecosystem

The pervasiveness of platforms has gained interest from practitioners and management scholars. The term *platform* has been widely used to explain management phenomena from different perspectives such as product design, market-transaction, and industry platform (Gawer, 2009; Thomas et al., 2014). Depending on the research stream and empirical settings, platforms have multiple definitions and theoretical underpinnings (Tiwana, 2014; Gawer and Cusumano, 2014; Thomas et al., 2014). From a *product system perspective,* a platform is a collection of core elements that is reusable across a range of

products (Baldwin and Woodard, 2009; Gawer, 2009). In this stream of research, the concept of platform centre on the reuse or sharing of common elements across production systems (Baldwin and Woodard, 2009). The platform architecture following 'design rules' where a set of low-variety elements (i.e. the platform) is surrounded by numerous high-variety elements (i.e. complementors). The product platforms are typically used within an internal firm to produce a variety of products at a lower cost and to enhance flexibility in product designs to achieve economies of scope and scale (Gawer and Cusumano, 2014). For example, Sony built its Walkman products based on key modules and platforms to produce around 250 models of Walkman at a low cost (Gawer, 2009). Moreover, product platforms enable learning across products and can reduce production costs of complex products, such as aircraft and automotive (Gawer, 2009). For instance, automotive manufactures generally use a common product platform for different products or models (Simpson et al., 2006).

From a *market-transaction* perspective, the term 'platform' is used to characterize products or services that mediate transactions between two or more groups of markets. This multi-sided platform creates value by enabling direct interactions between different groups of participants who may not be able to interact otherwise (Eisenmann et al., 2006; Hagiu, 2009). This type of platform operates in a multi-sided market, a market where one or several platforms enable two or multiple groups of users (e.g. readers and ads) and try to attract them to the platform by appropriately charging and governing users on each side of the platform (Hagiu, 2014). In this market, the platform owners benefited from market intermediation, while the platform users benefited from the lower search and transaction costs (Rochet and Tirole, 2003). For instance, Airbnb and Booking.com reduce search costs by providing search function based on desirable characteristics, while PayPal offers digital features to settle transactions between buyers and sellers; thus, reduce the transaction cost. The key important feature of the multisided platforms is the presence of *indirect network effects* in which different side of a group of users can mutually benefit from the increasing number of participating users on another side (Rochet and Tirole, 2003; Eisenmann et al., 2006; Hagiu, 2014). For example, users benefited from Netflix with more available movies, while the content providers benefit from a large base of viewers (McIntyre and Srinivasan, 2017). Moreover, positive indirect network effects can lock other firms out from gaining market share, which enables the platform owner to dominate a market (Katz and Shapiro, 1986). As such, most of the research on multisided platforms concern with pricing structures and governances to solve the 'chicken-egg' problems (i.e. no side will join without the presence of others) (Hagiu, 2014).

The *industry platform* perspective considers platforms as a 'central hub' that serve as foundations where other firms can build complementary products or services on top of it and can gain access to the platform's users/customers (Cusumano and Gawer, 2002; Gawer and Cusumano, 2014; McIntyre and Srinivasan, 2017). An industry platform performs functions that are essential to a technological system (i.e. ecosystem) and solve business problems for other firms in the industry (Gawer and Cusumano, 2008). Industry platform is more complex than product platforms and multi-sided platforms since it constitutes both modularity and market facilitation features (Thomas et al., 2014). Moreover, an industry platform typically organizes around an ecosystem of partners or complementors (Gawer and Cusumano, 2014), a point which I shall discuss later. Gawer (2014) considers industry platforms as evolving organizations characterize by (1) a modular technological architecture; (2) value creation through economies of scope in supply or/and in demand; and (3) federation and coordination of various agents who can simultaneously innovate and compete. The distinguishing feature of the industry platform resides in its role in federating and coordinating (as opposed to simply coordinates or intermediate) multiple agents in the ecosystem (Gawer, 2014). The aim of Industry platforms is to facilitate and increase the degree of innovation on complementary products and services (Gawer, 2009). As complementary innovations grow, the platform creates a cumulative advantage and entry barrier which makes it harder to dethrone by rivals or new entrants (Gawer and Cusumano, 2014). The examples of industry platforms are Microsoft Windows, Intel microprocessors, Apple's iPhone, and Goggle's android.

In this thesis, the term *platform* corresponds to the notion of industry platforms according to the definition described earlier. In particular, I focus on the platform which is based on digital technology that serves as a foundation where outside parties can build complementary products and services on top of it (Tiwana, 2014). The platform is part of an ecosystem shaped by layered modular architecture (LMA) which consists of loosely coupled layers of multiple platforms (Yoo et al., 2010; Sturgeon, 2019).

Platform-based ecosystem. In the past years, the term "ecosystem" has been widely used in discussion among practitioners and strategy scholars (Adner, 2017; Jacobides et al., 2018). Broadly speaking ecosystems refers to interdependence among independent actors across organizations in realizing value propositions. Several streams of research have emphasized different aspects of ecosystems based on their unit of analysis. One stream of research centres around an individual firm and its environment in the context of a *business ecosystem* such as the 'Microsoft ecosystem', the 'Silicon Valley ecosystem', or the 'entrepreneurial ecosystem'. This research conceived an ecosystem as

a *community* of interacting actors beyond the boundaries of industries that depend on each other for their survival and competitiveness (e.g. Iansiti and Levien, 2004; Teece, 2007). These studies emphasize the shared fate of the community as a whole and the role of ecosystem managers i.e. 'keystone' or 'hub' firm as a provider of stability as well as an orchestrator of value creation and capture (Iansiti and Levien, 2004a; Dhanaraj and Parkhe, 2006). The second stream of research focuses on the activities and interactions among actors to create novel value propositions (e.g. Adner, 2006; Adner and Kapoor, 2010; Adner, 2017). In this view, the ecosystem concept aims to highlight the interplay between a core product, its components, and its complementary products/services, which together create value for customers (Adner, 2017). Ecosystem is defined as "the alignment structure of the multilateral set of partners that need to interact in order for a value proposition to materialize" (Adner, 2017, p.42). Every firm in an ecosystem defines its own ecosystem strategy based on its view on the ecosystem structures, roles, and risks (Adner and Kapoor, 2010; Adner, 2017). Across different actors, these strategies can be consistent or contradictory. As such, the focus is on understanding how interdependent actors interact and how they reach mutual agreements regarding the position and flows of activities in order to develop and commercialize innovations for the end customers (Adner, 2017).

The third stream of research, which is the main focus of this thesis, focus on the ecosystem of a platform which entails the platform's sponsors/owners and their complementors that enhance the platform's value to consumers (e.g. Wareham et al., 2014; Gawer and Cusumano, 2014a; McIntyre and Srinivasan, 2017). Platform-based ecosystem refers to the platform and its network of complementors that produce complementary products/services to enhance platform value (McIntyre and Srinivasan, 2017). Jacobides and colleague (2018) illustrates platform ecosystems as a "hub and spoke" where an array of peripheral firms (i.e. complementors) connected to the central platform through open-sources technologies and/or technical standards. An example of a platform-based ecosystem can be found in the video games industry (Cennamo and Santaló, 2013), the enterprise resource planning industry (Wareham et al., 2014), and the software industry (Eisenmann et al., 2011).

At the most fundamental level, a platform ecosystem consists of three different actors: Platform owner/sponsor, complementors, and consumers/users (Gawer and Cusumano, 2014). Platform owner/sponsor is the "architect" of the ecosystem who sets the ecosystem-level goals, defines the member's role, and establishes standards & interfaces (Gulati et al., 2012). The complementor is an actor that generate

complementary products/services based on technological resources provided by the platform. The complementary products/services enhance the value of a core platform's product/service through indirect network effects so that the value of the core products is greater with the complementary prpducts/services than without them (Gawer, 2009; McIntyre and Srinivasan, 2017). The complementord also gain access, either directly or indirectly, to the platform's mutual customers (Ceccagnoli et al., 2012). Together, these actors create and capture value from the end users by utilizing the platform features and functionalities.

Platform ecosystems can be seen as a semi-regulated market where the platform sponsor foster and orchestrate the entrepreneurial actions of its members (Wareham et al., 2014). Therefore, strategy in the context of a platform-based ecosystem is not only about the search for competitive advantage, but also the search for alignment (Wareham et al., 2014; McIntyre and Srinivasan, 2017). These unique challenges raise specific strategic questions concerning the governance mechanisms between the platform owner and its complementors (Gawer and Henderson, 2007; Boudreau, 2010; Wareham et al., 2014), the leadership role of a platform owner at the industry level (e.g. Gawer and Cusumano, 2008), and rivalry between competing platform ecosystems. Some of these topics will be discussed in detail in the later section.

The layered modular architecture of platform ecosystems. A platform ecosystem often part of a broader innovation ecosystem where the platform works as a central engine providing a set of standards, shared assets, and interfaces that underpin an activity system around it (Thomas et al., 2014; Dattee et al., 2018). In the digital economy, the structure of the ecosystem is typically shaped by a *layered modular architecture* (LMA) that consists of competing sets of nested platforms (Yoo et al., 2010; Sturgeon, 2019). As shown in Figure 2, at the foundational level, the technology platforms (e.g. chipsets, programming language, network) enable the functionality of the core platforms to provide higher-level products and services such as standardized hardware systems and software environments. These lower-level layers enable the higher-level platforms to develop user-facing applications and to connect multiple groups of users (Eisenmann et al., 2006). These higher-level platforms support additional platform layers and could generate an unbounded range of market applications because of the modular system elements and re-programmability of digital technologies (Zittrain, 2006; Yoo et al., 2010). Moreover, the digital artefacts such as software and hardware components make new functionalities can

be rapidly added at a negligible cost (Huang et al., 2017) which results in a vast array of new products, services, and business models.

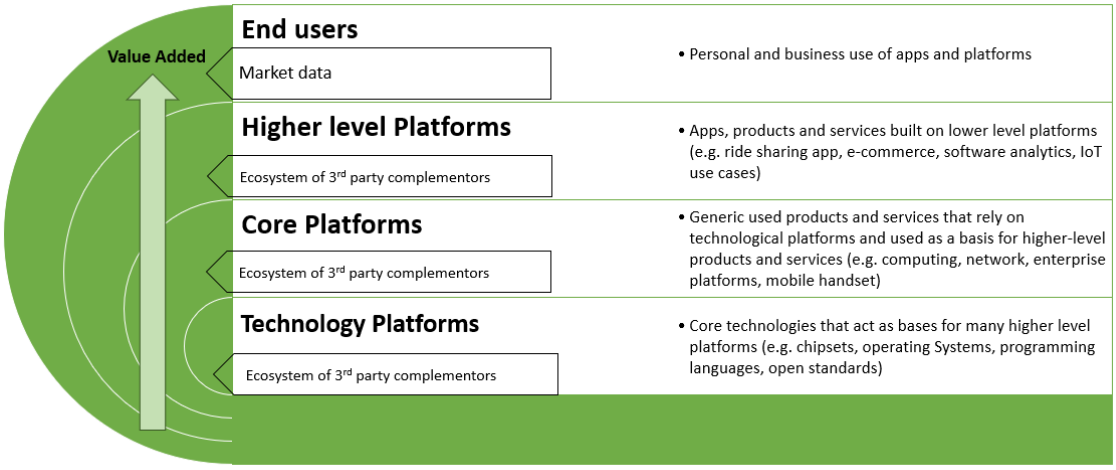


Figure 2: Multi-layered platforms ecosystem (Sturgeon, 2019)

The result of such multi-layered architecture is a vast ecosystem of nested platforms, each with its standards, industrial or consumer users, and markets (Sturgeon, 2019). This adds another complexity for strategy making during the platform development process since firms encounter unbounded opportunities (Dattee et al., 2018). A firm may opt to focus on a certain layer, either in the lower layer or the higher layer, to be a specialist for that particular layer. The firm then would courting for its installed base at one layer, while serving as a component at another layer (Yoo et al., 2012). For instance, Google maps act as a platform at the service layer and at the same time act as a component of the android-based phones in the device layer (Yoo et al., 2010). The dynamic nature of LMA also enables the same firms to compete on one layer and peacefully coexist on the other layers. For example, Apple's iPad and Amazon's Kindle are competing in the device layer but complementing each other in the application layers with their iBook and Kindle's contents (Yoo et al., 2010). A firm may also aim to capture the most value in the ecosystems by addressing the whole layers. Moreover, the nature of digital platforms enables easy scalability, which opens up the opportunity to establish domination in multiple layers (Sturgeon, 2019). In this case, the platform owner my 'envelope' rivals in the other layers by extending the platform functionalities (Eisenmann et al., 2011). Competition in multi-layered platform ecosystems, thus, not only reside *within* a layer but also *across* different layers (Sturgeon, 2019). The challenges exacerbate when the technology and market are still evolving since platform owners have to make the technology and business decisions based on moving targets (Dattee et al., 2018).

2.1.2 Strategic Decisions in Platform Creation

Platform creation involves designing a core platform technology and orchestrate third-party innovators (complementors) around the core of the platform. A platform creator needs to ensure the collective innovation performance of the platform ecosystem and orchestrate the relationship without formal contractual agreement (Gawer and Cusumano, 2002; Wareham et al., 2014). As such, platform creation involves strategic decisions that govern technology evolution, product and system design, and interdependencies among actors in the ecosystem (Gawer and Cusumano, 2008; Wareham et al., 2014; McIntyre and Srinivasan, 2017). Prior research provides in-depth insights into the strategy to develop a platform and compete in a platform-based market (Gawer and Cusumano, 2008; Parker et al., 2016; Cusumano et al., 2019). In general, there are four key strategic decisions a platform creator should make: *Platform Positioning*, *Technical Design & Architecture*, *Ecosystem Membership*, and *Governances*. The following paragraphs describe each decision.

Platform positioning. When introducing a new platform in a market, the platform creator needs to determine the positioning of the platform in relation to other competing platforms. A platform positioning strategy describes the type of contents and functionality a platform will offer, the range of users it would target, and the degree of uniqueness of the platform's value propositions (Eisenmann et al., 2011; Cennamo, 2019). To gain a competitive position in the markets, a platform creator should offer compelling value propositions that would attract users, partners, and complementors to join the platform (Gawer and Cusumano, 2002; Dattee et al., 2018). It can be done by developing technological solutions that solve essential technological and business problems (i.e. bottlenecks) that would support the growth of an ecosystem (Gawer and Cusumano, 2008; Adner, 2012). For instance, Qualcomm established a wireless technology platform for the cellular phone industry by solving a basic technical problem of incompatibility and inefficiency between wireless devices (Gawer and Cusumano, 2008). When there is a dominant platform in the market, aspired platform creators could offer alternative value propositions that address unmet user needs (Suarez and Kirtley, 2012; Cennamo and Santaló, 2013). The platform owner could develop a platform that is customised for underserved groups of users. This was the approach taken by Apple when introducing the iPhone (Suarez and Kirtley, 2012). A more detailed review of positioning and competitive strategies is provided in the next section.

***Technical design & architecture*.** Platform creators encounter with various forms of platform's design & architecture. Platform architecture describes the functionality of

each component of a technological solution and explains how they would interact (Baldwin and Woodard, 2009; Tiwana, 2014). The platform architecture should be easy to connect to or to build upon to create both intended and unintended values/applications (Gawer and Cusumano, 2008; Tiwana, 2014). In designing the platform architecture, a platform creator should answer several questions related to the degree of openness, such as which features should be developed in-house, how open the interface should be, and how much information about the platform should be exposed to the outsiders/complementors (Gawer and Cusumano, 2002; Boudreau, 2010). Prior research suggests that a platform creator faces the tensions between *control* and *openness* when determining the platform architecture (Boudreau, 2010; Tiwana, 2014). On the one hand, the platform creator should maintain control over the features to appropriate and gain considerable amount of value (West, 2003). On the other hand, if it has too much control, the platform creator may not be able to attract complementors and to encourage innovations (Gawer and Cusumano, 2002). Therefore, platform creators should relinquish some control over the technical design in order to attract wider engagements by external parties. For example, a study by Boudreau (2010) showed that opening a technology platform by granting greater level access to the complementors (i.e. hardware developers) will increase innovations in terms of new product introductions. Nevertheless, giving too much control of the platform may have a detrimental effect on the platform's innovativeness. Thus, determining platform technical design & architecture entails addressing the tension between control and openness.

Scope & Ecosystem membership. The third strategic decisions related to the membership of the platform ecosystem. A platform owner would need to determine who should be included in the platform and how to attract them (Eisenmann et al., 2006; Hagiu, 2014). Moreover, the firm should define the roles of each member (as producers, complementors, or consumers) and define how the interaction between members would look like (van Alstyne et al., 2016). The decision of platform membership would affect the structure of interdependencies and the competitiveness of the platform in the long-term. For instance, Microsoft introduces Windows as a three-sided platform (users-application developers-hardware manufacturers), while Apple prefers to choose a two-sided model by producing the hardware itself (Hagiu, 2014). The next challenge for a platform owner is to attract members to the platform. The literature has underscored the *chicken-egg* dilemma of launching a new platform where neither side will join without the other side joining first (Caillaud and Jullien, 2003; Rochet and Tirole, 2003). Prior research has suggested for providing financial incentives to one side of the group by

exempting membership fee or by implementing different pricing strategies for a different side of users (Hagiu, 2014). Other non-financial incentives such as technology transfer, co-marketing, and diffusion of development tools such as Software Development Kits have also been found to be beneficial to attract partners/complementors (Gawer and Henderson, 2007; Wareham et al., 2014). In addition, recent research has underscored the importance of getting acceptance from the key actors in the platform ecosystem (Ansari et al., 2016; Snihur et al., 2018). A case study of TiVo, a digital video recorder start-up, showed how the firm adjusts its platform strategy to gain support from the ecosystem incumbents (e.g. broadcast networks, broadband providers) (Ansari et al., 2016). In addition, platform creators engage in simultaneous cooperation and competition relationships with other ecosystem actors (Gnyawali and Park, 2011; Hannah and Eisenhardt, 2018). For example, platform owners often have opportunities to extend the scope of their platform by integrating into the complementary markets (Gawer and Henderson, 2007). In this case, the platform owner may need to consider the effect of competing with the complementors as it may create disincentives to commit to the platform ecosystem (Gawer and Henderson, 2007; Alexy et al., 2018). Thus, determining and retaining membership of the ecosystem should also consider the coopetition tensions that may emerge during interaction among members.

Governance mechanisms. Finally, the platform creator should decide the governance mechanisms of the platform ecosystem. A platform owner should design governance mechanisms that encourage contributions from autonomous actors to create complementary products and services to a heterogenous group of end users beyond predefined products/services (Wareham et al., 2014). In essence, governance is about regulating innovations of those whom the platform owner cannot directly control i.e. partners/complementors (Tiwana, 2014). Wareham and colleagues (2014) argued that the governance mechanism of a platform ecosystem should address the paradox of stability-evolvability. For a platform ecosystem, the ability to generate new outputs (e.g. products, services) and complementary innovations are essential (Baldwin and Woodard, 2009; Boudreau, 2010). The platform evolvability is particularly important when the markets are heterogenous and the technologies are emerging. However, excessive evolvability is financially unsustainable since complementors and consumers would have little assurance of their investments (Tiwana, 2014). Maintaining the balance between stability and evolvability is a central challenge in designing governance mechanisms. On the one hand, ecosystem governance requires a mechanism that could increase a desirable variance to cultivate evolvability. On the other hand, to maintain stability, ecosystem

governance requires mechanisms to limit undesirable variance (Yoo et al., 2012; Wareham et al., 2014). Platform owners should, therefore, introduce governance mechanisms that would support variance-increasing and variance-decreasing. For instance, a study by Wareham et al., (2014) in the enterprise resource planning (ERP) software ecosystem showed how a platform owner gives open-source code to increase the complementors' creativity and at the same time, employ partner certification to reduce undesirable variance in the process.

To summarize, there are several strategic decisions that have to be made by a platform creator related to the value propositions, technical design, membership, and ecosystem governance. A platform owner should also consider emerging tensions that may arise when making strategic decisions such as the chicken-egg, control-openness, cooperation-competition, and stability-evolvability.

2.1.3 Competing in a Platform-based ecosystem

The proliferation of digital economy and platform technology is changing the nature of competition and altering the way firms conducting business. Advances in digital technologies shift the competition level from a standalone product to platform systems (Cennamo and Santaló, 2013; Cusumano et al., 2019). The platform-based competition challenges the key assumptions on the existing theory of competitive strategy which based on the traditional product-based market (Porter and Heppelmann, 2014; van Alstyne et al., 2016). First, while in traditional market competition defined at the level of a well-defined product-market, platform competition operates *across* multiple product-markets and industries (Rochet and Tirole, 2003). Competitors are not defined as firms offering similar products for the same customers since the products built on or sold through the platform are varied and span across sectors or industries (Cennamo, 2019). The inter-connectedness and interdependencies of an integrated product-system are spans beyond traditional industries' boundaries (Parker et al., 2016). As such, the porter five-forces model, which assumes a fixed industry boundary, may no longer be relevant (Parker et al., 2016). For example, the competition between Google and Apple with their smartphone not only occurred in the mobile phone market but also in a wider application market (Suarez and Kirtley, 2012).

Second, the general theory of competition considers market structure as a given, where firms are responding to the market structure (Porter, 1985). The implicit assumption in traditional market strategy is that competition entails a zero-sum game which involves a battle for a variable slice of a fixed pie (Priem, 2007). However,

platform competition is a battle for a positive-sum where the platform enlarges the size of the pie or create an alternative pie that taps new markets and sources of supply (Cusumano et al., 2019). The illustrative example is Amazon which invented new models of self-publishing and publishing on demand, within the traditional book industry (Parker et al., 2016). Finally, in the world of platforms competition become less important than cooperation and co-creation since the crucial factor is not protecting value inside the firm, but creating value outside the firm (Brandenburger and Nalebuff, 1996; Ceccagnoli et al., 2012). In this case, the main factor for competing in the platform market is no longer ownership of (physical) assets, but access to customer-partner-producer networks and their interactions (Hagiu, 2009).

According to Parker (2016), competition in a platform ecosystem can be seen as a game of 'three-dimensional chess' where the lead firm navigates dynamic competitions at three levels: platform against platforms, platform against partners, and partner against partners. At the first level, one platform competes with another, as in the smartphone battles among Apple (iPhone), Google (Android), and Rim (Blackberry). The competitive advantage of these product resides on the power of the entire ecosystem (i.e. apps) rather than on a particular product feature. At the second level, competition occurs between a platform and its partners. For example, Microsoft invited third parties to develop new features such as browser, instant messaging for its operating system, while at the same time developed the features by itself (Eisenmann et al., 2011). Competing with a partner/complementor is a risky move as it can strengthen the platform (through added features), but at the expense of weakening partners (Gawer and Henderson, 2007). Finally, two unrelated platform partners compete for positions within the platform ecosystem. For example, in the case of video console ecosystems, multiple video game developers target the same consumers at the same console (Cennamo and Santaló, 2019).

Platform positioning strategies. A number of studies in the platform strategy literature have investigated how a platform establish competitive advantage and secure a strategic position in the market. At the most fundamental level, there are two strategies a platform can choose: Platform *domination* or Platform *differentiation* (Rochet and Tirole, 2003; Suarez and Kirtley, 2012; Cennamo and Santaló, 2013; Cennamo, 2019). Platform domination strategy suggest aiming for a position where it could address the largest customer base and gain the biggest network effects (Katz and Shapiro, 1986; Schilling, 2002; Rochet and Tirole, 2003). This strategy derives on the assumption that network size is the core element of platform competitive advantage (Rochet and Tirole, 2003; Hagiu, 2009). The platform's competitive value lies in the size of the installed base of users as

users can get a direct benefit from the opportunities to interact with others (Schilling, 2002). A large base of users also provides indirect benefits to the users from the positive externalities, which incentivise complementors (and other users) to produce complementary innovations (Rochet and Tirole, 2003). For example, a video game console with a large user base has more value to game developers since it offers greater market opportunities; the other way around, a video game platform with a large option of games are more attractive for the users (Venkatraman and Lee, 2004). The increase of the platform's network size also increases switching costs and lock-in effects, which makes it more difficult for users and complementors to switch to other competing platforms (Hagiu, 2009). As such, once a platform reaches a critical mass of users it creates a positive network effect between the users' and complementors' network size which gets reinforce overtime and further enhances the value of the platform (Rochet and Tirole, 2003; Hagiu, 2009). These direct and indirect network effects, therefore, motivate the development of a large installed user base and complementors to achieve domination in the ecosystem.

The platform domination strategy suggests that the way to win the competition in a market is by building scale fast and growing the network of users and complementors; thereby, limit the market space for sub-scale competitors (Eisenmann et al., 2006; Cennamo, 2019). As such, the key competitive actions for a platform creator adopting this strategy is to gain a wide adoption on both sides (i.e. users & complementors), and grow it larger than competitors (Cennamo, 2019). To attract both-sides of the market and to overcome the 'chicken-and-egg' problem, prior studies have proposed pricing as a mechanism to attract and coordinate both sides of the markets (e.g. Rochet and Tirole, 2003; Parker et al., 2005; Hagiu, 2009). The general suggestion for pricing strategy is to subsidize a group that is more valuable and charge a group that benefits from the presence of the other group (Eisenmann et al., 2006). For example, Facebook gives free account to users, while charging advertisers for promoting in the platform. Another mechanism to promote adoption is related to the 'platform openness' in which platform providers grant broad access and participation to its members (West and Wood, 2008; Boudreau, 2010). Empirical researches have shown how platform openness leads to the faster growth of users and a greater number of complementary offerings that contribute to establishing dominance (e.g. Boudreau, 2010; Alexy et al., 2018). Finally, Eisenmann and colleagues (2011) introduced the 'platform envelopment' as a strategy to expand the scope of the platform. Platform envelopment occurs when one platform adding another platform's functionality to its own by leveraging common components and a shared user relationship

(Eisenmann et al., 2011). For example, Microsoft's Windows incorporated functionalities offered by other specialized platforms such as Netscape (web browser) and Real Player (media file management) that enable Microsoft to expand to adjacent markets and establish dominance.

Prior studies show that platform dominance strategy is particularly suitable in markets following the *winner-take-all* logic (van Alstyne et al., 2016; McIntyre and Srinivasan, 2017; Cennamo, 2019). The winner-take-all logic works in a market that encourages users to adopt one platform and abandon others. Scholars identify three conditions that susceptible to the winner-take-all effect: Strong network effects, High multihoming or switching costs, and High homogeneity of consumers and complementors (Lee et al., 2006; Hagiu, 2009; Parker et al., 2016; Cennamo, 2019). First, as mentioned earlier, strong network effects attract more users to a platform with a larger installed base. The more users join the ecosystem, the more values are created and the more profit margins are captured by the platform owner (Hagiu, 2009). Second, the higher it cost users to participate on more than one platform (i.e. multihoming) or the more expensive it takes to switch to another platform, the more likely it is for winner-take-all logic to prevail (Parker et al., 2016). For example, most people typically chose either an Android phone or an Apple phone and stay with it for a few years since it is relatively expensive to have both of them or frequently switch from one to another (Parker et al., 2016). Finally, the winner-takes-all logic prevails when the users do not have distinctive needs or preferences (Cennamo and Santaló, 2013). High market commonality makes platform size become the key value for users (Cennamo, 2019). For example, the absence of distinct user needs and the presence of strong network effects in the ride-sharing services lead to a fierce rivalry between two or three dominant platforms (Parker et al., 2016).

Another approach to competing in a platform-based ecosystem is through platform differentiation (Suarez and Kirtley, 2012; Zhu and Iansiti, 2012; Cennamo and Santaló, 2013). While the platform domination strategy assumes that there is only one winner, which is the platform with the largest network, platform differentiation strategy seeks competitive advantages through unique market positioning or superior performance. Previous studies have shown that platform technical performance and functionalities are key important values for users, apart from the network size (Tiwana, 2014; Gawer and Cusumano, 2014). Superior technical performance can benefit users by improving productivity, ease of use, and better performance (Zhu and Iansiti, 2012; Cennamo, 2019). Furthermore, users may have different needs and preferences that open up opportunities for niche specialization (Cennamo and Santaló, 2013; Parker et al., 2016). In this case,

users may prefer a specialized feature dedicated to their needs rather than a generic feature offered by the dominant platform (Zhu and Iansiti, 2012). The heterogeneity of market needs and preferences makes platforms' unique functionalities more valuable than the platform's network size (Cennamo and Santaló, 2013). As such, competitive advantage can also be achieved through differentiation by determining market positioning along with the heterogeneity of customers' preferences and relative to competing platforms (Cennamo and Santaló, 2013; Seamans and Zhu, 2014; Cennamo, 2019).

The platform differentiation strategy puts more emphasize on establishing a unique identity rather than platform size (Cennamo, 2019). The key competitive action for a platform creator following this strategy is to gain differentiation advantage based on a unique market positioning (e.g. Cennamo and Santaló, 2013; Seamans and Zhu, 2014) and distinct technological architecture (Gawer, 2009; Zhu and Iansiti, 2012). As such, platform creators applying this strategy perform competitive actions that are contradictory to the domination logic. For instance, rather than aiming for a mass market, a platform creator can customize the platform to a particular segment that underserved by a dominant platform (Suarez and Kirtley, 2012). Facebook did this by focusing on students' community to differentiate from MySpace, the dominant social network at that time. Moreover, platforms can differentiate by purposefully limiting access to certain users that they do not want to serve. For example, eHarmony, an online dating platform, applies an extensive screening of users' in order to ensure the users in its platform are their target market (Cennamo, 2019). Restrictive access for complementors or partners can also be applied through a quality screening or certification program (Wareham et al., 2014). A restrictive openness, as opposed to full openness, can be applied to ensure the quality and exclusivity of the platform's ecosystem (Cennamo, 2019). In addition, platform creators can also differentiate by developing exclusive content/complements that are not available on other platforms (Cennamo and Santaló, 2013). Platform creators could also apply technology-based differentiation by focusing on certain functions that appear to the emerging needs of users (Zhu and Iansiti, 2012; Suarez and Kirtley, 2012). In this case, differentiation can be achieved by focusing on only a few attributes highly valued by target users while de-emphasizing other attributes that are less essential to them (Suarez and Kirtley, 2012). For example, when launching the iPhone's, Apple differentiated by focused on its unique strengths in user interface and multi touch display and de-emphasized other features outside its strengths (Suarez and Kirtley, 2012). In the end, platform creators' choices of the market scope and technical architecture contribute to the overall positioning of the platform in the market.

Moreover, platforms evolve as a result of increased competition or other dynamics in the market (Cennamo, 2019). In this case, a platform's competitive positioning might get challenged or even dethroned by others by others (Eisenmann et al., 2011; Suarez and Kirtley, 2012; Gawer and Cusumano, 2014). Moreover, platforms competitive landscape may shift due to convergence of previously separate adjacent markets (e.g. Parker et al., 2016; Khanagha et al., 2020). In this case, platforms may find themselves competing in a larger market domain. For example, when Facebook launched the "Candy Crush game" it made inroads for social media-based games which changed the competitive landscape in the video games industry. With the changed competitive domain, platforms should continuously scan their competitive environment and evolve their strategy accordingly (Cusumano et al., 2019). As such, when assessing platform strategy, it is necessary to consider not just the platform's strategic positioning at a given point of time, but its evolutionary competitive positioning overtime (Cennamo, 2019). Nevertheless, most studies investigating platform competitive strategy adopt a cross-sectional view, rather than the dynamics of platform positioning and its evolution process (McIntyre and Srinivasan, 2017). The few scholars who took a temporal perspective (Seamans and Zhu, 2014; Seamans and Zhu, 2017) have only focused on one directional strategic repositioning (from A to B); thus, do not fully capture the dynamic of platform strategy over time. Scholars, thus, have limited knowledge about the evolution and dynamics of platform competitive strategy.

Overall, this section reviews the literature on platform strategies and describes the nature of competing in a platform-based ecosystem. Platform strategy challenges extant theory of competitive strategy based on traditional, linear value chain business model. Furthermore, platform businesses entail fundamentally different value creation and capture logic than the linear, value-chain businesses. As such, developing and orchestrating a new digital platform present multiple strategic challenges for established firms with a legacy of a linear value chain.

2.2 Established Firms' Responses to Technological Changes

The rise of emerging technologies, such as digital platforms, can change an industrial landscape and pose a long-term threat to the legacy businesses and competitiveness of established firms. Scholars have documented how technological changes render existing technologies and business models obsolete and disrupt established value-network (Abernathy and Clark, 1985; Christensen and Bower, 1996; Tripsas and Gavetti, 2000; Taylor and Helfat, 2009). It is often argued that established firms tend to struggle with new technological development and get replaced by new entrants (e.g. Christensen, 1997; Ansari and Krop, 2012). However, prior studies have noted that some established firms survive and thrive across technological changes (Garud et al., 2002; Bhardwaj et al., 2006; Svahn et al., 2017). Therefore, why some organizations adapt and prevail toward technological changes, while others are inert, and fail is a central question for strategic management scholars and practitioners (Eggers and Park, 2018; Kumaraswamy et al., 2018). The literature on incumbent adaptation to technological changes and radical innovations has investigated the dynamics of technological changes and organization responds (Ansari and Krop, 2012; Eggers and Park, 2018). This literature provides useful theoretical lenses to understand how and why established firms can thrive in technological changes, especially in the emergence of new digital platforms.

In this section, I review the vast literature on incumbent adaptation toward technological changes. First, I analyse the challenges or barriers that may hinder established firms to succeed in technological changes. Then, the review moves to the studies on firms' strategy to nascent fields that are triggered by emerging technologies. In the last section, recent studies investigating platform creation by established firms in established ecosystems are reviewed.

2.2.1 The Challenges of Established Firms Towards Emerging Technologies

Scholars and practitioners have long grappled to understand how established firms' response to waves of technological changes. Emerging technologies, such as digital imaging, electric commerce, artificial intelligence, and the internet of things have been a game changing wave in this regard (Day and Schoemaker, 2000; Ahuja and Lampert, 2001; Eggers and Kaplan, 2009). Emerging technologies have the potential to create entirely new industries, remake the existing one, and obsolete established strategies (Abernathy and Clark, 1985; Day and Schoemaker, 2000; Yoo et al., 2010). Emerging technologies often change the organizational process of transforming inputs and outputs and shifts the underlying cost structure (Christensen and Bower, 1996; Hill and

Rothaermel, 2003). Moreover, emerging technologies are typically deployed in a fundamentally different business model (Chesbrough and Rosenbloom, 2002; Christensen, 2006). With such disruptive effects, it has been argued that established firms are often having difficulties to prevail in the new competitive landscape shaped by emerging technologies (e.g. Christensen and Bower, 1996; Day and Schoemaker, 2000).

Many researchers have sought to understand why established firms fail whereas some others adapt and survive by investigating the phenomena of technological change throughout history (Eggers and Park, 2018 for a complete review). For example, various phenomena of technological changes have been investigated including the shift from analog to digital photography (e.g. Benner and Tushman, 2002), the emergence of digital media (e.g. Gilbert, 2005), and the generational changes of semiconductor (e.g. Adner and Kapoor, 2010). Prior studies have produced multiple theories and propositions to explain the heterogeneity of incumbents' response to emerging technologies. Several factors such as firm's identity (Tripsas and Gavetti, 2000), managerial cognition (Eggers and Kaplan, 2009), dynamic capability (Danneels, 2011a), core resources & capabilities (Leonard-Barton, 1992), learning routines (Katila and Ahuja, 2002), market evolution & industry structure (Jacobides et al., 2006), and ecosystems (Adner, 2012) have all been shown to explain the challenges of established firms in the face of technological changes. In essence, I categorize the hindering factors of established firms in adapting to the emerging technologies into five groups: Resource Legacy, Learning Routines, Managerial Cognition, Relational Interdependences, and Organization Configuration. Table 1 provides a summary of the hindering factors and their organizational implications.

Table 1: Hindering factors of established firms in the face of emerging technologies

Hindering Factors	**Organizational Implications**	**Representative Sources**
Resource Legacies	▪ Excessive attachments to existing customers ▪ Too strong commitment to existing technologies ▪ Unwillingness to invest in emerging technologies	Rosenbloom & Christensen (1994); Christensen & Bower (1996)
Learning Routines	▪ Efficiency-oriented learning routines ▪ Limited motivation for experimentation and exploration into new technologies ▪ Inability to develop new capabilities and routines.	Levinthal & March (1993); Tushman & O'Rielly (1996)
Relational interdependencies	▪ Lack supports from existing stakeholders ▪ Coopetitive tensions with existing partners/customers. ▪ Heterogeneity of existing stakeholders in adopting new technologies/innovations	Adner & Kapoor (2010); Benner (2010)
Managerial Cognition and Organization's Identity	▪ Managers' lack attention to new technologies ▪ Managers' erroneous belief on the impact of new technologies to organization ▪ Perception of identity-challenged technologies	Tripsas & Gavetti (2000); Eggers & Kaplan (2009)
Organizations configuration	▪ Lack of integration mechanisms prevents assimilation of new knowledge ▪ The absence of an ambidextrous structure deters exploration activities	Siggelkow & Levinthal (2003): O'Rielly et al., (2009)

Resource Legacy. The first source of hindering factor is related to the established firms' existing configuration of resources & capabilities. Research has found that established firms' may have advantages over new entrants during technological changes due to their existing resources such as manufacturing, marketing, and distribution (Teece, 1986; Helfat and Lieberman, 2002). These complementary resources may allow them to overcome a lack of relevant core technological knowledge and allow them to survive in technological changes (Rothaermel, 2001). However, in most cases, technological changes can render both firms' core and complementary resources obsolete (Agarwal and Helfat, 2009; Danneels, 2011a; Roy et al., 2018). In this case, the firms' existing resources become the source of inertia and rigidity in responding to technological changes (Leonard-Barton, 1992; Gilbert, 2005).

Studies have shown that established firms are generally reluctant to allocate necessary resources and attention to emerging technologies and businesses (e.g. Rosenbloom and Christensen, 1994; Christensen, 1997; Day and Schoemaker, 2000). This resource *rigidity* is explainable since emerging technologies offer uncertain returns compare to the existing technologies and markets (Day and Schoemaker, 2000). For instance, Smith Corona, a typewriter manufacturer company, did not invest in building new resources to compete in the emerging inkjet printing market even though they had a considerable financial slack (Danneels, 2011). In addition, firms' financial dependence on the existing technology and business model would hinder investment in exploratory activities that do not contribute directly to the firm revenues (Christensen, 1997; O'Connor and DeMartino, 2006). As such it may lead to a bias in resource investment where the firm prefers to invest in the technologies that would preserve their existing resources and market positions (Gilbert, 2005). Moreover, resource rigidity increases when emerging businesses and technologies have the potential to disrupt the firm's technology and business model (Christensen, 1997; Christensen, 2006). In this case, the firm has a strategic incentive not to invest in emerging technologies since it would speed up the obsolesce of their existing businesses model and markets (Chesbrough, 2010; Khanagha et al., 2014). Prior studies revealed that established firms tend to reluctant to cannibalize their existing businesses (e.g. Rosenbloom and Christensen, 1994; Christensen and Bower, 1996). Established firms often unwilling to leave an existing customer base over an emerging customer base that demands new products associated with emerging technology (Christensen and Bower, 1996; Christensen, 1997). As such, established firms tend to get 'disrupted' when such emerging demands grow (Christensen, 1997). Research has also shown that firms are less likely to adopt new technology when it is not consistent with their existing strategic commitment (Benner and Tushman, 2002; Benner and Tushman, 2003). A strong commitment to the existing technologies gives lower incentives for the firm to adopt new technology that potentially competes with the existing technology (Rosenbloom and Christensen, 1994). In this case, the firm's core capabilities become rigidities that constraining the firm's ability to develop new capabilities (Leonard-Barton, 1992). The failure of Polaroid in digital photography, for example, was mainly due to the resource allocation bias that favour innovations on the existing technology (i.e. chemical film) rather than the new technology (i.e. digital) (Tripsas and Gavetti, 2000). In sum, firms' resource legacy can create an investment bias against emerging technologies that are not consistent with the existing technologies and market they have invested.

Learning Routines. The second challenge is related to organizational learning routines. Research has shown that established firms tend to exploit existing capabilities than innovate and explore (Levinthal and March, 1993; Tushman and O'Reilly, 1996). The existing learning routines tend to focus on the established practices that make them inert to the boundary-spanning activities (March, 1991; Ahuja and Lampert, 2001; Benner and Tushman, 2003). The large part of the organizational routines of established firms has been directed for practices that are necessary and efficient for them. As such, established firms would emphasize the familiar solutions and development that are adjacent to existing competencies (Cohen and Levinthal, 1990; Helfat, 1994). These routines are helpful for innovations in familiar settings, but they become ineffective when applied to ambiguous and uncertain settings such as emerging technologies (Day and Schoemaker, 2000; Zollo and Winter, 2002). Prior studies have shown that this efficiency-oriented routine makes exploratory learning and development of new relevant capabilities extremely difficult (Ahuja and Lampert, 2001; Gilbert, 2005). In addition, ambidexterity scholars argue that firms' survival in technological changes depends on their ability to simultaneously balance exploitation-associated activities (e.g. refinement, efficiency, and implementation) and exploration-associated activities (e.g. experimentation, variation) (Tushman and O'Reilly, 1996; O'Reilly and Tushman, 2008). Such ambidextrous relies on the orchestration abilities of two distinct, yet interrelated features of organization structure, process, and culture (O'Reilly and Tushman, 2004), which many established firms lack (Andriopoulos and Lewis, 2009). Moreover, established firms tend to reinforce certain ways of problem solving based on past successes (Cohen and Levinthal, 1990; Levinthal and March, 1993). Established firms also often lack in engaging with exploration search as they tend to search in known and well-tried directions (Katila and Ahuja, 2002). Prior choices of technology or solutions may lead the firms to search and to explore areas that are closely related to their competencies (Bayus and Agarwal, 2007; Eggers, 2016). Overall, the firm's existing organizational routines that favour efficiency over novelty and adjacent over distant solutions constraints experimentation and new capability development that essential in the face of technological changes.

Relational interdependencies. Another hindering factor stems from managing relational interdependencies with both existing and new stakeholders of an ecosystem. Established firms have developed complex networks of customers, suppliers, and partners with whom they interact to create products/services in their core businesses (Iansiti and Levien, 2004a; Nambisan and Sawney, 2011). This network of interdependent

stakeholders plays an important role in supporting the value creation and value capture of the firm (Adner, 2012; Jacobides et al., 2018). However, emerging technologies might disrupt a firm's longstanding relationship with its stakeholders of the existing ecosystem (Gilbert, 2005; Adner, 2012). Emerging technologies have the potentials to re-structure firms' existing value network that may result in the changes of roles, relationships, rules, and transactions among ecosystem members (Jacobides et al., 2006; Ansari et al., 2016). For instance, the emergence of digital video recorder technology has impacted the TV industry ecosystem and changed the relationship among broadcast networks, content providers, advertisers, content distributors, and regulators (Ansari et al., 2016). The firm may need to mobilize the member of its existing network to adopt the new paradigm of the emerging business ecosystem, since failing to get support from the existing stakeholder may be detrimental not only for the emerging business but also for the established one (Adner and Kapoor, 2010; Ozcan and Santos, 2015). Yet, different members of the ecosystem have motivations and interests toward emerging businesses (Khanagha et al., 2018). Some members may be supportive, while others may be against the emerging technology. In many cases, the relationships can be 'coopetitive' where the firm engage in a cooperative and competitive relationship at the same time (Gnyawali and Park, 2011). As such, the challenges for an established firm attempting to develop emerging businesses are to reconfigure its ecosystem and manage the relationship in such a way that it will benefit both new and existing businesses (Khanagha et al., 2020). In addition, prior studies reveal that established firms' response toward emerging technologies is also influenced by external actors, such as security analysts (Benner, 2010; Benner and Ranganathan, 2012). In this case, established firms face pressures from the external actors to choose strategies that maximize shareholder value and preserve existing competitive advantages (Benner, 2010). A study by Benner and Ranganathan (2012), shows how pressure from security analysts discourage established firms from investing in new technologies that are outside the firms' domain. Overall, established firms' legacy relationships with multiple stakeholders can constrain the firm's response toward emerging technologies.

Managerial cognition and Organizational identity. The fourth hindering factor comes from the mental models (i.e. cognition) of managers. Research has widely documented the role of managerial cognition in affecting established firms' behaviour toward technological changes (e.g. Kogut and Zander, 1996; Tripsas and Gavetti, 2000; Eggers and Kaplan, 2009; Tripsas, 2009). Managerial cognition entails managers' attention, interpretation, and belief towards emerging technologies and their impact on

organizations (Eggers and Kaplan, 2013; Helfat and Peteraf, 2015). Prior studies have shown that managers who paid more attention to new technologies are more likely to achieve a faster and better adaptation (Kaplan, 2008a; Eggers and Kaplan, 2009). Attentive managers tend to have a better capacity in sensing new opportunities or threats in a faced-paced environment (Joseph and Ocasio, 2012; Helfat and Peteraf, 2015). A study by Eggers and Kaplan (2009), for instance, found that top managers who put more attention toward emerging technologies were more likely to identify the promise of the technology and quickly embrace the technology. The study also showed that too much attention to the existing technologies was associated with slower adaptation of emerging technologies. Moreover, managers' cognitive frame i.e. belief and perception toward emerging technologies may hinder or facilitate incumbents' adaptation to technological changes (Tripsas and Gavetti, 2000; Gilbert, 2006). The seminal case of Polaroid is one example of how managers' cognitive frames can hinder the adoption of emerging technology. Polaroid's inability to embrace digital photography is not because of the lack of necessary technological capabilities, but because of managers' belief on the razor stick-and-blade model as the only way for the firm to commercialize its products (Tripsas and Gavetti, 2000). Managers' cognitive bias on the key attributes of business models such as value proposition, market segments, and revenue streams may also hamper firms' adaptation to technological changes (Chesbrough and Rosenbloom, 2002; Chesbrough, 2010). For example, a study by Chesbrough and Rosenbloom (2002) revealed cognitive bias within Xerox that discourage the firm to develop personal copiers. However, a cognitive frame that is consistent with emerging technologies may increase the likelihood of adaptation (Gilbert, 2006; Eggers and Kaplan, 2009). For example, Intel's success in transforming to a platform-based firm was partly due to managers' belief in the platform-based business model and technology (Gawer and Phillips, 2013).

Managers' cognitive frames are also influenced by the shared belief of organizational identity. Organizational identity refers to the members' shared understanding of who the organizations are believed to be (Anthony and Tripsas, 2016; Ravasi et al., 2020). Prior studies have shown how organizational identity can blinds firms toward technological change (Tripsas, 2009; Kammerlander et al., 2018; Garud and Karunakaran, 2018). Emerging technologies that deviate from the members' expectations associated with the organizational identity are difficult to adopt (Tripsas, 2009). For instance, a study by Tripsas (2009) showed the difficulty faced by a firm that identified itself as a digital photography firm to pursue new opportunities in flash memory technology. Another study by Altman and Tripsas (2015) suggested that the success of

transitioning from a product-based to platform-based business model involves a concurrent shift in some aspects of organizational identity. Overall, these researches suggest that when emerging technology challenges managers' existing beliefs about the existing technologies and business models, it creates significant obstacles for organizations to adopt them. A more detailed review of the implications of managerial cognition to a firm's strategy is provided in the next section.

Organization configuration. The last factor which may hinder established firms' adaptation relates to the organization structure and how the firms organize themselves in general. Compared to the previous factors, little empirical research has specifically focused on investigating the effect of organizations' configuration to established firms' adaptation (Eggers and Park, 2018). Nevertheless, research indicates that certain forms of organizational structure may facilitate adaptation, while others structure may hinder adaptation (Westerman et al., 2006; Tushman et al., 2010; Ansari and Krop, 2012). For example, ambidexterity literature has shown that firms with ambidextrous structure i.e. structurally separate between exploitation and exploration activities are better in developing emerging business opportunities (O'Reilly et al., 2009; Tushman et al., 2010). Another study suggested that inter-unit knowledge management such as cross-functional teams may help firms' survival in the face of technological changes (Hill and Rothaermel, 2003). Siggelkow & Levinthal (2003) also theorized that the degree of centralization affects a firm's ability to explore and adapt. Other research has explored the degree of vertical integration as another organizational configuration that influences firms' adaptation to technological changes (Adner and Kapoor, 2010; Kapoor and Adner, 2012). For instance, vertically integrated firms were found to be faster in launching a new product generation than non-integrated firms (Kapoor and Adner, 2012). In sum, these studies indicate that organization configuration in terms of form, structure, and centrality influence established firms' response toward emerging technologies.

Overall, established firms confront several hindering factors such as resource dependency, learning routine, relational interdependency, managerial cognition, and organization configurations in the face of emerging technologies. Nevertheless, more recent research shows that some established firms can thrive during technological changes. In this case, established firms successfully respond to technological changes by entering nascent fields and actively shaping the environment to their advantage (Garud et al., 2002; Santos and Eisenhardt, 2009; Anthony et al., 2016; Gavetti et al., 2017). The next subsection reviews studies on strategies in nascent fields.

2.2.2 Strategies in Nascent Fields

Emerging technologies often result in the creation of nascent markets and/or ecosystems that have potential to replace existing industries (e.g. digital photography, personal computer) or expand the existing one (e.g. biotechnology, electric vehicle) (Tushman and Anderson, 1986; Day and Schoemaker, 2000; Agarwal et al., 2017). Given its transformational effect, firms engage in nascent fields to capture emerging opportunities or to remain competitive during waves of industry transformation (Santos and Eisenhardt, 2009; Benner and Tripsas, 2012; Moeen, 2017). Nascent fields are business environments in an early stage of formation, which appear in the initial period of industry emergence (Santos and Eisenhardt, 2009). From the technology evolution perspective, a nascent period of technological evolution starts after the emergence of new technology, but before standardization and mass commercialization in place (Abernathy and Clark, 1985; Tushman and Anderson, 1986). In this period, which is also known as *an era of ferment*, firms are experimenting with multiple alternative technology options until a dominant design emerges (Anderson and Tushman, 1990).

From an industry lifecycle perspective, a nascent period starts from the incubation stage and ends with early signs of commercial viability before industry sales take-off (Moeen, 2017; Eggers and Moeen, 2018). Incubation stages denote a period of pre-commercial technological investments before the first product commercialization (Agarwal et al., 2017). After incubation stages, rapid firm entry results in a modest increase in product sales (Agarwal et al., 2017). Then, the nascent period ends at a point when improved commercial viability has triggered a sharp increase in sales (Eggers and Moeen, 2018).

In the context of ecosystems, a nascent period of an ecosystem is not fully defined. Literature typically described four stages of an ecosystem lifecycle that covers a birth phase, expansion phase, a leadership phase, and a self-renewal phase (Moore, 1993; Iansiti and Levien, 2004b; Teece, 2017). Based on these phases, a nascent period of an ecosystem can be defined as a period between the start of a birth phase and the tipping point of the expansion phase. The birth phase denotes by the emergence of an enabling technology that offers multiple ranges of future alternatives (Dattee et al., 2018). In this phase, ecosystem creators focus on defining the value propositions of a would-be ecosystem including what value is created and how the value creation and value capture structure should look like (Moore, 1993; Iansiti and Levien, 2004b; Adner, 2006). Then, the ecosystem 'blueprint' starts to crystalize and create a momentum that attracts others to participate, which leads to battles of positioning among actors (Moore, 1993; Dattee et

al., 2018). An ecosystem's nascent period ends at the later stage of positioning battle at a point before a clear leadership position emerges. Figure 3 illustrates an ecosystem's nascent phase and distinguishes the nascent phases from subsequent phases.

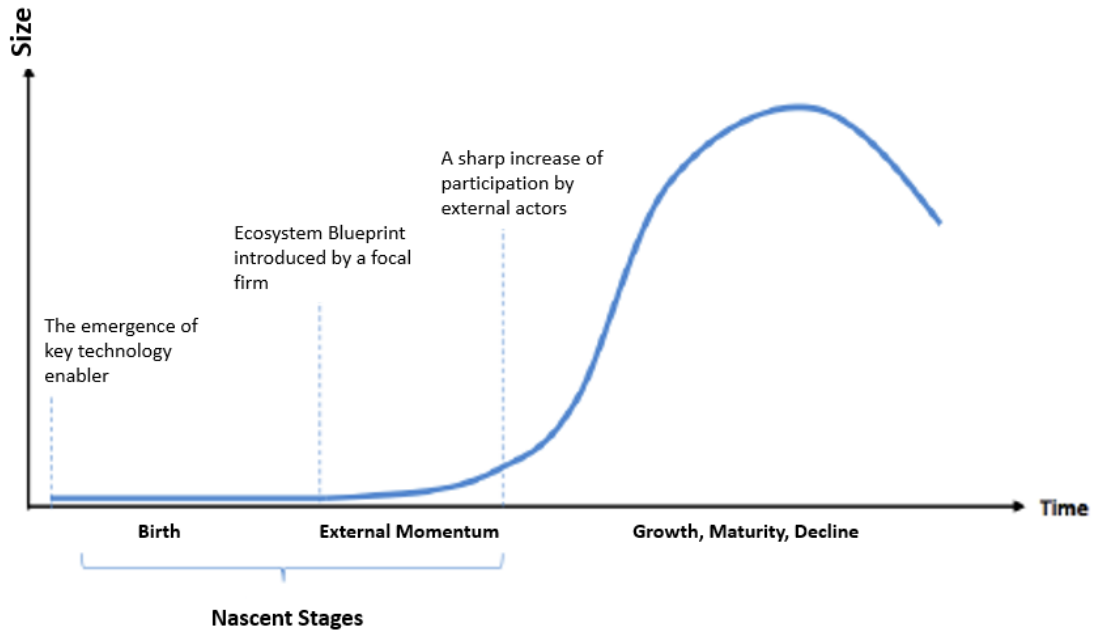


Figure 3: Nascent Stages of Ecosystem Lifecycle

The nature and characteristics of nascent fields. Nascent fields are business environments (i.e. industry, ecosystems, markets) characterized by extreme ambiguities with regards to technology, competition, and markets (Santos and Eisenhardt, 2009; Benner and Tripsas, 2012; Moeen, 2017). The contextual features of nascent fields make decision-making more complex and difficult (Eggers and Moeen, 2018). Therefore, strategic decisions must account for the inherent uncertainties and ambiguities of nascent fields. First, nascent fields are fraught with technological uncertainties. Given a lack of dominant design, firms encounter numerous technological options without clear indications of which one would prevail (Schilling, 2002). Consequently, the firms' decision on technological options could be decisive since choosing 'losing' technologies equal to failure in the nascent fields (Suarez, 2004; Eggers, 2016).

The challenges of technological uncertainties exacerbate when it is driven by new digital technologies. Advances of digital technologies lead to technology convergence which blurs the boundaries between once separated products and industries (Yoo et al., 2012; Porter and Heppelmann, 2014). Technology convergence complicates firms' strategy formulation process as it shifts the focus from choosing a single type of technology to a combination of multiple technologies (Yoffie, 1996). This condition

requires mastery of a broader array of technologies that extend beyond the firm's sphere of competence (Yoffie, 1996; Chesbrough, 2003). The development of products/services in this setting would need collective efforts of multiple stakeholders who might belong from different industries and not bound by contractual agreements (Adner and Kapoor, 2010; Adner, 2012). However, technological uncertainty implies that identifying potential collaborators and inducing them for collaborative endeavour toward emerging businesses could be difficult (Santos and Eisenhardt, 2009; Dattee et al., 2018).

In addition, firms competing in nascent fields face with a highly ambiguous market (Santos and Eisenhardt, 2009; Benner and Tripsas, 2012). Ambiguity refers to the lack of clarity about the meaning and implications of particular situations which leads to multiple potential interpretations (Davis et al., 2009). Ambiguity in nascent fields results from a lack of consensus regarding products/services definitions (Rindova and Kotha, 2001; Benner and Tripsas, 2012), customer preferences (Adner and Levinthal, 2001), and business models (McDonald and Eisenhardt, 2019). The market ambiguities imply that entrant firms lack complete knowledge regarding which customer groups will find the offering products/service attractive, and which business model will prevail (Adner and Levinthal, 2001; Anthony et al., 2016). In this case, firms may have to choose among a plethora of products and technology without any guidelines logic that connects technical potential with the realization of economic value (Chesbrough and Rosenbloom, 2002). Moreover, firms may not know which resources and capabilities that are still strategically valuable in the new fields (Davis et al., 2009; Danneels, 2011a). As a result, it will complicate the capability reconfiguration strategy to pursue emerging opportunities.

Given the absence of industry structure or ecosystem blueprint, firms may have different interpretations regarding which organizations represent customers, suppliers, or competitors and what the dependence relationship would look like (Rindova and Kotha, 2001; Santos and Eisenhardt, 2009). The collective cognitive frames about products and market categories may be diverse since various actors are still seeking the meaning of an unfamiliar field. A study by Rao (1994), for instance, shows how stakeholders (i.e. producers & consumers) in the early development of automobile industries disagreed on how automobiles should look and perform. The market ambiguities might intensify when the nascent fields are shaped by *generative* technology (Yoo et al., 2010). Generative technology such as the Internet of Things, Artificial Intelligence, and Blockchain has the potential to create a breath-taking variety of potential future applications (Zittrain, 2006). Consequently, firms not only encounter with different technological options, but also with an unbound variety of product-market applications that could overwhelm prospective

stakeholders with a "*mind-blowing space of exploration*" (Dattee et al., 2018, p.476). As such, the uncertain and ambiguous nature of nascent fields create strategic trade-offs and complicate firms' strategies. It would be nearly impossible for managers to be sure of what is going to happen in the industry, what the implications for the firm will be, and what the best ways of responding (Eisenhardt, 1989; Teece et al., 2016).

Strategies in shaping nascent fields. Despite complexities and challenges in nascent fields, recent research has documented some successful attempts of firms in entering and competing in nascent fields. The blur and fleeting structure of nascent fields also represents big opportunities for firms to create new markets and shape the new environments to their advantage (Santos and Eisenhardt, 2009; Gavetti et al., 2017). Firms often incentives to engage in a nascent field early on to build industry-specific knowledge and resource that allow them to build a defensible position in a new market or industry (Helfat and Lieberman, 2002; Agarwal et al., 2017; Gavetti et al., 2017). In this case, firms may aim to shape and dominate the field rather than just passively fitting in (Santos and Eisenhardt, 2009). A seminal study by Santos and Eisenhardt of five new ventures (i.e. start-ups) in nascent fields showed a series of strategic actions for constructing nascent markets. They introduced claiming, demarcating, and controlling as three interrelated strategic actions a new venture could apply in constructing new markets. Moreover, firms could shape meaning and promoting their identity to become a cognitive referent in the market. Then, the authors argued that firms could define industry structure and roles for other actors by developing alliances. Finally, at the later stage, firms could aim to control the market by owning the market space as much as possible (Santos and Eisenhardt, 2009). Interestingly, the authors found that new ventures can influence other market actors using *soft* power tactics (i.e. early timings, self-serving illusions, and exploitations of others' natural tendencies) to influence the actions of others.

Prior studies suggest that shaping a nascent field can involve institutional work where organizations create new meanings as the field emerge (Lawrence and Suddaby, 2006; Greenwood et al., 2011). The ambiguous and fluid situations in a nascent field offer the opportunity to shape the collective cognitions toward a particular industry or ecosystem (Santos and Eisenhardt, 2009). Firms who assume the role of 'industrial champions' initiate collective actions and devise strategies for establishing a sequence of interactions to create entirely new industries and associated institutional logic (Aldrich and Fiol, 1994; Garud et al., 2002). According to Lawrence and Suddaby (2006), institutional works involves constructing identities and meanings, reconfiguring actors' belief system, and mobilizing collective actions. In the context of shaping new

technological fields, an important aspect of institutional works involves the development of technological standards (Garud et al., 2002). Technological standards represent the rules of engagement that define how different systems work together to function (Garud and Kumaraswamy, 1993; Baldwin and Clark, 2000). By developing a common standard, firms can derive competitive benefits as they can dictate the specifications of individuals components and how they should interact (Cusumano and Gawer, 2002). The development of technological standards involves generating collective action among a group of actors that may have a contradictory vision and agenda (Garud et al., 2002). Prior studies have shown the role of institutional works to mobilize collective actions around the new standards (Garud et al., 2002; Gawer and Phillips, 2013). The case of Sun Microsystem showed how the firm employed social and political processes to mobilize collective actions and to avoid deviation from a common vision (Garud et al., 2002). For example, Sun Microsystem used strong-arm tactics through legal instruments to sustain cooperation and to suppress the private interests of actors within a coalition. The firm also evokes the image of a common enemy to galvanize collective action. Another study by Gawer & Phillips (2013) also showed how Intel cultivated an external perception of trustworthiness by convincing others that they were a neutral platform leader. This research implies that that the creation of new technical institutions requires political and social skills to mobilize collective actions and to maintain cohesiveness's among actors.

Research on ecosystem strategy has also underlined the importance of collaboration and coordination to facilitate ecosystem emergence. In an ecosystem, firms need to orchestrate a set of activities performed by multiple sets of partners in order to create value (Adner, 2012; Adner, 2017). In this case, ecosystem creators i.e. the keystone player need to ensure the availability of necessary components provided by other actors that are not bounded by hierarchical relationships or contractual agreements (Adner and Kapoor, 2010; Jacobides et al., 2018). Previous studies examined cooperative actions that firms use to enable partners to jointly create value for the overall ecosystems (Gawer and Henderson, 2007; Ethiraj, 2007; Ozcan and Eisenhardt, 2009; Adner, 2012). A study by Ethiraj (2007), for instance, showed how firms initiate joint R&D to enable component providers to resolve the constraints in developing components of a product system. Gawer and Henderson (2007) also found that Intel dedicated resources and provide incentives for its partners in producing components for the PC ecosystem. Similarly, Ozcan and Eisenhardt (2009) showed how proactive engagements of game publishers toward the carriers and handset makers contribute to the emergence of the wireless gaming ecosystem. Moreover, some studies note the role of firms' competitive actions in an

ecosystem (Gawer and Cusumano, 2002; Jacobides et al., 2006; Santos and Eisenhardt, 2009). Firms' competitive actions are essential to capture the value created within the ecosystem and to secure competitiveness. Research shows that firms can secure the most value capture through several mechanisms such as early entry (Jacobides et al., 2006), revenue sharing agreement (Santos and Eisenhardt, 2009), establishing proprietary standards (Gawer and Cusumano, 2002), and limiting dependence on complementors (Jacobides et al., 2016).

Recently, research has underscored the firms' ability to navigate cooperation and competition (i.e. coopetition) tensions to shape the emergence of a new ecosystem (Ansari et al., 2016; Hannah and Eisenhardt, 2018). A study by Ansari and colleagues (2016), for instance, highlighted the coopetition tensions face by a start-up firm attempting to reshape an established ecosystem through disruptive innovations. The coopetition tensions arose since the disruptor need the support of the incumbents whose technologies, products, or business model could potentially get disrupted. According to the authors, a disruptor confronted three coopetitive tensions simultaneously namely intertemporal, dyadic, and multilateral. To navigate these tensions, they found that the disruptor continuously adjusts its strategy as the ecosystem evolves (Ansari et al., 2016). Another study by Hannah & Eisenhardt (2018) showed how new ventures navigate cooperation and competition tension in the nascent residential solar industry. They found that firms that can balance competition and cooperation over time tend to have a higher performance. In doing so, successful firms shift cooperation-competition balance efficiently based on the 'bottleneck' crowdedness. In a similar vein, recent research by Dattee and colleagues (2018) investigated the creation of novel innovation ecosystems based on generative technologies. The authors showed that during a nascent stage of an ecosystem firms have difficulties convincing others to commit resources to a *de novo* ecosystem since there is no compelling "blueprint" for the future of the ecosystem. The absence of a blueprint implies the lack of value propositions (i.e. what value is created, how, and for whom) and the structures of ecosystems (i.e. who does what, who controls what, and how everyone will benefit) (Adner, 2006; Dattee et al., 2018). They found that the creation of a novel ecosystem is a process of collective discovery orchestrated by the focal firm that involves developing the provision of the ecosystem, envisioning the interdependencies, enacting internal and external momentum. To win at the ecosystem game, the authors suggested for establishing dynamic control over the creation process to ensure the value propositions evolves in a way that the firm hopes to capture some of the created value. A dynamic control entails influencing the direction of the ecosystem through a clarified vision and

anticipated control points, monitoring the evolution of ecosystems, and updating strategies (Dattee et al., 2018).

In sum, research on competition in nascent fields reveals that established firms not only passively adapt to nascent fields enabled by emerging technologies but can also attempt to influence the development of the field to their advantage. However, it requires a superior ability to mobilize collective actions and managing tensions of cooperation and competition.

2.2.3 Platform Creation by Established Firms

As mention in the previous section, the proliferation of digital platforms presents both challenges and opportunities for incumbent firms. For established firms with a legacy of traditional linear value chains, platforms represent a fundamentally different logic in creating value and establishing competitive advantage (Cusumano and Gawer, 2002; van Alstyne et al., 2016). The supply chain or 'product' business involves a linear series of production activities where firms create value by optimizing an entire chain of production activities and controlling the end products. In contrast, platforms create value by providing a foundation technology that is essential for complex and broader value propositions (van Alstyne et al., 2016). Platforms change the strategic objective from tightly controlled supply chains to loose coalitions of partners and complementors beyond the firm's boundary (Parker et al., 2016). Unlike the traditional buyer-supplier relationship in linear business models, a platform leader needs to exert influence on the ecosystem without formal contracts and hierarchical relationships. Table 2 contrasts the linear supply chain logic with the platform logic.

Table 2: The comparison of supply chain and platform
(Gawer & Phillips, 2003: Parker et al., 2016)

	Supply-chain	**Platform**
Industry Structure	○ Industry or supply-chain hierarchy	○ Platform-based ecosystem
Organizational Member	○ Focal Firm/Assembler ○ Supplier	○ Platform leader/Hub firm ○ Complementor
Objectives	○ Individual firm's performance	○ Individual firm's performance ○ Collective innovation performance of the ecosystem
Nature of industry leadership	○ Leadership through the control of supply-chain relationship and scarce & valuable resources	○ Leadership through orchestration of innovations by external firms
Source of authority and legitimacy	○ Formal buyer-seller contracts ○ Ownership of resources ○ Tight control of intellectual property rights	○ Non formal contracts mechanisms (e.g. industry forum, consortia, strategic interest group)

	Supply-chain	Platform
		○ Ownership of the platform's core technology, but not the whole system. ○ Open intellectual property through standard interfaces
Value creation	○ Optimization of a linear series of production activities. ○ Control of the end products	○ Creation of ecosystem-wide value propositions ○ Facilitation of external innovations ○ Facilitation of interactions among different sides of actors
Value capture	○ Number of products sold	○ The consumption/usage of platform's functions. ○ Complementary innovations
Innovation approach	○ Innovation trajectory solely defined by the focal firm ○ Locus of innovation for suppliers is restricted by the focal firm	○ Innovation trajectory is influenced but not defined by the platform leader ○ The platform leader distributed and orchestrated innovations, performed by ecosystem members ○ A wide scope of innovations on complementors

Despite the challenges, digital platforms also open new opportunities for established firms. The creation of a digital platform and its ecosystem enable established firms to create novel value propositions and thrive on technological changes (Gawer and Cusumano, 2008). For instance, industrial giants such as General Electric, Siemens, and Haier create a digital platform to connect their machines to the internet of things (Cusumano et al., 2019). Those established firms might be less familiar with platform strategy compared to the digital natives' firms (e.g. Amazon, Facebook, Google, Microsoft), but they have technical and market capabilities that can be leveraged to create a digital platform (Parker et al., 2016; Cusumano et al., 2019). Prior research suggests that large and established firms can have considerable resources & capabilities that they can marshal to shape the new technology and ecosystem (Garud et al., 2002; Agarwal et al., 2017; Eggers and Park, 2018). Established firms have a broad knowledge base and a strong reputation that they can be leveraged for developing a platform-based business (Gawer and Cusumano, 2008). They can mobilize a variety of resources, such as patent pool (West and Wood, 2008), existing installed base of users (Khanagha et al., 2020), and established network of partners (Ansari et al., 2016) Therefore, the success of established firms' in creating a platform firm may rely on its ability to reconfigure existing capabilities and develop the new one (Helfat and Raubitschek, 2018).

Platform adoption by established firms involves determining the strategy of capabilities reconfiguration that minimizes potential tensions between established business and the emerging (platform) businesses. The literature on incumbents' adaptation provides insights on the strategy for capability reconfiguration to respond to discontinuous changes (e.g. Lavie, 2006; Eggers and Park, 2018). First, an established firm could take a drastic approach by *transforming* its capabilities and business model to fully adopt a platform strategy. This strategy involves major organizational changes and may shift organizational identity (Gawer and Phillips, 2013). Intel's transformation in the late 1980s is an example of a firm following this strategy (Gawer and Cusumano, 2002; Gawer and Phillips, 2013). As depicted by Gawer & Phillips (2013), Intel engaged in a various transformation effort to adopt the 'platform logic'. The firm transformed its organizational routines (e.g. from *owning* to *sharing* technology) and shifted its business model (from linear value chain to platform) to fully adopt the platform strategy. The transformation approaches may allow the firm to capture the maximum potential value in the ecosystem, especially in the platform-ecosystem characterized by network externalities (Katz and Shapiro, 1986). The transformation approaches also effective to pre-occupy a strategic position in the ecosystem and hinders new competitors from entering the space (Parker et al., 2016). By gaining the first-mover advantages and network effects, the firm can define the competitive dynamics in the platform ecosystem (Gawer and Cusumano, 2008). Nevertheless, this approach requires significant investment and commitment from the management (Wessel et al., 2016; Khanagha et al., 2018). It also needs a superior ability to identify potential capability gaps that inform the direction of capability reconfiguration such as which capabilities to acquire and which capabilities to substitute (Lavie, 2006). Moreover, organizations will likely face tensions and conflicts from internal organizations and stakeholders caused by dramatic shifts in the firm's identity and organizational culture (Tripsas, 2009; Gawer and Phillips, 2013). As such, the success of this approach heavily depends on the firms' ability to manage potential tensions and internal conflicts.

The second alternative is to follow an *evolutionary* approach by incrementally adjusting and modifying existing capabilities. This approach aims to adjust the existing capabilities in a path-dependent manner with limited modification (Lavie, 2006). This approach follows the adaptation logic that emphasizes learning and evolutionary adjustment to emerging opportunities (e.g. Rindova and Kotha, 2001; Davis et al., 2009). The evolutionary approach encourages learning and experimentation in order to identify more effective strategies (Bingham and Eisenhardt, 2011). This approach suggests

delaying resource commitments when uncertainties are high to minimize the risk of committing early to a suboptimal strategy (Dattee et al., 2018). In the context of platform creation, established firms following this approach tend to aim to leverage as much as possible its established competitive advantage, while creating the platform business (Gawer, 2009). SAP, a global enterprise software maker, is one of the firms following this approach (Gawer, 2009). SAP has traditionally developed and sold integrated solutions (i.e. software) for enterprise resource planning and supply chain management. To develop a 'business process platform', SAP leverage its technical and market capabilities that relied on pre-existing knowledge used in software and applications. SAP's evolved technical capability enabled the development of a digital platform with predefined enterprise services and integration technology (Gawer, 2009). By this approach, SAP successfully transitioned to the platform business and developed an ecosystem surrounding it. Nevertheless, this strategy is based on the assumption that the firm's capabilities are relatively applicable to the new (platform) context. An evolutionary approach might be insufficient to produce the desired change in a timely fashion given the dynamic of platform competitions (Wessel et al., 2016; Cennamo, 2019). The firms may lose the opportunity to influence the development of the ecosystem and capture the most values from the ecosystem because of competitive actions by more aggressive players (Cennamo and Santaló, 2013). They may also face the risk of 'envelopment' by more dominant players which may challenge the survival of their platforms (Eisenmann et al., 2011). As such, managers may need to consider the opportunity cost of late response and the competitive dynamics of the ecosystems when following this strategy.

Between the two extremes, a firm may follow an intermediate response that incorporates *both* existing and new technological capabilities and resources. The *hybrid* strategy involves a combination of capabilities modifications through internal learning and acquisitions of new capabilities from external sources (e.g. industry consortium, alliance partners, new employees) (Lavie, 2006). Firms following this approach aim to introduce platforms that combine elements of both new and old systems (Furr and Snow, 2015; Suarez et al., 2018). Scholars argue that hybrid strategy allows an organization to learn about uncertain technological future especially related to supply-side knowledge, demand-side knowledge, and timing knowledge (Furr and Snow, 2015). In the context of platform creation, firms following this approach typically create digital platforms to enhance their existing competitive advantage in the linear value chain businesses (Parker et al., 2016). An example of this strategy can be illustrated by the case of Volvo in realizing the *connected car* vision (Svahn et al., 2017). Rather than radical transformation

or incremental evolution, Volvo's managers believed that the success of digital platform development depended on an appropriate combination of existing and new/requisite capabilities. Platform development at Volvo involved the acquisition of new capabilities through external collaborations (i.e. strategic alliances) as well as internal capability building. By this approach, Volvo tried to recombine its product legacy (i.e. car manufacture) with digital platform capability (i.e. cloud and connectivity) that would sustain its advantage in the car industry (Svahn et al., 2017). However, executing the hybrid approach is challenging and difficult as the firm engages in dual business models and follows two opposing logics simultaneously: product & platform (Markides and Charitou, 2004; Gawer, 2009). In addition, firms may expose to the 'hybrid trap' in which they do not excel in either the product or platform and deliver suboptimal performance (Suarez et al., 2018). Firms following this strategy, therefore, need to have a high-level *integrative* capability that enables them to effectively coordinate contrasting activities, capabilities, and objectives (Helfat and Raubitschek, 2018).

In essence, established firms adopting a platform strategy need to reconfigure their existing capabilities. Prior works suggest that firms may follow a transformation strategy that involves major organizational changes or follow an evolutionary approach which involves incremental changes. Firms may also follow an intermediate/hybrid strategy by combining existing capabilities and new capabilities. Each strategy has costs and risks which make the strategic choice far from trivial. The complexity of strategy development significantly increases in the context of nascent ecosystems since firms do not have sufficient knowledge regarding the technical characteristics and market preferences. In this setting, strategy development might rely on the managers' subjective interpretations and perceptions toward emerging opportunities. In the next section, the literature on managerial cognition is consulted to understand how cognitive processes influence firms' strategic actions in ambiguous environments.

2.3 The Role of Managerial Cognitions in Strategy Development and Strategic Change

The literature on platform and firms' strategy in nascent fields indicate that platform creation in nascent ecosystems replete with extreme uncertainty and ambiguity. In this context, managers making strategic decisions based on ambiguous information since the technologies are emerging, customer preferences are still in flux, and the ecosystem is still evolving (Santos and Eisenhardt, 2009). Consequently, many aspects such as technological features, market opportunities, and ecosystem interdependencies are open for interpretations. In this context, cognitive processes in which decision makers' try to interpret and make sense of ambiguous situations can play important role in decision making (Kaplan and Tripsas, 2008; Pfarrer et al., 2019).

The strategic cognition literature has underscored the impact of cognitive aspects on firms' strategic behaviours (e.g. Porac et al., 1989; Barr et al., 1992; Walsh, 1995; Narayanan et al., 2011). This literature provides useful insights for understanding how managerial cognitions shape firms' strategy in ambiguous environments such as nascent ecosystems. As such, in this subsection, the literature on strategic cognition is reviewed. The review starts by introducing the basic concept of managerial and organizational cognition in strategic management. Then, the cognitive process in relation to capability development and strategic change is reviewed. Finally, the emerging research investigating the relationship between managerial cognition and firms' strategy in nascent fields is explored.

2.3.1 The Cognitive Perspective on Strategy

Strategy and management scholars have long recognized the role of cognition in shaping firms' strategic behaviours. The concept of cognition originally derived from the field of psychology to describe the mental activities of decision makers (whether individual or as a collective) in processing knowledge and information (Schwenk, 1988; Walsh, 1995). Cambridge dictionary defined cognition as "the use of conscious mental process". In a similar vein, the Oxford Dictionary of Psychology defines cognition as "the mental activities involved in acquiring and processing information" (Colman, 2009). The concept of cognition in management research encompasses two interrelated meanings: *mental activities* and *mental structures* (Helfat and Peteraf, 2015). Strategy and management scholars have used a variety of term to denote mental structures including frames (Hodgkinson et al., 1999; Gilbert, 2006), interpretation systems (Daft and Weick, 1984; Dougherty, 1992), mental models (Hamel and Prahalad, 1989), and cognitive maps (Barr

et al., 1992). Despite a variety of terms, they assumed to play a key role in an individual's cognitive representation of an environment (see Walsh (1995) for a comprehensive review of a historical account of cognition in management research).

The study of cognition in strategic management has been focusing on the linkages between cognitive structure (i.e. managers' belief about environments and the state of organizations) and cognitive process (i.e. managers' mental activities in interpreting information) in strategy development (Porac and Thomas, 2002; Narayanan et al., 2011). The cognitive perspective in strategy encompasses how decision makers perceive, interpret, and make sense of an organization's strategic processes, actions, and related outcomes (Pfarrer et al., 2019). This perspective dates back to the work of Cyert & March (1963) on the behavioural theory of the firm. Their work challenged the assumptions of complete rationality and questioned the rational analytical models that do not consider environmental uncertainty in decision making. This insight provides a basis for cognition scholars to investigate the mental model of decision makers in understanding their organizational environment (Walsh, 1995). Moreover, Herbert Simon's works on 'bounded rationality' laid an important work in uncovering the cognitive limits of managers in making sense of the environment. The bounded rationality theory suggests that decision makers must construct simplified mental models to solve complex problems since they can only have an 'approximate rationality' to the problem (Simon, 1976). Simon argued that managers (i.e. decision makers) are subject to selective perception and bias due to cognitive limitations to comprehensively evaluate all relevant variables for a decision. Drawing on Simon's work, cognitive scholars pointed out the role of managers' subjective interpretation and their associated biases in mediating the organizational response to the environment (Daft and Weick, 1984). These scholars believed that it is managers' subjective representations of the environment that shape strategic decisions and subsequent organizations' actions (Daft and Weick, 1984; Barr et al., 1992).

In the managerial cognition perspective, managers are considered as knowledge workers with the main job to interpret and make sense of environment cues (Daft and Weick, 1984; Walsh, 1995). Managers spend most of their time to construe information, to be aware of external events, and to interpret cues into meaning for the organizations (Daft and Weick, 1984). The cognition perspective suggests that the external environment does not directly influence an organizations' behaviours or strategic actions. Instead, an organization only responses to the environment if managers within the organization sense and interpret the environment and choose to respond to it (Daft and Weick, 1984; Ocasio, 1997). Cognition scholars believed that organizations' strategic actions are shaped by

how managers notice and interpret the environment and translate those perceptions into strategic choices (Walsh, 1995). Confronted with a highly complex and uncertain environment, managers developed a knowledge structure or strategic frame to transform complex information to facilitate information processing and decision making (Walsh, 1995; Porac and Thomas, 2002). The strategic frame represents decision makers' belief regarding how the company can best succeed in certain competitive environments (Walsh, 1995; Narayanan et al., 2011). This frame entails managers' assumptions of the competitive environment and the organizational actions required to compete in that environment (Reger and Huff, 1993; Walsh, 1995). The strategic frame is developed over time based on past activities and acts as a 'guide' for directing organizational actions (Walsh, 1995). Cognition scholars suggest that to understand firms' strategic actions one has to understand mental models or a cognitive frame of decision makers at a time (Daft and Weick, 1984; Barr, 1998). As such, research on cognition and strategy has been focusing on exploring the interplay between environments, cognitive frames, cognitive processes, strategic actions, and outcomes or performances at a certain point in time.

One stream of research on strategic cognition focuses on understanding managers' strategic frames toward their organizational environment (Huff, 1982; Porac et al., 1995; Porac and Thomas, 2002). This research aims to investigate managers' mental structures in understanding the environment such as industry structure or competitions. A seminal study by Porac and colleagues (1989) on Scottish knitwear firms found that rivalry within an industry is influenced by the managerial cognition of the firm within the industry. In this case, managers make sense of the business they are in based on their subjective understanding of the product offerings. The authors also found that firms defined competitors as firms that operate in the same product offering and at the same geographical location. The authors argue that a narrow definition of competition is a result of managers' cognitive limitations. Moreover, other lines of works focus on the firms' collective strategic frame in shaping the boundary and dynamic of an industry (Huff, 1982; Reger and Huff, 1993; Porac et al., 1995). The collective strategic frame entails common assumptions regarding the causal relationship of industry boundaries, competitive rules, and strategy-environment relationship (Huff, 1982). Prior works have shown that firms within an industry interact with each other to develop a collective frame about the boundaries and the rules of competition in the market. For example, Porac et al. (1995) revealed that market boundaries are socially constructed by a collective cognitive model which is resulted from a firm's observation of each other's actions. Another study by Nadkarni and Narayanan (2007b) reported that firms do not merely respond to the

industry velocity; instead, they actively shape their industry velocity through cognitive construction mechanisms. They also found that firms in different industries (i.e. high and low velocity) develop different cognitive construction systems. These researches jointly suggest that environment is not purely exogenous, but endogenous to the interpretations and actions of the managers within a firm or collectively among firms.

The other streams of research aim to uncover the relationship between cognitions and strategic outcomes. The research focus of this stream is to understand the impact of certain strategic frames on the organizational actions and performances (e.g. Barr et al., 1992; Gilbert, 2005; Nadkarni and Narayanan, 2007a; Kaplan, 2008b). Empirical studies have provided evidence that different strategic frames shape various strategic actions. As an example, a study by Barr et al., (1992) examined the link between changes in top managements' mental model and changes in organizational actions of two railroad firms. They found that managers who successfully changed their mental models were able to renew their organizations amid environmental changes. They further showed that organizational renewal not so much relies on noticing environmental changes, but on being able to link the changes to the firm's strategy and to modify that linkage overtime. Another study by Gilbert (2006) on a newspaper organization revealed how a different strategic frame towards digital media (i.e. opportunity vs. threat) led to different strategic behaviours. A large sample study by Nadkarni & Narayanan (2007a) showed how different strategic schema led to a different strategic performance in certain industries. Specifically, they found that firms with a *complexity frame* tend to succeed in fast-clock speed industries, while firms with a *focus frame* were more effective in slow-clock speed industries. This study indicates that managerial and organizational cognitions can be more prevalent in shaping firms' strategies in uncertain and ambiguous environments.

Apart from understanding the content of managers' cognitive frame and its relationship to strategic actions and organizational outcomes, a group of cognitive researchers has been focusing on understanding the cognitive process in strategy development. This line of research focuses on the mental activities performed by managers in developing strategies (e.g. Thomas et al., 1993; Weick, 1995; Gavetti et al., 2005; Gavetti and Rivkin, 2007). Studies on the cognitive process typically focus on the internal cognitive dynamics in organizations and investigate the relationship between cognition and strategic outcome (Kaplan, 2011). Research has underscored at least two important cognitive processes in strategy making, namely *Sensemaking* and *Scanning* (Narayanan et al., 2011). According to Weick (1995) sensemaking is a process of structuring the unknown into a plausible and meaningful understanding. Sensemaking is

particularly important to comprehend non-routine events such as regulatory changes, market crises, and other unexpected events (Weick, 1995). Sensemaking enables decision makers to "turn circumstances into a situation that is comprehended explicitly in words and that serve a springboard into action" (Weick et al., 2005, p.409). Sensemaking at the individual level involves noticing, categorizing, simplification, and the use of heuristics (Thomas et al., 1993; Rajagopalan and Spreitzer, 1997). At the organization level, sensemaking involves building consensus in interpretation (Fiol, 1994). Empirical research has highlighted the sensemaking activities in an organization and their impact on strategy development (Bogner and Barr, 2000; Dutton et al., 2001; Rouleau, 2005). A study by Thomas and colleagues (1993), for instance, examined the link between the strategic sensemaking process to organizational performance. Moreover, Rouleau (2005) investigate the sensemaking activities of middle managers in a clothing company. She reported that middle managers had a crucial role in interpreting strategic change within the organizations.

Another cognitive process that has gained interest from cognitive scholars is scanning. Scanning involves searching and gathering external and internal information to identify important elements, issues, or events that might affect an organization in the future (Daft and Weick, 1984; Thomas et al., 1993). Gavetti and Levinthal (2000) classified two types of scanning or search process: Forward-looking and Backward-looking. The forward-looking search process entails on actors' cognitive maps of action-outcome logic, while backward-looking involves experiential learning. They found that different strategic frames shape subsequent paths of search and action. Interestingly, they argued that cognitive-based and experiential-based processes are complementary. Cognitive search provides a wider array of alternatives, while experiential search enables actors to test these alternatives based on the actual environment (Gavetti and Levinthal, 2000). Furthermore, prior studies have underlined the role of scanning in the change of strategic frames. For example, Greve and Taylor (2000) showed that innovations encourage managers to scan the environment which stimulates organizations to update their strategic frame and lead to the adoption of an innovation. A longitudinal case study at DuPont by Bhardwaj et al., (2006) documented how the firm conducts a continual entrepreneurial search for long-term growth. Importantly, the authors found that the search process often accompanies by the creation of a new knowledge structure (frame) and new capabilities.

In sum, the cognitive perspective on strategy emphasis the causal importance of strategic frame and process to understand how firms obtain and sustain competitive

advantages. This perspective contends that how decision makers make sense, interpret, and perceive their organizational environments can have direct implications for strategy formulation, strategic actions, and firm outcomes. As such, the cognitive lens provides a powerful theoretical apparatus to understand firms' strategic behaviours.

2.3.2 Cognitions, Capabilities, and Strategic Changes

Strategy scholars have devoted substantial efforts to understand the heterogeneity in organizations' response toward changes. The main explanations have been grounded in the differences in either incentives or capabilities (Kaplan, 2011; Eggers and Kaplan, 2013). For instance, drawing from economic perspectives, scholars argue that differences in response to changes such as emerging technologies can be explained as rational responses to differential economic incentives (e.g. Henderson, 1993; Christensen and Bower, 1996). Other scholars drawing on the resource based view and dynamic capabilities argues that firms face difficulty adapting to change due to the path dependence and initial endowments (Leonard-Barton, 1992), and the strategic changes may not succeed unless they have dynamic capabilities which enable the firms to reconfigure their resources (Teece and Pisano, 1994; Helfat et al., 2007).

Previous research has started to add cognitive explanations to explain why firms changed their strategy. Research on this stream claims that strategic change is preceded by the shift in firms' strategic frame. They contend that having the appropriate capabilities or incentives may not sufficient for firms to instigate strategic changes (e.g. Barr, 1998; Tripsas and Gavetti, 2000; Gavetti et al., 2005). As mentioned earlier, the strategic frame encompasses managers' belief in the action-outcome relationship (Daft and Weick, 1984). Given the bounded rationality of managers, the cognitive may not accurately represent an environment; and the accuracy tends to decrease when the environment changes such as by market crises, regulatory changes, or new technologies (Simon, 1976; Daft and Weick, 1984). When changes in the environments contradict managers' belief on certain action-outcome linkages, it may trigger the evaluation of the existing strategic frame (Walsh, 1995). The strategic frame that can no longer accommodate or explain the occurrences in the new environment must be altered and a new cognitive frame must be developed (Barr et al., 1992). Fail to do so, may prevent managers from sensing problems and initiate strategic change (Barr et al., 1992; Tripsas and Gavetti, 2000). The strategic frame also determines managers' attention to changes in organizational environments and the interpretation of the impact of the changes to the firm's future performance (Ocasio, 1997; Barr, 1998). Therefore, strategic changes will only occur when the managers'

strategic frame can successfully identify the opportunities (or threat) of the changing environment and link them to the organizations' performance (Barr, 1998; Bogner and Barr, 2000). As an example, a study by Barr (1998) showed how strategic changes were preceded by the shift in managers' strategic frame. By tracing and comparing managers' interpretations of six pharmaceutical firms over time, she found that firms did not undertake strategic responses toward the environmental change until the managers redefine the causal link between the change and its impact on the firms' performance.

Prior works have documented how a strategic frame can both facilitate and hinder strategic changes. The cognitive research have provided evidence on how the strategic frame may result in firms' inertia and hinder strategic changes' efforts (e.g. Burgelman, 1994; Hodgkinson, 1997; Tripsas and Gavetti, 2000). Firms' strategic frames often lag behind changes in the internal or external environments, which make strategic change problematics (Narayanan et al., 2011). A strong organizational identity may also reinforce the existing cognitive frame and prevent them to adopt a new frame (Tripsas, 2009). The case of Intel is an example of how cognitive inertia may delay strategic changes (Burgelman, 1994). Intel continued to invest in memory businesses even after they were no longer viable because of top management's persistence in viewing Intel as a memory company. However, when a firm's strategic frame is in favour of the environmental changes, it may increase the firm's attention and initiate new strategic initiatives (Ocasio, 1997; Kaplan, 2008a). Cognitive research has also found empirical evidence on the effect of cognition in facilitating strategic changes. In this case, strategic changes may be initiated by managers who proactively challenge their assumptions and beliefs about the firm, the environment, and the keys to competitive success (Teece, 2012; Helfat and Martin, 2015). A study by Cho and Hambrick (2006), for instance, showed that changes in the top management attention from engineering to entrepreneurial orientation were correlated with subsequent changes in strategic actions. Another study by Kaplan (2008a) reported a positive association between managerial cognition and firms' adaptation to technological changes. By assessing firms' responses to the fibre-optic revolution, she found that managers' interpretations of emerging technologies influence firms' investment in a new area. Interestingly, she suggested that managerial cognition role in triggering strategic changes was higher when firms' do not have relevant capabilities. This study is one of the first studies which considers the interplay between cognition and capability in strategic change.

Recently scholars have begun to investigate the link between managerial cognition and organizational capabilities to explain firms' responses towards changes. Researchers

have increasingly aware that the development and deployment of capabilities are influenced by managers' cognition and the interpretive processes in which they engage (Eggers and Kaplan, 2013). They argued that managerial cognition determines firms' decisions on which capabilities to developed (Gavetti, 2005; Lavie, 2006; Laamanen and Wallin, 2009; Eggers and Kaplan, 2013). For example, Laamanen and Wallin (2009) found that the evolution of a firm's capabilities portfolio was in line with the cognitive paths of managers. Moreover, a study by Eggers & Kaplan (2009) empirically showed that capabilities deployment only occurs if the strategic frames align with the opportunity. Eggers and Kaplan (2013) further argued that capabilities development occurs through two interrelated cognitive processes: Identification of purposes and Interpretations of what the organization is capable of. First, managers identify the purpose of capability building by estimating the ideal capabilities given the organizational environment (Lavie, 2006). In this case, managers interpret the environment either as an opportunity to seize or a problem to solve and assess what capabilities are seen to be relevant (Barr, 1998; Kaplan, 2008a). Then, managers estimate what the organizations can actually do. Scholars argue that the nature and usefulness of organizational capabilities are subject to interpretation (Taylor and Helfat, 2009; Danneels, 2011a). Therefore, managers' interpretation of what the capabilities are, shape the direction of capability development for the identified purposes (Eggers and Kaplan, 2013).

In addition, scholars have identified the cognitive process of *matching* capabilities to opportunities (Eggers and Kaplan, 2013). They contend that managers must mobilize capabilities to initiate strategic actions or strategic changes because it is not enough to develop an interpretive frame of their environments or to develop a set of capabilities without mobilization (Barr et al., 1992; Tripsas and Gavetti, 2000; Gilbert, 2006; Eggers and Kaplan, 2013). Prior studies have observed the matching process during strategic changes and organizational adaptation, where managers interpret the fit between internal capabilities and external capabilities and (Taylor and Helfat, 2009; Danneels, 2011a). For instance, Taylor and Helfat (2009) revealed the effect of managerial cognition in the firm's ability to redeploy existing complementary assets in supporting new technological opportunities. The case of Smith Corona by Danneels (2011a) also showed managers' bias in interpreting the applicability of existing capabilities to new environments. He found that Smith Corona's failure to enter into a new product category is partly because of the managers' overestimation of the applicability of the existing capabilities in the new domain. This study suggests that managers may have different perspectives on the existing capabilities and their potential to be deployed to new environments.

The insights from studies on the capabilities-cognition interplay have encouraged scholars to examine the capability of managers in performing cognitive activities. Research on this area builds on the assumption that managers have different capacity in anticipating, interpreting, and responding to the evolving environment (Adner and Helfat, 2003). This line of research considers cognition as a capability and move from analysing the heterogeneity of cognition among managers (in terms of cognitive frame and knowledge structure) to the cognitive ability of managers (Eggers and Kaplan, 2013; Helfat and Peteraf, 2015). Recently, Helfat and Peteraf (2015, p.835) introduced the concept of *managerial cognitive capabilities* which refers to "the capacity of individual managers to perform one or more mental activities that comprise cognition". They identified specific types of cognitive capabilities that underpin dynamic managerial capabilities for sensing, seizing, and reconfiguring, and explained their potential impact on strategic changes. For instance, they proposed *perception* and *attention* as two important cognitive capabilities for sensing opportunities. The cognitive capability of perception allows for early recognition of new opportunities, while attention facilitates environmental scanning. Importantly, they suggested that managerial cognitive capabilities may function as mediators of the relationship between changes in the organizational environment and strategic change.

In sum, strategy scholars have underscored the role of managerial cognition in affecting strategic change and inertia. Literature has also highlighted the role of managers' in interpreting the changing environment and initiating strategic changes through capability developments and deployments. Overall, research on this stream has provided compelling arguments that managerial cognitions matters in strategic changes.

2.3.3 Managerial Cognitions and Firms Strategies in Nascent Fields

Strategic and management scholars have applied the cognitive lens to explain firms' strategic behaviours in highly uncertain and ambiguous contexts, such as during the emergence of new technologies. Research has highlighted that in ambiguous and uncertain contexts, managerial cognitions play a crucial role in shaping firms' behaviours since managers should make sense of overwhelming and contradicting information (Gavetti et al., 2005; Kaplan, 2008b; Benner and Tripsas, 2012). In the context of emerging technologies, scholars argue that new technology is subject to sensemaking given the unpredictability and of the technologies (Weick, 2000; Kaplan and Tripsas, 2008). The nature of emerging technologies and their trajectory is not obvious. As a result, managers are unsure about what the technology is, how it should be used, and what the

implication to the existing technology is (Kaplan, 2008b). In such ambiguous conditions, managers need to make sense of the situations and make choices about how to respond (Eggers and Kaplan, 2009). Kaplan and Tripsas (2008) proposed the concept of a technological frame, which captures how managers make sense of technology. A technological frame guides the managers' interpretation of what the technology is and what the function is. They argued that managers' technological frames are influenced by their idiosyncratic organizational history and industry affiliations. The authors further argued that multiple actors' technological frames and interpretive processes influence the technology trajectory during technological evolution.

Prior studies have empirically examined the impact of managerial cognitions on the firms' behaviours towards emerging opportunities. These studies have focused on firms' responses to ambiguous opportunities resulted from the emergence of new technologies (Tripsas and Gavetti, 2000; Gilbert, 2006; Eggers and Kaplan, 2009). Prior research typically focused on the managerial cognitions in relation to the firms' strategic choice on adaptation i.e. whether to embrace a particular new technology or not. For instance, during the transition to digital imaging, managers' cognitive frames have been found to influence firms' decisions in adopting digital technology (Tripsas and Gavetti, 2000; Tripsas, 2009). A similar effect has been found during the shift from print to online media (Gilbert, 2006; Cozzolino et al., 2018) and in telecommunication firms' response to new communication technologies (Kaplan, 2008b; Eggers and Kaplan, 2009). Each of these studies showed that managerial cognitions influence interpretations and organizational decisions towards ambiguous opportunities created by new technologies. Moreover, previous research has revealed that certain managerial cognitions can also initiate proactive actions to emerging opportunities (Gavetti et al., 2005; Bhardwaj et al., 2006; Teece, 2012; Gavetti, 2012) rather than mere passive responses. Scholars argued that some "entrepreneurial managers" have cognitive capacities to discover emerging opportunities and create new opportunities (David J. Teece, 2007; Alvarez and Barney, 2007). As described in the previous sub-section, these entrepreneurial managers typically have superior cognitive abilities to recognize opportunities as they arise (Helfat and Peteraf, 2015). Furthermore, research showed that forward-looking managers are able to initiate entrepreneurial actions to new opportunities even if they lack the needed capabilities (Gavetti, 2005; Kaplan, 2008a). Furthermore, Gavetti (2012) argued that firms' ability to pursue and compete for a 'superior' opportunity depends on the leaders' ability to overcome complex mental processes. Specifically, he argued that superior opportunities are cognitively distant; hence, they require superior strategic leadership to

manage the mental process of identifying, seizing, and legitimizing opportunities. Together, these studies imply the important role of managerial cognition and managers' cognitive capability in shaping firms' behaviours in uncertain and ambiguous contexts.

In addition, scholars have recently begun to investigate the role of cognition in firms' entry strategy to nascent fields (Benner and Tripsas, 2012; Zuzul and Tripsas, 2020). As mentioned in the previous section, in nascent fields there is no established 'dominant category' or a conceptual schema that most stakeholders adhere to when referring to products/services that address similar needs and compete for the same market space (Suarez et al., 2015). In this case, managers not only have to interpret the meaning of underlying technologies, but also need to make sense of unfamiliar product designs, business models, customer preferences, and competitive dynamics (Santos and Eisenhardt, 2009; Eggers and Moeen, 2018). A few studies have examined the link between managerial cognition and firms' strategy in nascent industries. For instance, Benner and Tripsas (2012) argued that in a nascent industry, firms' product feature choices are influenced by the way managers interpret emerging opportunities and conceptualize the product. They contended that managers develop initial product concepts based on their assumptions about the emerging industries since they lack concrete data on customer preferences. Interestingly, they found that the managers' conception of a new product type is influenced by the prior industry affiliation. For example, their data suggests that photography firms were more likely to frame digital cameras as a substitute for analog cameras, while computing firms frame it as a computer peripheral. A more recent study by Zuzul & Tripsas (2020) investigated how four start-ups progress in the nascent air taxi market. This study highlighted the role of founder identity in influencing the firms' flexibility in responding to the evolving nascent market. They showed that founders who identified themselves as *revolutionaries* tend to reject required adaptive changes that contradictory to identity and managerial beliefs. In contrast, founders who identified themselves as *discoverers* were more adaptable to changes. This study suggests that a founder's identity shapes managerial beliefs that can influence a firm's survival in a nascent industry. Moreover, this study also implies that managers might need to continuously adjust their cognitive frame about the product and business model due to the highly evolving nature of nascent industries.

These studies provide solid evidence that managerial cognition does influence firms' strategic behaviours in nascent fields. Nevertheless, the mechanisms in which managerial cognitions influence firms' strategic decisions regarding product and technology choices, business models, competitive or collaborative strategy, platform

design (in the case of platform creation), and market positioning deserves more attention (Eggers and Moeen, 2018). Research may also investigate the interplay between managerial cognition, firms' strategy, and industry/market/ecosystem dynamics (Kaplan and Tripsas, 2008; Suarez et al., 2015). As shown by Zuzul & Tripsas' (2020) study, the highly evolving nature of nascent fields may require firms to shift and pivot away from their current strategy towards a different approach. It implies that firms may switch or even break away their existing strategic frame in different milestones of industry/ecosystem emergence. As such, it would be worthwhile to research the firms' internal cognitive dynamics overtime to unpack the complex relationship between the nascent fields, cognitive strategic frames, and firms' strategies.

To conclude, this subchapter reviews the literature on the cognitive perspective in strategy to understand how cognitive processes may influence firms' strategic behaviours. Prior literature has provided compelling arguments on how cognitions influence firms' strategic action and outcomes/performance. Extant research has also shown that cognitions can trigger strategic changes or inertia. Moreover, more recent studies indicated that managerial cognitions shape firms' strategy in nascent fields. Overall, these researches suggest cognitive explanations for understanding firms' strategic actions in a highly uncertain and ambiguous context.

2.4 Platform Creation by Established Firms in Nascent Ecosystem: The interplay of ecosystem dynamics, strategic frames, and platform strategies

This section discusses the intersection between the literature on platform strategy, established firms' response to technological changes, and managerial cognition that motivates the research question which this study addresses. The following paragraph describes the relevance of investigating the dynamic process of platform creation strategies by established firms, and the motivation of using the cognitive lens to explain the emergence of different platform strategies overtime. This section concludes by the fundamental issues and research gaps that motivate this thesis.

Platform researchers have acknowledged an increasing number of established firms adopting a platform strategy – a strategy where firms orchestrate complex value propositions by controlling a digital architecture (Tiwana, 2014; Evans and Gawer, 2016). Advances in digital technologies create new markets and opportunities that encourage established firms to enter and seek growth from nascent ecosystems (Evans and Gawer, 2016; Eggers and Moeen, 2018; Nambisan et al., 2019). Platform literature provides insights on strategies to create and orchestrate platform-based businesses (McIntyre and Srinivasan, 2017 for a review). However, the platform theory has been built primarily on examples or insights from firms that have started as a digital platform (e.g. Google, Amazon, Facebook, Uber). To date, very few studies investigate the strategies that established firms can follow to create a digital platform for nascent ecosystems (i.e. Dattee et al., 2018; Khanagha et al., 2020). Moreover, literature generally expects a high degree of dynamic capability, assuming that once decisions for platform strategy are made, firms would be able to reconfigure their capabilities accordingly (Cusumano and Gawer, 2002; Gawer and Cusumano, 2008; Teece, 2017). Yet, recent studies have underscored the challenges faced by established firms when trying to create and orchestrate platforms due to the limitations coming from their organizational legacies and resource dependencies (Gawer and Phillips, 2013; Wessel et al., 2016; Cozzolino et al., 2018).

Platform literature has highlighted several key strategic decisions for developing a new platform. One important strategic decision to be made by a platform creator is how to position its platform in the market (Gawer and Cusumano, 2008; Adner, 2012). Platform positioning strategy influences strategic choices on the technical functionalities a platform would offer (i.e. platform architecture) and the range of markets and

applications it would address (Cennamo and Santaló, 2013; Cennamo, 2019). Platform strategy literature has highlighted platform positioning strategy as the main determinants of value created within the platform ecosystem and value captured relative to other competing platforms (e.g. Eisenmann et al., 2006; Gawer and Cusumano, 2008; Suarez and Kirtley, 2012; Cennamo and Santaló, 2013). Furthermore, a firm occupying a strategic position in a nascent ecosystem determines the share of the value created in the ecosystem that the focal firm will command (Adner, 2017), the sustainability of the platform strategy over time (Eisenmann et al., 2011), and the firm's ability to influence the development of the ecosystem to gain an increasing advantage over time (Gawer and Cusumano, 2008; Cennamo, 2019).

Extant research has offered two distinct approaches to develop a strategic position in the ecosystem: domination and differentiation. The domination approach advocates for aiming a position where it could address the largest customer base and gain the biggest network effects (Schilling, 2002; Hagiu, 2009). On the contrary, the differentiation approach focuses on claiming a position that allows for a unique market identity through distinctive technological features and market scope (Cennamo and Santaló, 2013). The conventional line of thought holds that a platform creator picks its position and march their resources and capabilities to occupy and defend its role in the ecosystems (Adner, 2006; Gawer and Cusumano, 2014). Existing research offers scant guidelines for how established firms can develop a platform positioning strategy (Adner, 2006; Adner, 2017; Cennamo, 2019). For instance, Adner (2006; 2017) suggests performing a thorough analysis of the ecosystem structures including the activities required to materialize the desired value proposition, the actors needed to undertake those activities, and the links between those actors, in order to determine a promising position in the ecosystem. Other studies emphasize certain market characteristics such as the heterogeneity level of complementors and customers (Lee et al., 2006; McIntyre and Srinivasan, 2017), customer preferences (Zhu and Iansiti, 2012), and competition dynamics (Seamans and Zhu, 2017) as factors that must be taken into account for developing a platform strategy. Overall, these studies generally assume that firms are able *ex-ante* to scan the environment, understand market preferences, and identify interdependencies among actors in the ecosystem.

However, theories and insights that were derived by observing established ecosystems may not be applicable to nascent ecosystems. The inherent uncertainties and ambiguities of nascent ecosystems made it difficult for a platform creator to fully know *ex ante* the ecosystem structures and market characteristics (Dattee et al., 2018). For

example, platform creators may struggle to understand the relevant dimensions on which to differentiate since technologies, market preferences, and competitions are unspecified (Santos and Eisenhardt, 2009). Choosing a differentiation strategy by targeting a niche market may also imply constraining firms' choices and options early on (Seamans and Zhu, 2014), which minimizes both its opportunities to grow and its latitude to influence the formation of the ecosystem to its advantage. Similarly, while the domination strategy and aggressive actions may be effective for pursuing opportunities that can be assessed and dimensioned, it becomes riskier for ambiguous opportunities since it can prematurely lock the firms to suboptimal investments (Rindova and Kotha, 2001). These associated risks and dilemmas, thus, make the development of a positioning strategy in nascent ecosystems far from straightforward.

The inherent ambiguity of nascent ecosystems prevents managers to have complete rationality about the environment (Santos and Eisenhardt, 2009). The strategy developments in this context, thus, are mainly influenced by the cognitive factors where decision makers interpret and make sense of ambiguous situations (Gavetti and Rivkin, 2007; Kaplan and Tripsas, 2008; Eggers and Kaplan, 2009). In particular, how managers frame the ambiguous environment becomes the driver of strategic decisions (Bogner and Barr, 2000; Nadkarni and Barr, 2008; Benner and Tripsas, 2012) and subsequent platform positioning strategy. Strategy literature has underscored the role of strategic frames in shaping firms' strategic behaviours toward ambiguous opportunities (e.g. Tripsas and Gavetti, 2000; Gilbert, 2006; Gavetti and Rivkin, 2007). Strategic frame entails managers' interpretation of the environment where a firm operates, and assumptions of strategic actions required to compete in that environment (Nadkarni and Narayanan, 2007a; Kaplan, 2008b; Raffaelli et al., 2019). Strategic frames enable managers to make decisions and act under extreme ambiguity by simplifying complex information and providing mental templates for ill-defined problems (Walsh, 1995; Eggers and Kaplan, 2013). These interpretations and assumptions become particularly salient when firms enter a highly ambiguous new ecosystem since managers lack concrete data about market preferences as well as technological and social interdependencies (Benner and Tripsas, 2012; Anthony et al., 2016).

Prior research suggests that strategic frames influence how firms understand boundaries and the rules of competition in an industry (Porac et al., 1995; Nadkarni and Narayanan, 2007b). In nascent ecosystems, actors are not fully aware of each other and the available competencies and roles (Dattee et al., 2018). Hence, strategic frames in this context entail manager assumptions on the activity configurations, roles of actors, and

interdependencies among them (Adner and Feiler, 2019). Consequently, the way managers cognitively frame the alignment structure of the ecosystem shapes the ecosystem strategy. In addition, strategic frames influence the identification of potential opportunities in a new environment (Shane, 2000). Extant studies have shown that emerging opportunities are cognitively distant and managers have varying capabilities in sensing such opportunities (Gavetti, 2012; Helfat and Peteraf, 2015). A study by Benner & Tripsas (2012) also reveals how a firm's interpretation of emerging opportunities, which influence by prior industry background, influence the conceptualization of products feature for nascent markets. Thus, strategic frames influence a firm ability to sense emerging opportunities in nascent ecosystems and its attitude toward the opportunities.

Strategic frames also shape managers' evaluation of emerging opportunities in terms of their relevance to the firm's capabilities and legacies (Lavie, 2006; Raffaelli, 2019). When confronted with emerging opportunities, managers interpret the match between the firm's capabilities and the emerging opportunities before taking strategic actions (Eggers and Kaplan, 2013). Prior research on incumbent's adaptation argues that opportunities that perceived not fit with the organization's capabilities and legacies tend to be disregarded (Hodgkinson, 1997; Tripsas and Gavetti, 2000). Nevertheless, managers can leverage their cognitive capacity to recognize contradictions and embrace incongruous capabilities and opportunities (Smith and Tushman, 2005; Raffaelli et al., 2019); hence, they are able to bundle and mobilize seemingly incompatible capabilities to pursue emerging opportunities (Eggers and Kaplan, 2013). Moreover, how managers perceive the applicability of existing capabilities to the new environments influence the pathway of capability developments and reconfiguration (Lavie, 2006; Danneels, 2011b). This implies that managers with different assumptions of capabilities-opportunities fit will have different approaches to capability reconfiguration in relation to securing strategic positions in the nascent ecosystems.

Lastly, the shift in firms' strategic frame could instigate strategic changes that necessary to respond to the changing environment (Barr, 1998; Raffaelli et al., 2019). Prior studies have documented how strategic frames can both facilitate and hinder strategic changes (e.g. Burgelman, 1994; Hodgkinson, 1997; Tripsas and Gavetti, 2000). Since the strategic frame entails managers' belief on the action-outcome relationship (Daft and Weick, 1984), strategic changes occur when manages redefine their belief on the causal link between the changing environment and its impact to the firm's performances (Barr, 1998; Eggers and Kaplan, 2009). These studies indicate that the

dynamic of a firm's strategies in a nascent ecosystem is influenced by the fluctuations of a firm strategic frame over the course of the ecosystem's evolution.

Despite its potential impact on platform creation, current strategy literature rarely considers cognitive aspects in examining firms' strategic actions in a nascent platform-based ecosystem (Suarez et al., 2015; Pfarrer et al., 2019). Moreover, existing platform strategy research mostly focuses on platform strategy at a given point in time rather than examining its processual dynamic over time (McIntyre and Srinivasan, 2017). The few scholars who took a processual perspective (e.g. Eisenmann et al., 2011; Teece, 2017; Khanagha et al., 2020) have focused around technology and market evolution over the platform's lifecycle, but did not examine the internal cognitive processes. As such, how managerial cognitions influence firms' positioning strategy over time remains unclear.

To conclude, the literature on platform strategy has underlined the strategic decisions a platform creator should make when developing a platform for an established ecosystem. However, literature provides scant guidelines that established firms can follow to create a platform for nascent ecosystems. More recent research revealed that platform creation in nascent ecosystems is fraught with challenges and dilemmas since strategic decisions must be made under conditions of uncertainty and ambiguity. Established firms face unique challenges in this regard, as they need to incorporate constraints of their organizational legacy and resource dependencies in their decision making. These challenges call for an in-depth investigation of the process of platform creation for a nascent ecosystem by an established firm. Furthermore, platform creators will likely deploy a complex repertoire of strategies that change over time given the highly evolving nature of nascent ecosystems. As such, we need to understand why certain platform strategies emerge or shift over the course of ecosystem evolution. The literature on managerial cognition can provide a powerful theoretical lens to understand firms' strategic actions given the prevalence of cognitive processes that may dominate on strategy making in the ambiguous environment.

Thus, it motivates this study to ask: *How does an established firm develop platform positioning strategies for a nascent ecosystem* and *Why does it emerge and shift over time?* This research question has elements of uncovering the process (how), which can be observed through the firm strategic actions, and the drivers (why), which can be observed through the strategic frames underlying the strategic actions. To address this question, therefore, an in-depth longitudinal study that allows for a thorough investigation of internal dynamics in organizations is needed.

CHAPTER 3. METHODOLOGY

This chapter introduces the methodology and research design of this research project. The research methodology entails a plan, procedure, and techniques applied in a research project to address the research question(s). Specifically, the research methodology describes philosophical assumptions, research design, the data sources and the collection techniques, and the approach to data analysis (Ritchie et al., 2014). A detailed explanation of these various aspects and the rationale of the chosen methodology is presented in this chapter.

This chapter consists of five sub-chapters. The first sub-chapter explains the philosophical assumptions underpinning this research including the ontological and epistemological assumptions regarding the investigated social phenomenon. Then, the next sub-chapter describes a case study approach as a suitable strategy of inquiry. In line with the qualitative research design approach, the data sources and the collection techniques are discussed. Next, a detailed documentation of the data analysis approaches adopted in this research is presented. This chapter concludes with the ethical consideration of this research project.

Overall, this research adopts critical realism (Mir and Watson, 2001) as the philosophical stance to questions of ontology, epistemology, and methodology. A longitudinal case study (Pettigrew, 1990) method is used to provide an in-deep understanding of the evolving process of the phenomenon under investigation. Multiple techniques were used for data collection including, semi-structured interviews, field observations, analysis of internal archives, and external reports. In analysing the data, an iterative inductive theory building technique (Strauss et al., 1997) was used to infer theoretical insights from raw data. The following sub-chapters explain the motivations underlying the chosen research methodology.

3.1 Philosophical Stances

Research design and the choice of methodology should be guided by philosophical paradigms that underpinning a researcher's stances on the nature of reality (Benton and Craib, 2010; Myers, 2013). Social reality can be approached in different ways that are underpinned by particular philosophical paradigms (Ritchie et al., 2014). Scholars have argued that researchers should maintain consistency between their philosophical assumptions and the methodological approaches they adopt in order to produce a better research practice (Myers, 2013; Ritchie et al., 2014). In essence, philosophical paradigms

represent researchers' belief in the nature of reality (ontology) and the nature of knowledge (epistemology). The philosophical paradigm determines researchers' assumptions on what is to be observed, what kind of questions are supposed to be asked, and how the results of scientific investigations should be interpreted (Guba and Lincoln, 1994). These philosophical assumptions will then guide the research methodology and its associated practices including data collection and data analysis (Myers, 2013).

While there are different varieties of philosophical traditions underlie social research, they can be categorized into three distinct schools of thought: *Positivism, Interpretivism,* and *Realism*. Positivism subscribes to the assumption that there is a single objective reality (truth) that exists independently of researchers (Benton and Craib, 2010). The main tenets of positivism lie in the beliefs on the objectivity and value-free process within social phenomena which allow researchers to be objective and remain emotionally neutral (Guba and Lincoln, 1994). Researchers adopting positivism tend to explore social linkages of social phenomena based on event regularities which involve a substantial number of empirical observations of events, usually in the form of large quantitative data sets (Benton and Craib, 2010). In contrast, interpretivism asserts that there is no such a thing like 'objective truth' since reality is a socially constructed activity which can be seen through different perspectives and point of views (Myers, 2013). Interpretivism appreciates the complexity of social phenomena and recognizes the inability to understood social realities from an objective point of view (Guba and Lincoln, 1994). Interpretivism believes that knowledge is produced by exploring the understanding of the social world of the actors being studied by focusing on their meanings and interpretations (Ritchie et al., 2014). Therefore, the main objective of the interpretivism is to understand the subjective meanings of a social phenomenon by investigating how individuals acknowledge the existence of these meanings, and how they reconstruct and understand them (Stake, 1995). Lastly, realism emerges as an alternative philosophical stream that provides a middle ground between positivism and interpretivism (Danermark, 2002). Ontologically, realism assumes that there is a reality that exists independent of people's beliefs or understanding about it (Vincent and O'Mahoney, 2018). However, critical realists[1] believes that the reality is only accessible through the perceptions and interpretations of individuals due to the multifaceted and stratified nature of reality

[1] Critical realism is a variant of realism introduced by Roy Bhaskar in 1978. It considers reality as a stratified environment consist of the *empirical* domain (i.e. observable reality), the *actual* domain (i.e. the reality that exists independent of observers), and the *real* domain (i.e. underlying mechanisms).

(Bhaskar, 1998; Ritchie et al., 2014). They also argue that social phenomena occur in *open systems* where the generative mechanism cannot be isolated from its context (Vincent and O'Mahoney, 2018). The aim of knowledge is, therefore, to discover the deep causal mechanisms beyond what is observable by the researcher (Danermark, 2002). Critical realism is primarily interested in causal explanations, moving from the *what* to *why*, that describe the underlying mechanisms behind empirical and actual events. As such, critical realists prefer a research method that allows for an in-depth investigation that provides rich and detailed explanations beyond the 'surface level' of a certain social phenomenon (Piekkari and Welch, 2018).

This research is guided by the *critical realism* philosophy which informs the methodological viewpoints and other important choices throughout the research. This includes the research focus, questions, and the conceptualizations of the social phenomenon under investigation. Being trained as an engineer, I used to look at social phenomena from the perspective of natural science where there is an objective reality independent of the observer. Therefore, researchers could investigate a social phenomenon by observing patterns or regularities and it is possible to find the general laws concerning the causality in a social phenomenon. However, I am convinced that one could not fully understand a social reality by only observing the 'observable'. Being involved in the management research for the past 7 years, I acknowledge various intangible factors such as discourse, perceptions, and interpretations that also play a role in shaping the realities. Yet, I am not convinced that reality and scientific knowledge is purely socially constructed in which social realities reside on individuals' consciousness. For example, within an organization, there are real things such as 'managers', 'profit/loss', 'production systems' that are not socially constructed. These contentions convinced me to subscribe to the critical realism ontological assumptions that distinguish between reality and the interpretation of the reality held by individuals.

Regarding the epistemological assumptions, I agree with the contention that there is no such thing as 'pure' inductive (or deductive) in acquiring and interpreting knowledge (e.g. Blaike (2011); (Piekkari and Welch, 2018)). My experience in management research reveals that it is unlikely for researchers to generate and interpret their data with a 'blank mind' since we, as researchers, will likely to have background knowledge, either from theory or prior observation. Hence, I am more convinced with a *retroduction* logic which endorsed by critical realists. In this logic, the researchers seek a possible explanation for patterns that emerge in the data and identify the mechanisms that might have produced them by trying out a different model for 'fit' (Blaike, 2011; Ritchie et al., 2014). Lastly,

I believe that to some extent generalization of a theory is possible and good research is the one that can generate insightful theory for practices. In this case, the research findings or theories should not aim for a 'general law' (as expected by positivists). Instead, they should have a limited and contingent generalizability for a particular context.

My subscription to critical realism influenced how I treat some organizational and managerial concepts in this research, including the nature of strategic choice, opportunities, and innovation. For example, I treat manager as an 'information processor' (Daft and Weick, 1984; Mir and Watson, 2001) where she/he interpret and make sense a 'real' event in their organizational environment. Hence, I acknowledge the limitation of managers (i.e. bounded rationality) to comprehend 'complex' realities. The critical realism view also in line with the *strategy processes* research (e.g. Burgelman, 1983; Pettigrew, 1992; Langley et al., 2013) that focus on the actors' actions and cognitions on decision making. Moreover, I adopted a realist perspective on entrepreneurial opportunities (e.g. Ramoglou and Tsang, 2016). In this case, the opportunities are not merely out there waiting to be discovered nor they are created through a subjective process of social construction (Alvarez and Barney, 2007). Instead, I concur with the realists that argue opportunities are present in the deeper domain of existence and need to be actualized by the entrepreneurs through the introduction of novel products or services (Ramoglou and Tsang, 2016). Furthermore, the realism philosophy shaped my view on innovation as a process (rather than merely as an outcome) that involves both tangible (e.g. experimentations, prototyping) and intangible (e.g. imagination, ideation) activities. This view also in line with the emerging view on innovation 'as a process' which focuses on the unfolding process of innovation (e.g. Garud et al., 2017; Garud et al., 2018).

In sum, this research is guided by a critical realism paradigm that considers social phenomena as an *open system* which consists of multiple underlying structures and generative mechanisms. As a line of inquiry, this research adopts a retroduction logic that involves movement from the empirical level to the abstraction level to uncover the generative mechanisms of a social phenomenon. These philosophical stances, eventually, influence the choice for a longitudinal case study as the methodology of this research.

3.2 A Longitudinal Case Study as the Research Method

This research employs a longitudinal case study (Pettigrew, 1990; Langley, 1999) based on field research (Edmondson and Mcmanus, 2007) as a methodology to investigate platform strategy development in a nascent ecosystem by an established firm. This research method is chosen based on the philosophical assumptions and the research objectives. The following paragraphs provide justifications of the chosen method, as well as TELECO as the investigated case.

As mentioned earlier, the critical realism paradigm encourages a research method that allows researchers to deep dive beyond the surface level of empirics to uncover the 'deep structure' of social phenomena. Scholars have considered Qualitative research as a suitable practice in this regard (e.g. Sayer, 1992; Guba and Lincoln, 1994). Compared to quantitative research, qualitative research is more powerful in providing an in-depth understanding of a complex and poorly understood social phenomenon (Myers, 2013; Ritchie et al., 2014). Since the research on platform strategy creation in a nascent ecosystem is in its earlier stage, qualitative research is the most *methodologically fit* (Edmondson and Mcmanus, 2007). Qualitative research enables the collection of data that are rich and detailed, which are difficult to measure quantitatively (Ritchie et al., 2014). Moreover, it allows the researcher to capture multiple viewpoints from different actors that are necessary for a comprehensive understanding of a phenomenon under investigation (Myers, 2013). Qualitative research is also uniquely suited to opening the 'black box' of organizational processes by uncovering the 'how' and the 'why' aspects of the individual or collective action as it unfolds over time (Doz, 2011). Although a mixed method approach is often advantageous, quantitative methods are not sufficient to capture detailed feedbacks from the actors/participants (Denzin and Lincoln, 2005). Therefore, a triangulation of multiple qualitative techniques is used in this research to capture a broader range of perspectives and to corroborate research findings rather than a mixed method (Denzin and Lincoln, 2005; Myers, 2013). The justification of a qualitative research design also supported by strategy and innovation scholars that encourage a deeper understanding of strategy development and innovation process over time (e.g. Langley et al., 2013; Burgelman et al., 2017; Garud et al., 2017). Thus, the qualitative approach is suitable with the nature of the social phenomenon under investigation and the research philosophy.

A longitudinal single case-study design (Pettigrew, 1990; Siggelkow, 2007) is chosen to understand the dynamic process of platform strategy development in a nascent ecosystem by an established firm. A case study is one of the qualitative methods that

focus on developing an in-depth description and analysis of a bounded system (i.e. case) in its real-life context (Yin, 2009). A case study is deemed to be appropriate when the boundaries between phenomenon and context are not clearly evident and when the use of a variety of data collection procedures are needed (Stake, 1995; Yin, 2009). The case study research also suitable if there is either no theory or limited one and if the aim is for theory building related to a complex process (Eisenhardt and Graebner, 2007). A case study research can be done through single cases or multiple cases. However, this research employs a single case (and longitudinal) due to its various advantages in understanding the complex organizational process. First, a single case study enables an in-depth understanding of complex organizational phenomena from a variety of perspectives over time that could result in a rich 'story' describing the 'how' and why' aspects (Dyer and Wilkins, 1991; Siggelkow, 2007). Secondly, a single case study gives privilege to researchers of unique access to a phenomenon that may not be easily observable to outsiders (Ozcan et al., 2018). The case may be an initiation of an unusual or rare phenomenon in which multiple cases may not exist (Yin, 2009). Lastly, a single case study allows researchers to study a complex process over a long period of time that would not be feasible through multiple cases (Ozcan, 2018; Piekkari and Welch, 2018).

The longitudinal single case study design has been advocated as a powerful methodology to investigate temporally evolving processes of organizational changes at a fine-grained level of detail (Pettigrew, 1990; Langley, 1999). Moreover, a longitudinal study based on field research at a real organization or industry has the potential to generate substantial theoretical contributions as well as relevant insights for practices (Edmondson and Mcmanus, 2007). A longitudinal single case study has been used by prominent scholars to examine a variety of complex organizational processes including corporate venturing (Burgelman, 1983), organizational changes (Langley et al., 2013), innovation (Garud et al., 2006), and organizational responses to emerging technologies (Tripsas and Gavetti, 2000). These studies showed the effectiveness of a longitudinal single case study to explore the contexts, content, and process of changes over time. Given the main objective of this study to uncover the dynamic processes of platform strategy development, it is essential to trace the unfolding process longitudinally over an extended period of time. Overall, a longitudinal case study design enables the collection of rich data and a deep immersion to the organizational process as it unfolds over time. As such, the longitudinal case study design is the most appropriate methodology to investigate the dynamic interplay between platform positioning strategy, managerial cognition, and ecosystem evolution and the underlying mechanisms that form the interplays.

The study investigates the case of a global telecommunication corporation in developing a platform positioning strategy in the nascent IoT ecosystem[2]. The chosen case is appropriate for answering the proposed research questions for several reasons. First, IoT represents a nascent ecosystem where the market and technology are still at the early stage of development (McKinsey, 2017). The IoT ecosystem comprises of multiple actors such as device makers, platform providers, application developers, system integrators, network providers, and industrial end-users that exhibit complex interdependencies; yet, the ecosystem structure is still in flux (Deloitte, 2014). The case organization, TELECO, is one of the first firms that engage in the IoT ecosystem since its inception. Therefore, the case of TELECO in the IoT ecosystem can be considered as a 'revelatory' case (Yin, 2009). Secondly, TELECO has a legacy of a traditional linear business model that may not fully align with the platform business model. This is important since part of this study is to investigate the response of an established firm and their transformative efforts toward emerging technologies. Hence, this case is suitable for the theoretical context. Thirdly, TELECO's long engagement in the IoT ecosystem enables a longitudinal observation of evolving contexts, strategies, and cognitions at different points of time. Finally, the research agreement between TELECO and the University of Leeds gave me unique access to extensive archival data and field access to conduct interviews with relevant informants and to perform field observations. Overall, these accesses make the progresses and changes of the investigated phenomenon 'transparently observable' (Pettigrew, 1990). A more detailed explanation of the research setting is provided in Chapter 4.

[2] A detailed explanation of the research setting presented in the next chapter.

3.3 Data Collection

In this research, a combination of retrospective and real-time data collection approaches were utilized to capture the dynamic process of platform strategy development (Pettigrew, 1990; Langley, 1999). The data collection started in spring 2017 when I was given access to TELECO's internal system and database through its corporate laptop. At the same time, I had the opportunity to meet with a manager and his team that works on new business developments at TELECO around 5G and IoT technology. The access to an internal system as well as the communication with one of TELECO's managers provided an initial background on TELECO's initiatives in IoT. A more intensive data collection started in September 2017 when I was seconded to TELECO's headquarter in Stockholm, Sweden. During the secondment, I was given an internal status in the organization which provided a great advantage for a real-time collection of multiple data sources. Nevertheless, the data collection covered a wider period starting from 2011, when the firm formalized its efforts in IoT, until early 2020. As such, the data collection also captured the retrospective aspects of the investigated case.

As mentioned in the previous section, rich, detailed, and evocative data are needed to shed light on the investigated phenomenon that is not well understood. Therefore, multiple sources of data were utilized in this study. The focus was to extract insights from qualitative data including interviews, internal archives, observations, and published reports/articles. Interviews with key informants are an efficient means to obtain rich and empirical data that capture both real-time and retrospective processes of interest (Eisenhardt and Graebner, 2007). Moreover, internal archives are an important source for understanding events and decisions at different milestones of the organizational process, while published reports and articles give insights related to the environmental contexts in which an event or strategic decision occurred (Ozcan et al., 2018). Finally, participation observation allows for a deep investigation of actors' interpretations and actions, and triangulate (i.e. confirm) what informants have said in the interview to what they actually do (Myers, 2013). Table 3 summarizes the data sources and their use in the analysis. A more detailed description of data sources presented in the following subsections.

Table 3: The detailed description of data sources and their used in analysis

Data Sources	Details of the data	Use in the analysis
Semi-structured Interviews	37 semi-structured Interviews with 35 senior and middle-level managers involved in TELECO's IoT platform initiatives 5 workshops (one online, four offline) between 2018-2019	Gained insights on managers' interpretation on the ecosystem dynamics, opinions on TELECO IoT strategy, and the rationale behind the strategy emergence. Presented the preliminary findings for the sake of triangulation and deepening understanding on validity of the researcher interpretation.
Field observations	18 Months presence at the headquarters, 5 days a week following the standard working hours. 117 files of field notes from observations of internal meetings and presentations.	Provided an in-depth understanding of internal strategy development process within TELECO and a firm-wide organizational context. Identified tensions and challenges faced by managers when implementing strategy. Provided opportunity to triangulate insights from interviews and internal documents
Internal archives	335 files of Internal documents including presentations, product and marketing guidelines and, and strategic planning. 44 video recordings of senior managers' internal presentations and discussions on IoT strategy ranging from 4 -90 minutes of recording. 57 CEO's letter from 2017 to 2019 and 8 annual report from 2011 to 2019 54 instances of managers' comments in an internal online strategy forum and in internal social media about IoT.	Provided a detailed description of the IoT platform strategy including the platform technical design, and partnership/ecosystem strategy and how they evolved over time Gained understanding on the underlying motivation of a particular strategies and related strategic assumptions held by the managers. Provided an understanding on the strategic context at the firm-wide level. Captured the issues and concerns of managers from different organizational units related to TELECO's strategy on IoT.
Published reports and articles	51 Analyst reports on the consequences on the IoT ecosystem related to the telecommunication for telecom industry accessed via Google search and TELECO's internal database 77 files of articles and commentaries published	Captured additional understanding of IoT at the ecosystem level. Complemented the understanding regarding the IoT ecosystem dynamics over time and compared them to the TELECO's view on the ecosystem structure/dynamics Gained an outsider view of the evolution of TELECO's strategy in IoT;

Data Sources	Details of the data	Use in the analysis
	online in industry news website such as telecoms.com, iotrevolution.com and online blogs.	Triangulate observations and emergent findings.

3.3.1 Semi-structured Interviews

The semi-structured interview is a prevalent method for data collection in qualitative research (Myers, 2013; Ritchie et al., 2014). Interview entails a conversation between researchers and relevant actors with the aim to understand the interviewee's perspective on the investigated phenomenon (Myers, 2013). In this case, the informants were considered *knowledgeable agents* who are able to provide a detailed account of their actions and the rationale behind them (Gehman et al., 2018). The semi-structured interview technique was used which entails a set of pre-defined themes and open questions. An interview protocol format was used to ensure that interview themes are sufficiently covered and relevant for the research questions (Castillo-Montoya, 2016). Nevertheless, the themes covered in the interview protocol were varied from interview to interview depending on the interviewee's knowledge and background in relation to a particular organizational context. In this case, the interview protocol was not rigid guidance. Instead, it is a framework that allows the interviewer to ask further questions to explore the expressed views of the participants (Ozcan et al., 2018). As such, some questions may be omitted (or added) in particular interviews and the order of questions may be varied according to the flow of conversation. The Interview protocol is provided in Appendix 1.

In total, 37 interviews were conducted with 35 informants between July 2017 and November 2019. The informants were senior and middle managers involved in the IoT initiatives during the observation period. The informants were chosen based on their current (or former) role and position within the IoT unit. Some informants who were not part of the IoT unit but played an important role in the IoT platform initiatives were also interviewed[3]. The majority of the interview was conducted through face-to-face, but due to geographical limitation, some interviews were conducted through video conference (i.e. Skype). In every interview, the respondents were asked about their involvement in the IoT platform initiatives, their experiences, and their opinion on certain strategic decisions. In particular, I asked their view on the rationale of certain strategic decisions

[3] These informants typically researchers from the R&D department who work with the development of IoT-related technology & business or strategist from the strategy department at the corporate level.

and the risks/downsides of such decisions. The respondents were also asked to explain the projects/activities related to the IoT platform development as well as the challenges they faced in the process. Additionally, the respondents who had long been in the IoT initiatives were asked to describe how certain strategy emerge at different points in time and the rationale behind the emergence. Some of the informants (4 person) were interviewed multiple times at different times to clarify emerging events (e.g. strategic changes) and to confirm some of the emerging concepts from the initial stage of data analysis. Overall, the interviews typically lasted from 25 to 70 minutes and were recorded (except for four interviews) and transcribed. The interviews were further triangulated with archival data and field observations. The detailed information about the interviewees can be found in Table 4.

Table 4: The list of conducted semi-structured interviews

Informant (anonymize)	**Date**	**Organizational Positions**	**Interview Method (F2F or Skype)**	**Duration (Minutes)**
GW	19/07/2017	Customer-driven Innovation manager	Face-to-face	25
EJ	01/12/2017	Head of IoT advanced industries	Face-to-face	45
HT	31/01/2018	IoT Sales Engagement Manager	Skype	32
FG	02/02/2018	Head of Strategy and Organizational Development	Skype	60
HS	07/02/2018	Former IoT platform Project Manager	Skype	45
IS	09/03/2018	Sales Engagement Manager IoT	Face-to-face	60
PP	20/03/2018	Head of IoT research program	Skype	60
JS	22/03/2018	Architect Solution IoT	Skype	45
DK	27/03/2018	IoT project manager	Face-to-face	30
JE	27/03/2018	Senior engagement Manager	Skype	60
AL	28/03/2018	IoT Researcher	Skype	30
RV	10/04/2018	IoT project manager	Face-to-face	50
LK	24/04/2018	IoT Program Director	Face-to-face	45
WC	27/04/2018	Director of IoT Customer Engagement	Skype	60
FP	02/05/2018	Product development manager	Skype	45
LN	02/05/2018	Head of IoT Technology & Solution	Skype	60
JL	09/05/2018	Former head of customer Unit Industry & Society	Face-to-face	60
JF	10/05/2018	IoT ecosystem and technology expert	Face-to-face	60
EH	17/05/2018	IoT Partner & Commercial engagement manager	Face-to-face	44
LM	31/05/2018	Project Manager advanced industries	Face-to-face*	60

SE	20/07/2018	Smart Manufacturing Portfolio Manager	Face-to-face	60
GW	02/09/2018	Customer-driven Innovation manager	Face-to-face*	45
YB	13/10/2018	Head of the technical support IoT platform	Face-to-face	60
SM	29/10/2018	Portfolio Manager of IoT Transport & Logistics	Skype	60
EJ	19/11/2018	Head of IoT advanced Industries	Face-to-face*	30
FA	22/11/2018	Strategic Product Manager IoT Accelerator	Face-to-face	60
RH	30/11/2018	IoT partner Ecosystem Managers	Face-to-face	55
MJ	08/12/2018	Head of Ecosystem and Partnership IoT	Face-to-face	60
PJ	12/12/2018	Strategic Product Manager IoT Accelerator	Face-to-face*	30
MA	18/12/2018	IoT Senior project Manager (Member of leadership team)	Face-to-face	60
KE	20/12/2018	Head of IoT Sales Engagement	Skype	30
TS	20/12/2018	IoT Sales & business developer	Skype	35
KV	19/02/2019	Strategic Product Manager IoT Accelerator	Face-to-face	40
AM	27/03/2019	IoT Service Management	Skype	70
HD	16/09/2019	Head of IoT Ecosystem	Face-to-face	60
AB	16/09/2019	Senior portfolio and product manager IoT	Face-to-face	60
MS	05/11/2019	IoT customer director	Skype	50

* The interview was not recorded as requested by the informant

In addition, during the secondment, I held five workshops with TELECO's employees who interested in the topic of platform strategy and business model. During the workshop, I presented my research topic and preliminary findings to the audiences. The workshop was helpful to gather inputs from the participants around the current issues in IoT within TELECO or in the ecosystem in general. The workshop also provided me the opportunity to test my findings and refine the emergent theoretical framework. Table 5 provides a detailed summary of the workshops.

Table 5: The overview of workshops

Workshop	Date	Place	Agendas	Number of participants
"Building and orchestrating emerging ecosystem"	25/01/2018	TELECO's Head quarter, Sweden	• Presenting my research topic around IoT • Discussion on strategic challenges around IoT	22
"Strategic challenges in nascent industry"	20/02/2018	TELECO's Head quarter, Sweden	• A roundtable discussion with middle-level managers about strategic challenges in IoT	4
"Strategies for Innovation in Emerging Business"	06/03/2019	TELECO's office, Santa Clara, US	• Presenting my research on the developing platform strategy for IoT ecosystem • Discussions on the practical implications of my preliminary findings for TELECO	8
"The creation of a Platform-based Business by Established Firm: Lessons of TELECO in the IoT"	18/08/2019	TELECO's Head quarter, Sweden	• Presenting the findings and theoretical framework related to the platform development process at TELECO • Gathered feedback on the insights derived from the research • Discussions of the 'lesson-learned' for practice	14
"Adoption of platform business model by TELECO"	31/10/2019	Online (Webinar)	• Presenting the findings and theoretical framework related to the platform development process at TELECO • Gathered inputs concerning the relevance of theoretical insights of this research to practice	10

3.3.2 Internal Archives

Internal documents are also a significant source of data for this study. The full access to TELECO's internal archives allowed me to collect 335 internal documents related to the IoT platform initiatives from 2011 to 2019. The collected documents including strategic planning, strategy presentations (both to internal & external audiences), product and marketing guidelines, internal reports, newsletters, and meeting notes in various formats (Pdf, PowerPoint, and Words). The documents enabled me to track strategic changes and to understand how the platform strategy unfolds over time. The internal product & marketing guidelines and external presentations were useful to analyse the strategic content of the platform in a certain phase. These documents were equally powerful as the interviews since they gave a detailed account of the platform's technical features, business models, and positioning strategy in general. Moreover, the internal reports, presentations,

and meeting notes described the rationale of the strategy and strategic assumptions held by the managers at a certain period of time. These data captured the cognitive factors of strategy making that allowed me to understand the '*why'* aspects regarding the strategy emergence especially in the earlier phases of the process (prior 2016). I have also collected the annual reports (from 2010 to 2019) and the *CEO's letter* (from 2016 to 2019) which covered TELECO's overall strategic objectives and vision. These documents provided a better understanding of the general strategic narratives and firm-wide contexts. Moreover, I joined an internal online strategy forum where the TELECO's employee discuss key strategic issues. From the online forum, I captured 54 instances of discussion related to the IoT initiatives. Finally, I gained access to 44 internal video recordings of workshops and internal presentations by senior managers concerning the IoT platform initiatives. The videos were not used to gain an in-depth understanding the emotion of embodied cognition of the involved actors (Gylfe et al., 2016); instead, they complement the insights from the documents and interviews related to the strategic content (the what and how) and the underlying motivations (the why).

NVivo, a qualitative software tool, was used to organize a large set of archival data[4]. The documents were organized according to the year it belongs (2011 to 2019). NVivo was practically helpful to mark specific themes within search and to do advance searches. The software can help to group a relevant text (i.e. quotation) from different documents into common themes and to explore possible relationships between the themes. As such, NVivo made analysis of a large dataset much easier.

3.3.3 Field Observations

As part of the research agreement, I was seconded at the TELECO's headquarter in Stockholm from September 2017 and February 2019. The 18 months secondment provided a unique opportunity to observe the investigated process in real-time as they evolved[5]. Observations have been considered as important sources of data in field research as they enable a deep immersion of the investigated phenomenon (Pettigrew, 1990). Since the objective of this study is to understand the strategy development process, observations provided unique insights. Observation allow the researchers to observe complex social and behavioural processes as they unfold (Langley et al., 2013; Ozcan et al., 2018).

[4] The interview transcripts, published articles & reports, and field notes were also organized in NVivo.
[5] Especially for the second strategic changes, as I directly experienced the strategic changes.

During the secondment, I was treated as a 'formal' internal at TELECO with an official email account and access to the offices as well as some internal events. I was placed at the 'emerging business' unit that responsible for the creation of new businesses, including IoT. I spent 5 days a week on the premises following the standard working hours of the firm. This research adopted an *observer-as-participant* approach in which the researcher revealed their identity and made the participants aware of the intention of the research (Saunders et al., 2015). In this research, my involvement in the organizational activities was very limited, but I occasionally helped the managers on non-essential activities (e.g. sending meeting invitations, shared meeting notes) when asked. The full access to the organization premises allowed me to frequently engage with TELECO's employees, observe their day-to-day activities, and take part in informal chats during coffee breaks or lunches. I have also participated in project meetings in the IoT unit (in total 59 meetings) as a passive observer and attended numerous organizational internal events such as project showcases, workshops, and internal conferences. These meetings and internal events provide were very informative since they take place in the natural setting (Myers, 2013). Overall, the field observations not only allowed me to get a deeper understanding of the organizational process and strategy development process around IoT, but also the firm-level context within TELECO.

3.3.4 Published Reports and Articles

A variety of external reports and articles were also collected to complemented data from the internal sources. These data include analyst reports, press articles, and commentaries regarding the IoT ecosystem in general. The analyst reports were useful to understand the activities of other actors in the ecosystem and the evolution of the IoT ecosystem. These reports did not mean to provide an in-depth understanding regarding the strategic actions of other actors in the ecosystem, since this research only interested in the subjective' interpretation of TELECO's managers toward competitive dynamics in the ecosystem. Hence, analyst reports were utilized mainly to complement and triangulate TELECO's view on the ecosystem dynamics. In addition, press articles and commentaries (e.g. blog posts) related to the TELECO's strategy in IoT were collected. These data gave outsiders views about TELECO's strategy on IoT. In general, the data from published reports and articles had helped increase my understanding regarding the context of the IoT ecosystem and its progression over time.

3.4 Data Analysis

In analysing the data, I utilized the combination of established methodologies for longitudinal case analysis (Pettigrew, 1990; Langley, 1999), grounded theory building (Glasser and Strauss, 1967), and content analysis (Corbin and Strauss, 2008). The data analysis involved travelling back and forth between the data and the emerging structure of theoretical concepts in an iterative fashion (Corbin and Strauss, 1990). In doing so, further data collections were conducted to refine multiple elements in the theoretical concepts. Being seconded to the investigated organization provided me with a unique opportunity to immediately collect additional data relating to new events or the emerging theoretical concept from the preliminary analysis. The content analysis technique (Corbin and Strauss, 2008) was used to analyse the qualitative data from multiple sources (internal documents, field notes, and interview transcripts). As mentioned in the previous section, qualitative data software i.e. NVivo 12 was utilized to organize and analyse the data. The NVivo 12 was an efficient tool for data coding and recoding, identification of themes and subthemes, as well as searching for relationships among the themes. Figure 4 illustrates how the data was organized in the NVivo in which I grouped the data based on the sources and the year (phases) it represents.

Figure 4: The Data Organization in NVivo 12

As mentioned earlier, the data analysis was performed in an iterative and non-linear fashion. Nevertheless, for the sake of clarity, the data analysis can be described in four sequential steps. The data analysis was started by constructing a case history of the IoT platform development at TELECO. This first stage of the analysis was very important to identify the events, changes, and outcomes of platform strategies in different periods of development. The second stage was focused on investigating the different platform

strategies within the 9 years period. In the third stage, the analysis was focused on the cognitive factors of the managers i.e. the managerial assumptions related to the ecosystem structure, opportunity, and the opportunity-capability fit. Then, in the final stage, analysis related to the relationship between constructs was performed and a grounded theoretical model was developed. Table 6 summarizes the stages of data analysis. A more detailed explanation of each analytical stage presented in the following paragraphs

Table 6: The summary of data analysis

Stage in the Analysis	**Data used**	**Analytical Procedures**	**Analytical Outcomes**
Stage 1: Constructing a case history	Internal archives; Published reports & articles; Interviews	1) Thematic analysis 2) Temporal bracketing	A chronology of internal events, changes, and outcomes (Figure 5).
Stage 2: Identifying the content of platform strategy over time and the strategic changes	Internal archives; Interview data; Field observation (2017 – 2019)	1) Multiple rounds of open coding to identify positioning strategy in each phase. 2) Axial coding to relate the second-order codes (concepts) to positioning strategies	1) Identifications of platform architectures and platform market scopes in different phases Table 10 2) Development of constructs of three distinct positioning strategies (Figure 6a)
Stage 3: Analysing the strategic frame underlying the platform strategy	Interview data; Internal archives; Field observation (2017 – 2019)	1) Multiple rounds of open coding to identify the strategic assumptions of managers. 2) Axial coding to relate the strategic assumptions to strategic frames.	1) Identification of multiple strategic assumptions related to the ecosystem structure, opportunity, and capability fit (Table 10) 2) Development of new constructs of three distinct strategic frames (Figure 3b)
Stage 4: Developing a grounded theoretical model	Within case - analysis: Comparative tables of platform positioning & strategic frame	Selective coding to connect the “Strategic frame” to the “positioning strategy” constructs	Processual framework of platform positioning in a nascent ecosystem (Figure 20).

Stage 1: Constructing a case history. As suggested by Yin (2009), the first data analysis was aimed to build a chronological description of TELECO's journey in the nascent IoT ecosystem. The analysis covered 9 years period from 2011 when the firm formalizes the initiatives in building a connectivity management platform until late 2019. In constructing a case history, I mostly consulted with the internal strategic documents and published reports as well as interviews from managers that were involved in the development of IoT platform since its early development. These data sources contain valuable information related to the platform launching, introduction of new features, discontinuation of platform features, the growth of the installed base, new partnerships, and other internal events. By continuously reading and rereading, the internal documents I developed a timeline of the main changes in the TELECO's strategy and the organizational contexts in which the changes took place. At this stage, I did a 'temporal bracketing' (Langley, 1999) to categorize different phases of platform strategy development which correspond to the changes in platform positioning and the ecosystem dynamics. To increase the validity, I shared the preliminary timeline and temporal bracketing to the participants of the first and second workshops and revised accordingly based on the feedback. As a result, three distinct phases were identified, namely: "Phase 1: Entry and Initial positioning (2011 – 2015)", "Phase 2: Shaping the ecosystem (2015 - 2018)", "Phase 3: Shifting to an attainable position (2018 – 2020)". Overall, the data analysis at this stage results in a timeline of events and identifications of three phases of platform development which corresponds to different platform positioning strategies, as illustrates in Figure 5.

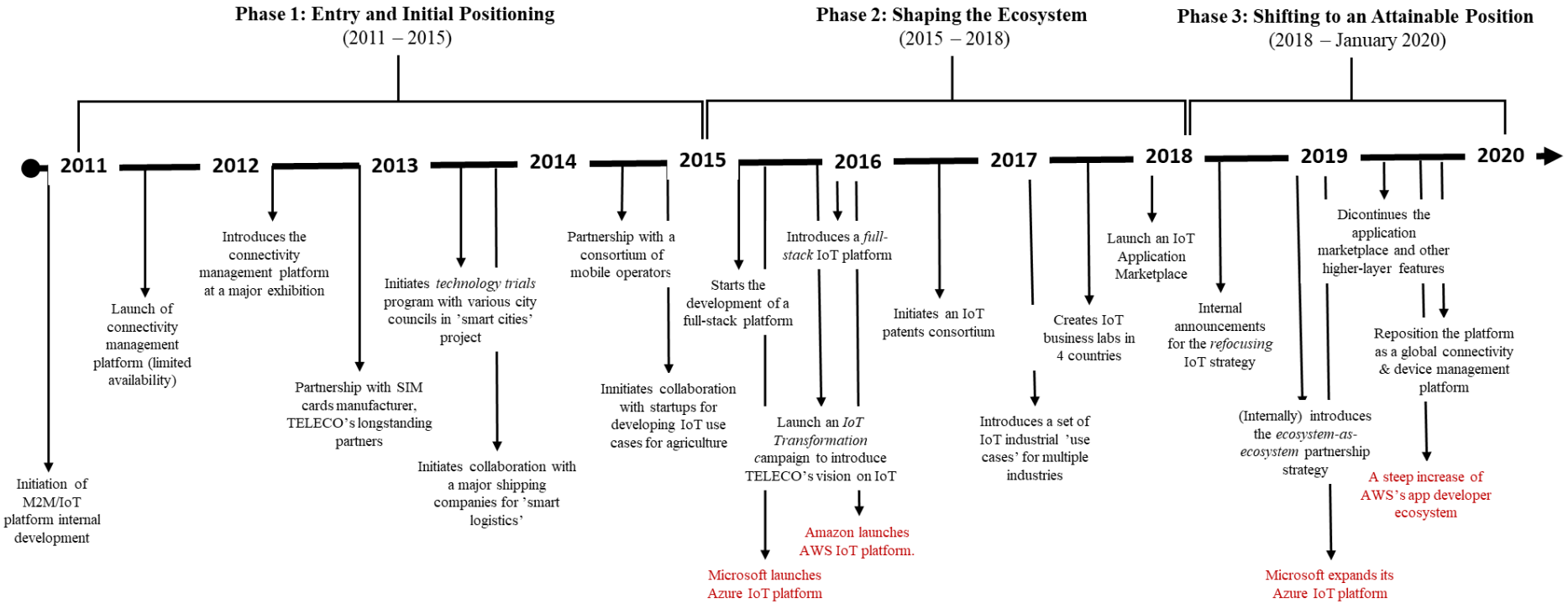


Figure 5: Timeline of events and temporal bracketing

Stage 2: Identifying the content of platform strategy over time and the strategic changes. Following recent suggestions for the analysis of platform positioning strategy (Cennamo, 2019), I mapped the changes in the platform positioning strategy related to the platform architecture and market scope between 2011 and early 2020. I decided to firstly focus on the platform strategies rather than the cognitive aspects of the strategy making since they were more observable. I examined the content of internal documents (e.g. Presentations, Product & Marketing guidelines, reports) describing the platform technical specification, product feature, platform roadmap, target market, customer benefits, competitive analysis, commercial plan, and ecosystem/partnership strategy. The content of interview transcripts and field notes were also analysed in order to understand the platform positioning strategy in phase 2 and phase 3. Following the advice by Gioia and colleagues (2013) regarding qualitative rigor in inductive research, I used sentences or paragraphs as coding units. Each textual expression was labelled with either the exact languages used in the text or with simple descriptive phrases. Then, multiple specific textual expressions were grouped into first-order codes according to the similarity. The links between first-order codes were established in the next round of axial coding. Then, the similarities in the first-order codes were evaluated and were given theoretical labels. As an illustration, the first-order code of "*Targeting and exploiting the existing network of customers*" was formed by statements explaining the mobile operators as the main target customers of the platform. That first-order code was linked to another first-order code of "*Engaging existing partners*" which then was grouped to a second-order code of "*Leveraging existing customers and partners*". The second-order code represents the firm strategic actions related to the platform architecture and platform market scope. Based on the analysis it was apparent that the platform architecture was represented by the technological layer in which the platform operates, while platform market scope was represented by the platform target markets and partnership approach. Finally, I inferred an association between the second-order codes based on informants' statements related to the strategic position aimed by the firm in a particular phase. Finally, these second-order codes were clustered in the form of new theoretical constructs representing the positioning strategy of the firm in each phase.

Stage 3: Analysing the strategic frame underlying the platform strategy. The next stage of data analysis was devoted to investigating the cognitive aspects underlying the development of platform positioning strategy. In line with the previous research on strategic cognition, I focused my attention on uncovering the strategic frame of managers i.e. manager's belief about the emerging ecosystem and its impact on the firm (Gilbert,

2006; Nadkarni and Narayanan, 2007a). At this stage, I relied on the interview transcripts and field notes to understand the rationale of a platform strategy. Internal archives including video presentations and interviews were also consulted. The content analysis technique was performed in analysing the qualitative data. At first, I looked at specific words that represent managerial believe, assumptions, and expectations such as "*We believe..*" , "*We thought..*", *"..will be.. in the future*". In the first round of the analysis, I found three types of assumptions held by the managers that shape the strategic frame in each phase, including the assumptions of ecosystem structure, the assumptions of opportunity, and the assumptions of capability-opportunity fit. It was quite apparent that managers tried to envision how the ecosystem structure would look like and what is the role of TELECO and mobile operators (as the firm's core customer) in the nascent IoT ecosystem. Managers also estimated how big the opportunity was for the firm and evaluated the extent the firm capabilities fit with the opportunity. Therefore, in the second round of data analysis, I focused on capturing managers' assumptions toward these aspects in different phases. Then, I employed the same coding technique as in the previous stage to structure the data. From this analysis, I identified the shifts of managers' assumptions over three phases of platform development, which highlights in Table 10 in Chapter 5. Finally, the second-order codes were clustered in a theoretical construct representing the strategic frame in each phase. The data structure derived from analysis in stage 2 and stage 3 is presented in Figure 6.

Stage 4: Developing a grounded theoretical model. In the last stage of data analysis, I verified the emerging theoretical constructs by running through the data once again. The aim of data analysis in this stage was not only to verify each theoretical construct but also to infer the relationship between the constructs of strategic frames and the platform positioning strategies (Gioia et al., 2013). Based on informant statements and theoretical work regarding these concepts, it can be inferred that strategic framed precede over and shape the platform positioning strategy. Follow-up meetings with key informants and the formal discussions during the workshop verified the correspondence between the emerging theoretical insights and their experiences, which further enhanced the internal and external validity of the theoretical model. I revised the model multiple times based on feedback from the informants, my supervisors, and academic colleagues during conferences. Finally, the robust theoretical model which is the core contribution of this study was developed and presented in Figure 20 (Chapter 6).

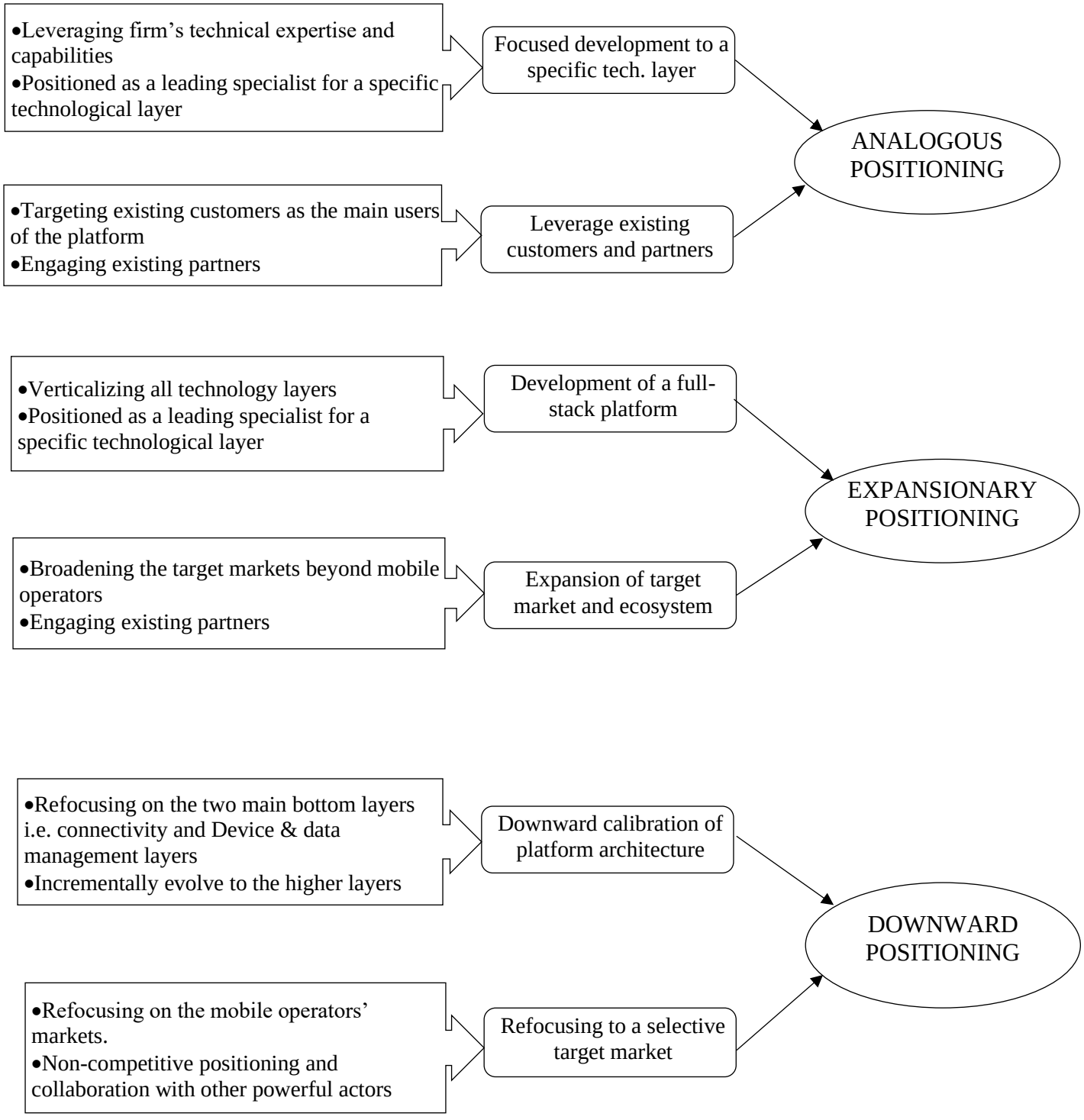


Figure 6: Data Structure i.e. from raw data to theoretical inferences

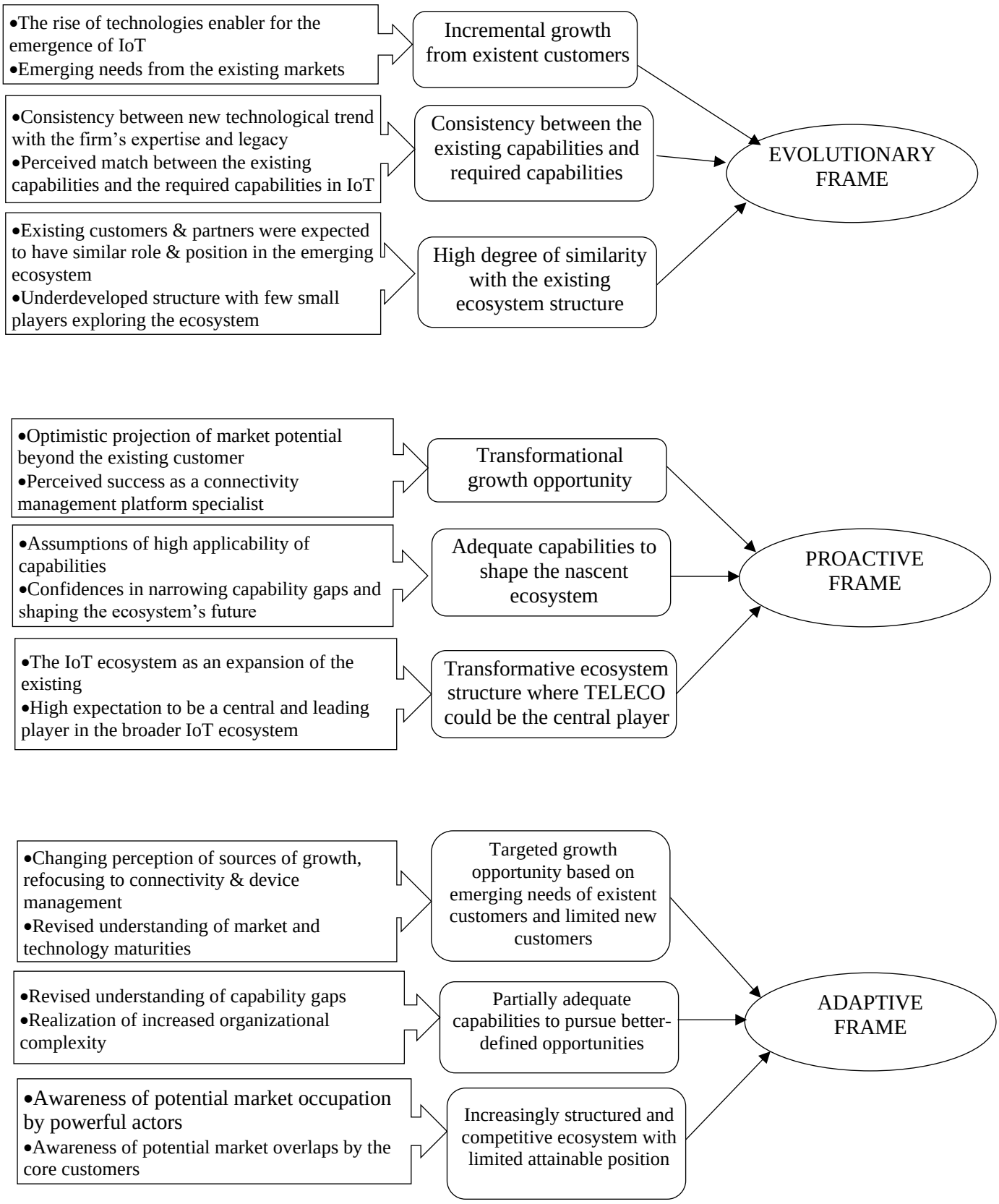


Figure 6 (cont.): Data Structure i.e. from raw data to theoretical inferences

3.5 Ethical Considerations

This thesis was part of the *Complex and Open Innovation for Networked Society* (COINS), a European Union-funded project. Consequently, all ethical considerations including data access, dissemination of results, conflict of interests, and confidentiality were resolved in the research consortium agreement (grant number: 675866). The consortium agreement has approved the use of all data obtained through the research project for this PhD thesis and following academic publications. In addition, I have obtained the approval of the ethical review from the Leeds University Research Ethics Committee (reference number: LTLUBS-178) before entering the field.

Ethical considerations were followed during the data collection. All research participants were informed about the objective of the research. In addition to a verbal notification from the researcher, the participants were provided with an information sheet (see Appendix 2) prior to the interview. The documents described the title of the projects, the researcher contact, the purpose of the study, the organization and funding body, the reason for the invitation, the confidentiality of the collected information, the opportunity to withdraw from the research, and the further use of data collection. All participants were asked for their consent in recording the interviews and were ensured with the anonymity. Finally, it is worthwhile to note that the researcher was not employed by the researched organization and did not receive any type of rewards from the host organizations or its employee. Hence, the absence of conflict of interest can be ensured despite the internal organizational status during the secondment.

CHAPTER 4. RESEARCH SETTING

This chapter describes the research context of the study. The research setting of this study is the Internet of Things (IoT) ecosystem that is in the process of emergence. This setting is attractive to this research for several reasons. First, despite its enormous potential, the IoT ecosystem is nascent and still emerging. There are huge variations in terms of technology architecture, value propositions, and the structure of value creation and value capture, which make strategy development carried out in a highly uncertain and ambiguous situation. Second, this nascent ecosystem is at the convergence of several established but distinct global industries, including telecommunication industries, information technology (IT) industry (e.g. software, application providers), and operational technology (OT) industry (e.g. device makers, machine manufacturers). Moreover, this ecosystem is potentially complex, with many different types of firms involved from the different industries which make it challenging to precisely envisioned how the structure ecosystem would look like. Lastly, this setting is appropriate for this study because the IoT ecosystem is shaped by a layered modular architecture consist of nested platforms. The multi-platforms characteristic of this ecosystem makes positioning strategy crucial for the platform competitiveness.

In particular, I chose TELECO as a case study to investigate the firm-level process of platform strategy development in a nascent ecosystem. The case of TELECO is a fertile ground to address the research question of this research due to several reasons. First, TELECO was among the first firms that engage in IoT platform development. By investigating one of the pioneer firms, this study could uncover a detailed process of strategy development since the inception of the ecosystem. In addition, TELECO business model is primarily based on a traditional, linear supply chain where the firm develops and sells products to customers. As such, TELECO represents an incumbent firm that did not has a high degree of familiarity with a digital platform business. Finally, this case study is suitable because I had the opportunity to observe the strategy development in real-time as the process unfolded in its natural setting and before the outcome was known. This kind of access to the organization allows the researcher to uncover the dynamic process of internal strategy development and the managerial cognitions underlying the development.

The following sub-chapters describes the research setting in a more detailed. The first subchapter explains the characteristics of the IoT ecosystem and the technological architecture of an IoT platform. Next, a detailed overview of TELECO, including

introduction to its existing business model, ecosystem, and organizational structure is described. Then, the IoT-related activities within TELECO and the organizational unit that responsible for those activities were described.

4.1 The IoT Ecosystem

The basic idea of IoT revolves around the enablement of physical devices (e.g. sensors, machinery, appliances) to communicate and exchange data with each other through the internet. In other words, IoT can be defined as any physical object that is linked via wireless networks. The rise of IoT was triggered by the development of sensors and wireless technology. The idea of connecting objects through the internet has been around since the 2000s (McKinsey, 2017). At that time the technologies, called Machine-to-machine (M2M) technology, were limited to one-to-one communication among the same type of devices/machines only. As can be seen in Figure 7, The IoT technology is the advancement of the M2M where it uses a cloud-based architecture to connect various types of devices (Al-Fuqaha et al., 2015). As such, the IoT entails a broader ecosystem of connected devices that exchange data through wireless networks.

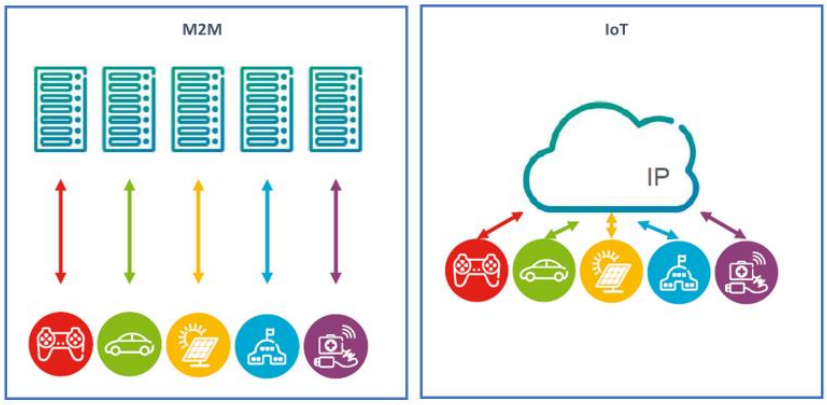


Figure 7: Differences between M2M and IoT (TELECO's internal document, 2013)

The *digitization* of physical devices through the IoT enables a new range of products, services, and business models for various sectors and industry verticals ranging from Google Nest 'Smart Thermostat' to Tesla 'Self-driving Car'. According to TELECO's internal report, the IoT is expected to connect 50 billion "things" to the internet by 2025. Analysts predicted that IoT has a potential economic impact of more than $2 trillion globally by 2025. The vast data and new information of products or devices enabled by the IoT bring multiple business opportunities to various application domains, which are often called *IoT verticals,* including agriculture, healthcare, and transportation. Despite its economic potential, many analysts and consultation firms

consider the IoT ecosystem and market is still in a nascent phase (IoT-now, 2016; McKinsey, 2017; Forbes, 2019). This is mainly because of the technology architecture and the market landscape of IoT is still emerging. Moreover, there has been a lack of agreement regarding the structure of IoT ecosystems in which each and every actors have their version of roles and responsibilities in the IoT ecosystem (Gartner, 2018; Hodapp et al., 2019).

Although there is a lack of precise view on the structure of IoT ecosystem, one can infer the ecosystem from the components that required for developing final IoT products/services. As shown in Figure 8 there are five distinct components which form an IoT ecosystem: (a) Sensors, (b) Hardware/devices, (c) Wireless network, (d) IoT platforms, and (e) Applications.

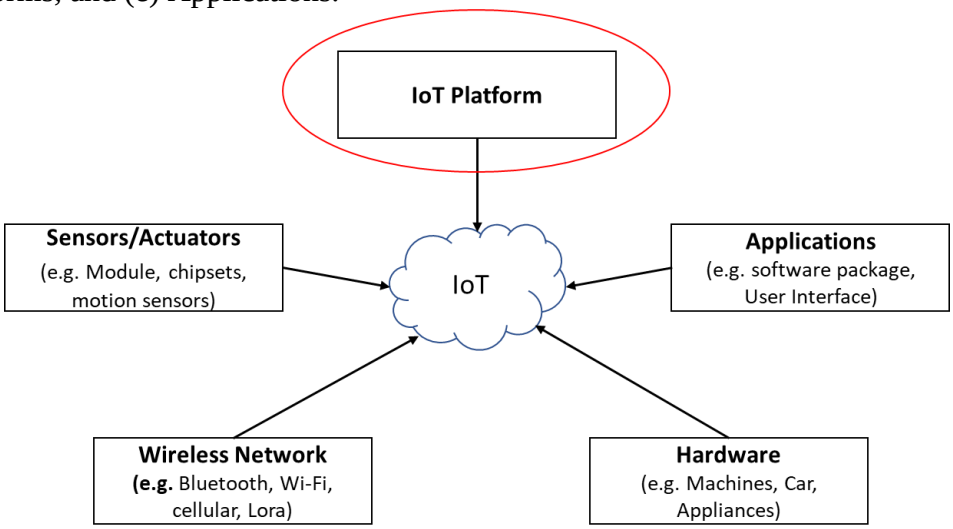


Figure 8: Illustration of IoT Ecosystem Components

Sensors are small electrical devices that capture changes in the environment (e.g. temperature, motion, position) or any relevant-data and send the information to other electric devices or processing units. Hardware/devices are the 'things' which embedded by sensors that would act according to the received signal or command. In other words, the hardware is any physical objects ('*things*') that could communicate and react without human intervention (e.g. 'smart' car, 'smart' thermostat). The wireless network is a communication channel or a medium that transport data from hardware (with embedded sensors) to connect to each other and to the cloud (i.e. IoT platform). The example of wireless network technologies including cellular (3G/4G/5G), WiFi, Bluetooth, and LoRa. Next, there is an IoT platform that processes the data in the cloud and acts like a bridge between the hardware/devices and the applications. The IoT platform could offer various features, which will describe in detail in the next paragraphs. Finally, applications are the software that processes the information from the IoT platform and triggers certain

actions. The IoT applications often entail a 'user interface' where the end user could control the system and set their preferences. In sum, these distinct components are essential for developing any IoT offerings (products and services) and have little value in isolation.

However, it is difficult to precisely define the actors and the relationship (interdependencies) among them since there is a lack of well-defined roles in the value creation and value capture process (Hodapp et al., 2019). For example, one could expect that mobile operators such as Vodafone, BT Telecom, T-Mobile would act as wireless network providers; yet, in practice, they could act as platform providers or application providers. Companies like GE, ABB, and Siemens that embedded IoT sensors to their industrial hardware (e.g. machinery, appliance, and equipment) also develop their own IoT platforms and applications. Moreover, software and application companies not only offering IoT platforms or IoT applications but also developing hardware (e.g. Google with its Nest thermostat, Amazon with its Alexa smart home system). In other words, the structure of the IoT ecosystem is still in flux where positions in the ecosystems are up for grabs by any players who aim to secure their competitive role and position in the ecosystem.

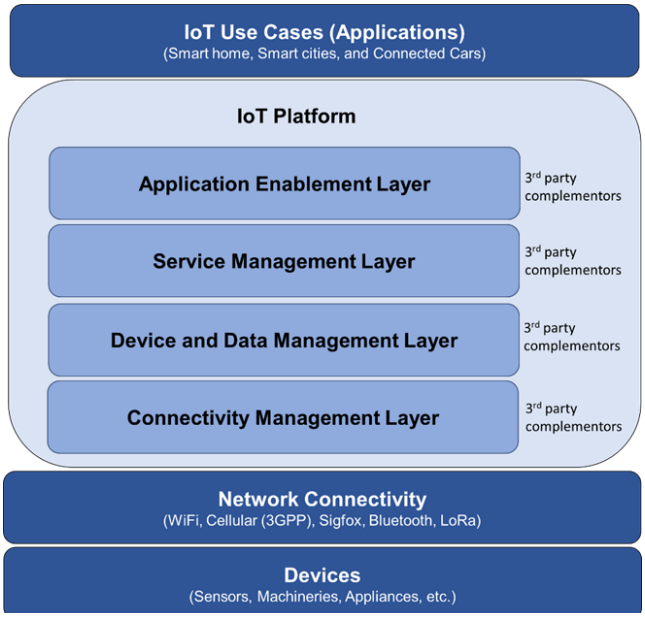


Figure 9: IoT Platforms layered architecture

The focus of the study is on the positioning of IoT platforms in the ecosystem. IoT platform can be considered as a central component in the IoT ecosystem that processes the data from IoT devices and enable the development of IoT applications services (Lucero, 2016). In a simple term, the IoT platform facilitates centralized management of connected devices and data process & storage. However, there is no consensus regarding

the architecture and feature of IoT platforms. Firms from various sectors including telecommunication, industrial infrastructure, enterprise system, and cloud computing develop their own version of IoT platforms. Nevertheless, an IoT platform entails a layered modular architecture that (Yoo et al., 2010) that typically consists of four layers (Porter and Heppelmann, 2014; Lamarre and May, 2017). Each of these layers entails distinct technical capabilities and engaged with different ecosystem partners (i.e. complementors). As illustrated in Figure 9, at the bottom layer, the connectivity management layer manages communication between IoT devices and applications through connectivity protocols such as RFID, WiFi, 3GPP (i.e. cellular). This layer ensures that IoT devices are reliably and securely connected to the network. The device management layer enables provisioning, monitoring, and control of IoT devices. In this layer, data from devices are received, proceed, and delivered to the service management or application layer. The service management layer integrates data from multiple sources for certain business purposes such as data analytics and monetization. Finally, the application enablement layer provides tools and functionalities for IoT use cases[6] development for various business applications including smart building, industrial automation, and smart cities (Porter and Heppelmann, 2014; Al-Fuqaha et al., 2015).

The four layers represent different design hierarchies where lower-level layers support functionalities at higher, user-facing layers. However, these layers are loosely coupled where the individual design decision in each layer can be made with minimum consideration of the other layers (Yoo et al., 2010). As such, innovations can arise independently at any layer through platform resources (e.g. SDKs and APIs). Nevertheless, orchestration is still needed at the ecosystem level to organize and coordinate complementary inputs made by independent stakeholders from various layers (Tiwana, 2014) in order to develop and deliver IoT applications to end users. This layered digital platform architecture has some resemblance to a traditional linear industry architecture. However, the software-based characteristics of a digital platform bring unprecedented levels of generativity, which allows the development of an unbounded range of digital applications. These features allow for faster scalability, which enable players to dominate based on very strong network effects (Yoo et al., 2010; Sturgeon, 2019). The results are vast ecosystems of nested platforms with various owners competing in different layers by offering their own standards, architectures, and functions.

[6] IoT use case is a common term that describes the area of applications where IoT technology is being deployed or implemented. The IoT use cases often deploy within certain verticals (market).

In sum, the IoT platform entails multiple strategic options of technical architecture and market scope that provide multiple entries strategy for firms. A firm may enter and compete by creating platforms, modules, products and services for a specific layer. It also provides opportunities to build a full-stack platform that addresses multiple layers that would benefit from economies of scope and diversification across layers. As such, strategy development for positioning the IoT platform is far from straightforward.

4.2 TELECO as the Selected Case Study

TELECO was chosen for an in-depth investigation of platform positioning strategy development in a nascent ecosystem because the firm was among the first in introducing a large scale IoT platform[7]. TELECO is a global telecommunication equipment provider, founded in 1876, with a worldwide operation in 180 countries. The firm has more than 90,000 employees worldwide (per 2019) and is one of the front runners in the cellular technology with around 50,000 patents. Around 40% of the global wireless connections and data move through TELECO's network equipment (per 2019). TELECO has a matrix organization, as can be seen in Figure 10. Within the period of analysis, TELECO had undergone two major re-organizations in 2016 and 2017. Nevertheless, the activities of the firms have been organized in a cluster of Business Units (BU), Market Areas (MA), and Group Functions (GF)[8]. The BUs are grouped according to specific product categories they represent. A BU owns, develops, and innovates products or services with profit and loss responsibility. The MA is responsible to sell products/services created by the BUs. It also responsible to develop as well as maintain relationships with customers

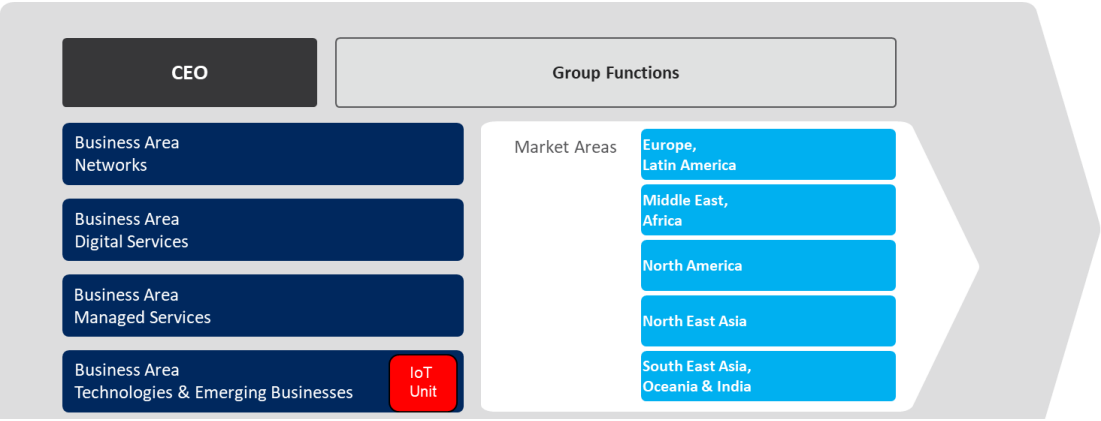


Figure 10: TELECO's organizational structure (2018 - 2019)

[7] At that time, it was considered as a M2M connectivity platform since the term IoT was only widely used in 2014. Nevertheless, TELECO's platform utilized cloud-based technology which is the basis of what now known as the IoT platform.

[8] The reorganizations mainly affected the name and the scope of the organizational units.

in specific areas/regions. Finally, the GFs support the development and management of common group processes within TELECO without profit and loss responsibility.

The IoT platform development and the other IoT-related activities were organized in a dedicated and independent unit within a BU. Since its development in 2011, the IoT unit has been growing in terms of size of employees and sales. However, the IoT unit has always been considered as an 'exploratory unit' that was not expected to be a profitable business until 2023. For example, since 2017, the IoT unit has been hosted in the business unit of Technology and Emerging Businesses that responsible to oversee new businesses outside the core businesses (i.e. Networks, digital service, and managed services). Moreover, the IoT unit had been moved between different business unit following the firm-level reorganization. Nevertheless, the unit has always been had a high degree of autonomy with little influence from the core businesses. As such, it is safe to assume that the reorganization had a little influence on the IoT platform strategy.

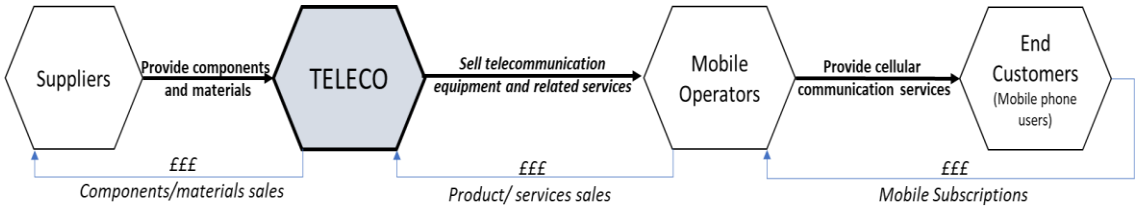


Figure 11: TELECO's legacies business model

TELECO's legacies and technological expertise in the telecommunication technologies bring certain advantages for exploring IoT opportunities and developing an IoT platform. Yet, IoT entails unique challenges that potentially require a new way of doing business. For many years, TELECO's business model is primarily based on a traditional supply chain or "pipeline business" (Parker et al., 2016) where the firm develops and sells telecommunication equipment to customers and delivers supports and maintenance services (see Figure 11). The sales of physical products and software have been the main source of revenue for the organization. Moreover, the transaction with the customers has been done in a transactional Business-to-Business (B2B) fashion in which TELECO supplies telecommunication equipment to the mobile operators in various countries (e.g. Vodafone, Three, Orange, Telia, China Telecom). However, in the platform business, a provider 'sells' the functionality and capacity of its platform and charge them based on the usage instead of selling hardware products and related services. The end users of the service would also shift from individual customers to enterprise customers (from B2B2C to B2B2B). The changes in value structure may require the development of new business models distinct from TELECO's legacy business model. In

addition, the IoT platform represents generativity where unbounded future applications can be produced from the combination of heterogenous resources of different stakeholders (Yoo et al., 2010; Wareham et al., 2014). At its most extreme, the IoT platform enables TELECO to offer various IoT applications to serve any industries (e.g. automotive, healthcare, manufacturing, agriculture) that would benefit from the implementation of IoT. As such, TELECO may need to engage with new partners that it has not partnered with before in order to facilitate innovations around the digital platform (Cusumano and Gawer, 2002; Nambisan and Sawney, 2011). These new challenges significantly increase the complexity of IoT platform development in TELECO.

In addition, the development of IoT platform positioning strategy entails a strategic dilemma for TELECO. For instance, TELECO's managers were confronted with a strategic choice whether to focus on a specific layer or to build a full-stack platform that addresses multiple layers of the platform architecture. TELECO may focus on the lower-level layer that requires specialized knowledge and has a higher barrier to entry. This approach may have less institutional issues due to the proximity to the firm's existing technological capabilities (i.e. telecommunication). Yet, such approach may significantly limit the potential opportunities it can capture. In contrast, the higher-level layers are more lucrative and bring more opportunities for value creation and value capture. However, the higher-level layers are more crowded with small and large players that have knowledge and expertise in specific areas and markets; therefore, it requires TELECO to stretch beyond its existing expertise. In addition, there were also opportunities for a balanced approach where the firm gradually evolves its platform by starting from the lower-level layers and incrementally move to the higher-layer. Nevertheless, choosing the right strategy was not a straightforward decision since the IoT ecosystem is evolving. Therefore, this setting allows for a transparent observation of the way an established firm strategizing to create a platform-based business in the nascent ecosystem.

To conclude, the case of TELECO's journey in the nascent IoT ecosystem is an appropriate setting to address the research question. The IoT platform ecosystem is nicely fit with the criteria of a nascent ecosystem from prior research (e.g. Ozcan and Santos, 2015; Hannah and Eisenhardt, 2018). Furthermore, the nature of IoT platforms which shaped by layered modular architecture makes positioning strategy central for firms' competitive advantage. Finally, TELECO, as the focal organization under investigation, provides a fertile ground for uncovering the internal process of strategy development and the dynamics of managerial cognitions in positioning a digital platform in a nascent ecosystem.

CHAPTER 5. FINDINGS

This chapter describes the empirical findings from the study of IoT platform creation at TELECO from 2011 to 2020. The longitudinal analysis allows the researcher to unpack the dynamic of platform positioning strategies in a nascent ecosystem over time. Three distinct positioning strategies are identified in different phases of the ecosystem evolution. These positioning strategies are significantly different in terms of platform architecture (i.e. technical layers & functionalities) and platform scope. The in-depth nature of this research allows me to highlight *how* these strategies unfold and identify the characteristics of strategic frames that explain the decisions for a particular platform positioning strategy. Specifically, the analysis reveals how managers' assumptions about the ecosystem structure, the growth opportunities, and the capability-opportunity fit evolve as the ecosystem progress. These changes in managerial assumptions lead to the shift in the strategic frame which eventually led to platform repositioning.

This chapter consists of four subsections. The first three sub-section (5.1 – 5.3) explains a certain phase of the development of TELECO's IoT platform. The first subsection describes TELECO's positioning strategy in the early stage of the IoT ecosystem and its associated strategic frame. The second subsection describes the changes of the strategic frame in the momentum phase of the IoT ecosystem which, triggers the adoption of a new positioning strategy. In the third subsection, the change of positioning strategy and the associated strategic frame in the later stage of development is explained. Finally, in the last sub-section (5.4), the comparison between strategic frames and platform positioning strategy of TELECO over a period of 9 years is presented.

5.1 Phase 1: Entry and Initial Positioning (2011 – 2015)

As early as 2010, even before the term 'Internet of Things' became prevalent, TELECO had begun to look at the potential of machine-to-machine (M2M) technology. At that time, the connection between devices/machines was mainly handled through a proprietary and closed system. As such, the connected devices were only limited to a single application with low interoperability between devices. Researchers at TELECO saw the opportunity to expand the application of the M2M technology by building a cloud-based digital platform that would bring disparate systems into large networks of connected 'things', which later become known as the IoT ecosystem. To explore the emerging opportunities, by the end of 2010, TELECO created a small unit as a joint program between the R&D department and a business unit to develop an IoT platform (i.e. a cloud-

based M2M platform). The creation of this dedicated unit marked TELECO's journey in the nascent IoT ecosystem.

5.1.1 Strategizing through an *Evolutionary Frame*

In the early phase of the firm's entry to the nascent IoT ecosystem, managers tried to make sense and envision how the structure of the ecosystem would look like (i.e. the role of actors, the positions, and their interdependencies) and the associated growth opportunities that TELECO's could capture based on its legacy capabilities. Interestingly, managers believed that a lot of elements in TELECO's legacy ecosystem in its core telecommunication businesses would apply to the IoT ecosystem. Managers in this phase assumed that TELECO's existing partners and customers would have a similar role in the IoT ecosystem. The managers expected that the interdependencies among actors in the IoT ecosystem would follow a linear value-chain model with new smaller players in the front-end of value chains, as shown in an internal presentation (Figure 12).

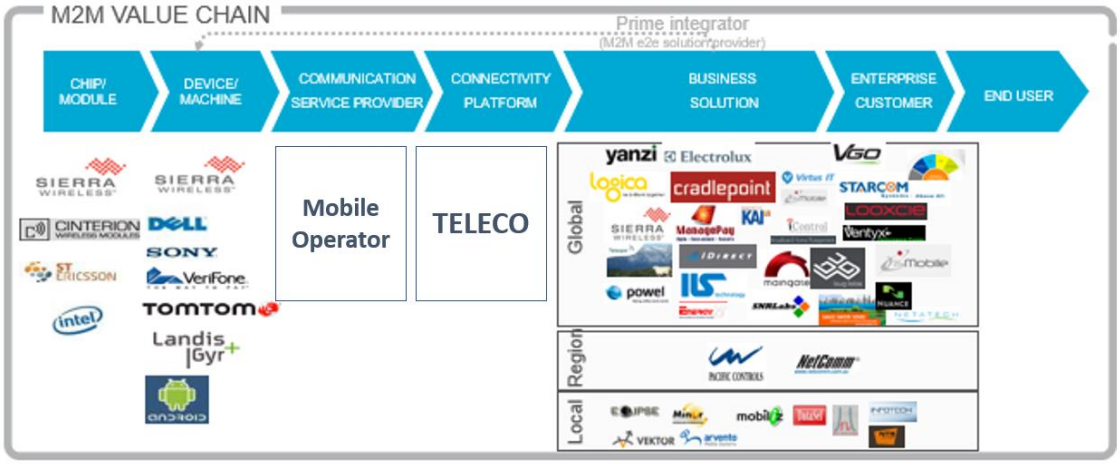


Figure 12: Managers' vision of M2M/IoT ecosystem structure (Internal document, 2013)

Managers expected mobile operators, TELECO's main customers, to take a prominent role in the IoT ecosystem, beyond their current role as a connectivity provider. Mobile operators were considered to have important assets and capabilities (e.g. access to end users, network infrastructures) relevant to the emerging IoT ecosystem even though at that time they had a low interest and lack of vision in IoT. It was clear that in this early phase, the managers envisioned the ecosystem's structure based on their knowledge and experience form the legacy ecosystem. Managers' assumption of mobile operators' role is noted below:

"Mobile operators, as the owners of the connectivity, are in a strong position to profit from the new (IoT) *ecosystem. They have key assets in the form of a large customer base and have extensive experience in building and running networks."* (Internal document, 2012).

In this phase, there was a lack of references concerning the magnitude of opportunities in IoT and the required capabilities to successfully capture the opportunities. Accordingly, managers evaluated the emerging IoT opportunities through the lens of the firm's existing capabilities and experiences in the prior ecosystem. The proliferation of connected devices was expected by the TELECO managers to provide a moderate growth opportunity given the firm's expertise in telecommunication technology. At this point, the opportunity was considered as an extension from '*connecting places and people, to connecting things*' (Internal doc, 2012). IoT was expected to provide new growth for TELECO from the emerging needs of the existing customers, the mobile operators. Managers assumed the IoT opportunities would come from the potential rise of data consumptions and related connectivity services. Hence, this would further increase TELECO's as well as mobile operators' relevance in the IoT ecosystem. The below quotation reflects the growth expectation of IoT in the early stage of the development.

"We are in the early stages of the next major inflection point for our industry – the connection of a vast array of "things". The cost of connecting devices is falling and the value of connectivity is rising for individuals, businesses and society in general. [..] New revenue opportunities are emerging for mobile operators through the delivery of M2M and related connectivity services" (Internal doc., 2010).

In addition, managers assumed that the required capabilities to explore emerging opportunities in the nascent IoT ecosystem would be consistent with the firm's legacy capabilities. Managers believed that TELECO's engagement in the nascent IoT ecosystem was a "*natural progression"* of the firm's technological legacies. Accordingly, it was expected that the firm's expertise in network and cellular technologies would bring competitive advantages in the nascent ecosystem. Despite the lack of clarity on the market potential, connectivity was considered as the "*key enabler*" technology for IoT. They assumed that without connectivity there would not be IoT in the first place; thus, connectivity was expected to provide an "entrance ticket" to the IoT ecosystem. As such, managers assumed a fit between the firm's capabilities and the perceived opportunity, as noted below:

"We manage over 950 million mobile subscribers and we have the competence from the Core networks to build the best in class (IoT) platform. We have the resources and economies of scale to do this as well as a long-term commitment to developing this business" (Internal document, 2011).

Overall, managers assumed that the structure of the nascent IoT ecosystem would be similar to the legacy ecosystem in which mobile operators would remain the 'hub' and capture the most value. They also assumed that the IoT would present a modest growth opportunity from the emerging needs of mobile operators. Moreover, the required capabilities to explore the emerging IoT opportunities were expected to be consistent with the firm's legacy capabilities in the telecommunication industry. Eventually, these assumptions formed an evolutionary frame in which managers believed that similar capabilities and positioning that made TELECO's successful in the legacy ecosystem would be applicable and help the firm succeed in the nascent IoT ecosystem.

5.1.2 Entering through an *Analogous Positioning* strategy

The evolutionary frame which assumed high conformity between the nascent IoT ecosystem and TELECO's legacy telecommunication ecosystem eventually shaped the firm's decisions on the platform architecture, market scope, and the overall platform positioning. In this phase, TELECO positioned the IoT platform analogous to its positioning in the legacy ecosystem by emphasizing a specialized feature that aligns with the firm's renowned expertise. At that time, managers acknowledged the possibility to build a *full-stack* platform that offer features in several technology layers. Nevertheless, managers strategically chose to focus on the connectivity management layer which builds upon its existing technical capabilities (Figure 13).

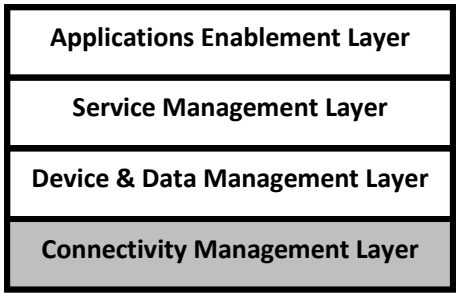


Figure 13: The chosen platform architecture (i.e. connectivity management layer)

The firm introduced the platform as '*the best in class connectivity platform*' by leveraging its strong reputation in the telecommunication industry. The quotations below explain the rationale of this positioning strategy:

"*In an emerging ecosystem like IoT, it is not easy to find the right path where we want to go. It has to be something that relates to where we can contribute. We can definitely contribute through connectivity. I believe with 3GPP* (i.e. cellular technology) *we can push for standardization and interoperability to reduce technological fragmentation. That's why we've been focusing on* (building) *connectivity platform since the beginning." (Portfolio Manager, 2017).*

Furthermore, the evolutionary frame encouraged TELECO to focus on the market that they know very well rather than target broader and unfamiliar markets. In turn, TELECO dedicated its connectivity platform to the mobile operator's market. The firm aimed to leverage its established network of mobile operators to form an initial installed base. During this phase, TELECO diligently communicated its vision of IoT to the mobile operators and explained how they should engage in the emerging ecosystem. The firm marketing efforts were targeted to convince mobile operators and its longstanding suppliers and collaborators in supporting the platform. The firm also initiated partnerships with a consortium of mobile operators to increase the platform adoption. For instance, in 2014, TELECO initiated a partnership with a consortium of mobile operators across Asia-Pacific, Middle East, and Africa. Lastly, TELECO's collaborated with device and sensor makers' that, which have a history of cooperation with the firm, to ensure interoperability with its IoT platform.

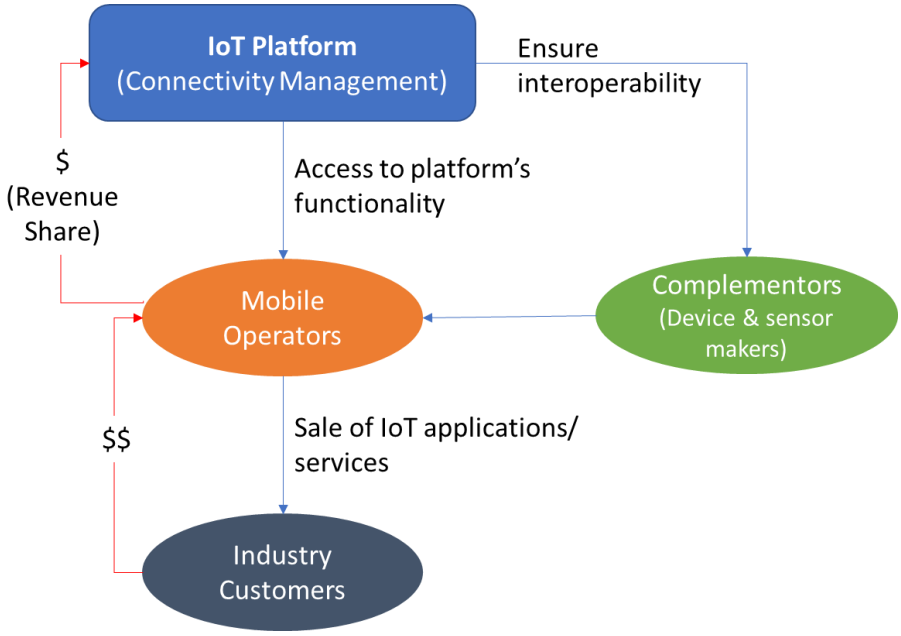


Figure 14: Illustration of value creation and value capture

Figure 14 illustrates the value creation and value capture activity through TELECO's IoT platform. In this approach, the mobile operators will be gained access to the platform's functionality to develop IoT offerings to the industry customers such as

connectivity service, data analytic, or other IoT related services. The mobile operators could also develop industry specific IoT services (e.g. smart cities, smart logistics) by collaborating with device makers and application providers. The platform revenue was generated based on the mobile operators' 'consumptions' of the platform features. As such, the more active the mobile operators in developing and selling IoT offerings, the more revenue TELECO's will receive.

TELECO gained several advantages by following the analogous positioning strategy. First, it allowed the firm to build upon its existing technology and market capabilities by focusing on the platform feature (i.e. layer) that was closer to the firm's capabilities. As such, the firm could avoid major capabilities reconfiguration that requires high investments and involves significant organizational changes. Second, it allowed TELECO to offer distinct value propositions that focus on the emerging needs of a specific market segment. In the early phase, the demand uncertainty and heterogeneity of IoT among customer segments were high due to incomplete knowledge regarding business applications and customers' preferences. By tailoring the platform for a segment that TELECO knows very well, it may increase the potential customer's adoption of the new platform. Finally, the analogous positioning strategy enabled TELECO to form an installed base and ecosystem of complementors in a relatively short period by leveraging its existing network of customers and partners. The strategy allowed TELECO to dedicate its market building efforts in introducing its vision of IoT to a specific set of audience. TELECO's marketing efforts were targeted to convince mobile operators and its longstanding suppliers and collaborators in supporting the platform. By this approach, twenty major mobile operators with around 8 million connected devices were subscribed to the platform. In sum, the analogous positioning strategy enabled TELECO to enter the IoT ecosystem by focusing on the technical layer and market that close to its technological and market capabilities.

Overall, TELECO strategy that positioned its platform analogous to its existing technology and market capabilities as well as reputation, enabled TELECO to enter and to establish an initial position in the nascent IoT ecosystem. Table 7 provide selected evidence of the emerging constructs related to the strategic frame and positioning strategy at this phase.

Table 7: Selected evidences of strategic frame and positioning strategy of TELECO in Phase 1

Aggregate dimension: *EVOLUTIONARY FRAME*	
2nd order theme	1st order codes and representative evidence
Modest growth from existent customers	*The rise of technologies enabler for the emergence of IoT* • "We are in the early stages of the next major inflection point for our industry – the connection of a vast array of "things". In 2020, everything that benefits from a connection will have one. We predict there will be 50B connections by 2020. From the Businesses perspective, it means that new applications will continue to automate industrial and business processes and help the businesses to manage their assets. New business opportunities will open up, companies which did not exist before will be born." (Internal document, 2011) • "The cost of 2G mobile modules has reached a point where mass-market deployment makes commercial sense, and 3G modules are following suit. the enormous economies of scale of 3GPP/3GPP2 standard technologies continue to drive down both the cost of modules and the solutions required to connect them." (Internal document, 2011) *Emerging needs from the existing markets* • "New revenue opportunities are emerging for mobile operators through the delivery of machine-to-machine (M2M) and consumer device connectivity services, which add value for enterprises and consumers." (Internal document, 2011) • "From being the owner of the service and customer relation, operators with the connectivity they provide, will be a part of the end solution, and the customer relation is many times moved to a specialized service provider bundling the connectivity with a device and application and sell this to the end user, being enterprise customer or consumer." (Internal document, 2013)
Consistency between the existing capabilities and the required capabilities	*Conformity between new technological trend with TELECO's expertise and heritage* • "We manage over 950 million mobile subscribers and we have the competence from the Core networks to build the best in class (IoT) platform. We have the resources and economies of scale to do this as well as a long-term commitment in developing this business" (Internal document, 2011). • "We have been leaders in telecommunications ever since [..] 1876. Today, we are expanding into the ICT arena [..]. It is a natural progression [..], and those technologies are powering modern technologies such as [..] and machine-to-machine (M2M) communication." (Annual report, 2013) • "TELECO have over the last 135 year been connecting places with fixed telephony services. From the 90s' onwards, we connected people. We're now reaching the inflection point where now we are connecting things" (Internal document, 2013). *Perceived match between the existing capabilities and the required capabilities in IoT* • "First and foremost, IoT is the key for the existing core business of the TELECO. Connectivity is prerequisite for IoT, you need to connect all different devices and IoT will drive a lot of connectivity." (Senior Manager, 2015).

	• "We build the solution based on our experience and assets where we are also a leading supplier in wireless provisioning. We have the competence in Business Support System and Core networks to build the best in class platform" *(Internal document, 2011).* • "We build the solution based on our experience and assets within the needed domains where we are also a leading supplier in wireless provisioning. We have the competence from BSS (i.e. Business Support System) and Core networks to build the best in class platform" (Internal document, 2014).
High degree of similarity between the nascent ecosystem and the firm's existing ecosystem	*Existing players & customers was expected to have similar role & position in the emerging ecosystem* • "From being the owner of the service and customer relation, operators with the connectivity they provide, will be a part of the end solution, and the customer relation is many times moved to a specialized service provider bundling the connectivity with a device and application and sell this to the end user, being enterprise customer or consumer." (Internal doc, 2013) • Similar (linear) value chain with operators and existing partners (i.e. device and chip/module) play important roles. (Internal doc, 2013) *Underdeveloped market with many small players exploring the markets* • "The main competitors come from new and small ventures as well as in-house developments of mobile operators. Our traditional competitors have intentions and stories but not credible today" (Internal Document, 2012) • "Although IoT offer endless opportunities, there are some issues when applying these technologies in a more open environment of different users and stakeholders related to security, reliability, participation, and provenance." (Senior researcher, 2014)

Aggregate dimension: ANOLOGOUS POSITIONING	
2nd order theme	1st order codes and representative evidence
Focused development to a specific tech. layer	*Leveraging firm's technical expertise and capabilities* • "We build the solution based on our experience and assets within the needed domains where we are also a leading supplier in wireless provisioning. We have the competence from BSS and Core networks to build the best in class platform" (Internal document, 2014). • "First and foremost, IoT is the key for TELECO's existing core business. Connectivity is prerequisite for IoT, you need to connect all different devices and IoT will drive a lot of connectivity." (Senior Manager, 2015).

	Positioned as a leading specialist for a specific technological layer • "The Connectivity Management platform will be able to address all verticals with its connectivity management offering, adding more value than the Basic Connectivity Provider*."* (Internal document, 2013) • "Our wanted position: TELECO connectivity platform perceived as the leading machine-to-machine (M2M) connectivity management platform by 2020" (Internal document, 2014) • "TELECO is a leading NEP (Network Equipment Provider) with a lot of connectivity knowhow and experience. The combination would therefore facilitate the global extension of M2M applications, i.e. allow telco's match the demands of the IoT*".* (Internal document, 2012)
Leveraging existing customers and partners	*Targeting and exploiting existing network of customers* • "The TELECO connectivity Platform is a platform offered to operators for B2B wholesale business development of M2M. It is a horizontal layered approach for M2M optimized for operational efficiency, commercial flexibility and providing simplicity for applications" (Internal document, 2011) • Initiate strategic partnerships with consortiums of mobile operators (i.e. Bridge alliance and GSMA) to increase the adoption of TELECO platform (February 2015). *Engaging existing partners* • Secured partnerships with the longstanding partners (e.g. SIM card, device makers) to ensure interoperability with the platform (February 2013). • Initiated joint research programs with leading chip & device makers including ARM, GEMALTO, and Intel to ensure interoperability with TELECO's IoT platform (Internal document, 2015).

5.2 Phase 2: Shaping the Ecosystem (2015 – 2018)

In this phase, TELECO shifted its platform positioning strategy which preceded by the change of the strategic frame toward the nascent IoT ecosystem. By mid-2014, the IoT technology had gained considerable attention in the ICT industry and beyond. Gartner, a global analyst firm, considered IoT was at *'the peak of inflated expectations'* in this period (2014-2015). The term 'Internet of Things' had surged of media coverage and became the new *buzzword*. The number of connected machines and devices had also reached around 15 billion globally by the end of 2015, which was also followed by increased development of IoT use cases in various sectors (IDC, 2016). At the same time, TELECO had initiated various exploration activities with new partners from outside the telecommunication industry such as utility providers, car makers, and city councils (Internal document, 2015). These collaborative explorations, which had been around since 2014, aimed to explore the commercial applications of connected devices in multiple industrial contexts and to showcase the technical capabilities of TELECO's platform. These successful collaborations combined with the progression in the ecosystem changed the managerial assumptions and strategic frame, which eventually led to the adoption of a new positioning strategy.

5.2.1 Strategizing through a *Proactive* frame

By 2015, TELECO's strategic frame toward IoT begun to shift following managers' changed assumptions on the ecosystem structure, the growth opportunity, and the opportunity-capability fit. After evaluating the progression of the IoT ecosystem, managers expected that more players including large IT firms such as IBM, Microsoft, Amazon, and Google would participate in the nascent IoT ecosystem. They envisioned that the structure of the IoT ecosystem would be radically different than the legacy ecosystem where mobile operators potentially face competition from big IT firms. These expectations were reasonable considering the launching of IoT platforms by IBM in late-2014, Amazon and Microsoft in 2015. However, managers were convinced that these new competing IoT platforms were still 'sub-scale' compared to the TELECO's platform that had been operating since 2011 (Internal doc, 2016). In this phase, TELECO connectivity platform had started to gain tractions with more than 8 million connected devices (apart from smartphones) managed through the platform. Moreover, TELECO's earlier involvement in IoT (i.e. M2M) heightened the confidence in occupying a more central role by becoming the 'bridge' between mobile operators, industry customers, and other players (Figure 15). Therefore, managers' confident that the nascent IoT ecosystem

would be malleable to shaping efforts by the firm. Managers' confidences are highlighted below:

"We have been doing it for many years long before the term IoT became super-hot in the last 18 months. We have led the market with our IoT connectivity platform, and it has become an industry-leading product in that space." (Marketing director, 2016)

"We are one of very few, if not only ICT provider with an end-to-end (E2E) offering spanning the value chain. As a natural bridge that links mobile operators with industry customers, we are in a unique advantage position to create value for both customer groups." (Internal Document, 2016).

Figure 15: Manager's envisioned of IoT ecosystem structure and TELECO's position (Internal document, 2016)

Nevertheless, the rapid entrance by other firms created a sense of urgency to act fast and decisive since managers were convinced that the ecosystem was still emerging, and many positions in different technological layers were up for grabs. In an internal memo, the CEO emphasized that "*Digitization and IoT are happening now"* and urged the firm to "*act now or miss out on the opportunity"* (2015). On several occasions, he stated that TELECO had what it takes to *"lead the transformation in the ICT market"* through IoT. At the same time, the market interest to IoT had started to grow with many non-ICT players in various industries begun to explore the IoT applications in their sectors. With the IoT technology became the new trend, managers' assumption of growth opportunity became inflated. At this point, managers sensed that IoT could open the way to serve new markets beyond mobile operators; hence had the potential to transform the firm *"from a single industry portfolio to multiple industry portfolio"* (Internal video, 2016). The growing ambition is followed by the new target set by TELECO's top management to generate 25% of the firm total sales from IoT-related businesses by 2020.

Moreover, managers assumed that TELECO would have the capability to shape the nascent IoT ecosystem according to the firm's vision and the projection of future capabilities. The perceived success in developing and positioning the connectivity management platform formed this assumption. At this stage, managers believed that TELECO had "*the breadth of capabilities that are required to ensure that nothing is left*

unaddressed" (Internal document, 2015). Moreover, managers expected the development of 5G, the next-generation cellular technology, in the upcoming years would further accelerate the adoption of IoT and the diversity of IoT applications. As the key developers of 5G technology, managers perceived that the IoT ecosystem would evolve in a way that is aligned with TELECO's vision and future capabilities; thus, strengthen TELECO's position in the IoT ecosystem. As described below:

"IoT is already happening even without the official arrival of 5G. The diversity of the IoT use cases will be further enhanced by 5G. With our global industry leadership in 3GPP (cellular technology) *and now 5G, we are enabling the IoT transformation for both mobile operators and industry customers"* (Internal Document, 2017)

Additionally, the successful collaborative exploration with non-mobile operators' partners in creating new IoT use cases/applications (e.g. connected cars, smart utilities) created a positive signal which encouraged managers to capture the opportunity in the higher layers (i.e. service management, application enablement). As noted before, by 2016, TELECO had initiated more than 50 collaborative projects with application providers, device makers, and industry customers to explore the development of IoT use cases in various industry sectors (e.g. cities, transportation, energy, agriculture). Motivated by the success of these collaborations, the head of IoT envisioned that TELECO could "*climbing up the value chain*" by offering a '*full stack*' platform that provides functionalities beyond connectivity (Field observation, 2018). It was believed that only offering connectivity management feature was not enough to secure future competitiveness in the IoT ecosystem. Managers acknowledged that expansion to higher layers requires new technical capabilities and broader engagement with firms outside the industry to be able to address broader market needs. Nevertheless, they believed that TELECO has "*the breadth of capabilities that are required to ensure that nothing is left unaddressed"* (Internal doc., 2016). Moreover, managers were aware that mobile operators had a different level of interest toward IoT and a lack of capabilities to develop IoT applications. By developing a full-stack platform, it was expected that TELECO could provide mobile operators with all the technical features required to develop IoT use cases. As explained by the head of IoT below:

"If mobile operators manage to do something in IoT, it's usually M2M or sim card communications. There is no real growth in providing only connectivity. We were saying that is not enough. We need to move up the value chain and deliver more than just connectivity" (Head of IoT, 2016)

In sum, the early success of initial positioning and collaborative explorations coupled with growing market traction changed managers' assumptions about the ecosystem structure, growth opportunity, and opportunity-capabilities fit, which formed a *proactive strategic frame*. In this phase, managers believed that the ecosystem structure would be radically different from the legacy ecosystem in which TELECO could become a central player and capture more value beyond the existing customers. Managers also sensed the high potential for transformational growth based on the emerging needs of industry customers who increasingly eager to adopt IoT technology. Managers in this phase were also convinced that TELECO's future capabilities (e.g. 5G, application development, analytics) are adequate to shape the nascent IoT ecosystems. These changes of assumptions eventually trigger the adoption of a proactive frame which entails forward-looking vision to shape the ecosystem and to capture more opportunities.

5.2.2 Shaping the ecosystem through an *Expansionary Positioning* strategy

The proactive strategic frame, which entails a growing ambition to achieve a prominent position in the IoT ecosystem, led to a change of platform positioning strategy. At this phase, TELECO aimed to position the platform as broad as possible to shape the ecosystem and to maximize the potential of value capture. In the mid-2016, TELECO launched the next generation of its IoT platform that offered functionalities in all of the technological layers. In other words, TELECO aimed to control most of the technological parameters in all layers by verticalizing the whole technology layers (see Figure 16). The platform was introduced as an *end-to-end* platform with a complete feature that enabled mobile operators and industry customers (e.g. manufacturers, car makers, enterprises) to develop a variety of IoT solutions and use cases. TELECO positioned the platform as "*the centre of IoT ecosystem and the hub for innovation*" that link mobile operators, industry customers, and complementors such as device manufacturers and application developers (Internal document, 2018).

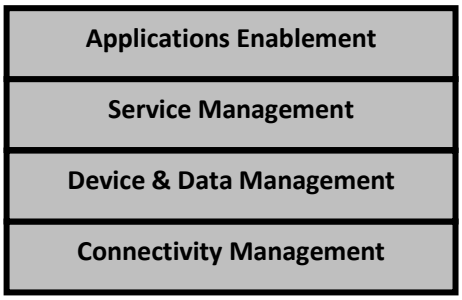


Figure 16: TELECO's 'end-to-end' IoT platform

In contrast with the prior strategy, TELECO aimed to control all the possible technological layers and target a wide range of market segments. In this case, TELECO's also expanded its role as an application provider which also developed IoT applications and sold them directly to the industry customers in various sectors. This strategy also aimed to achieve first-mover advantages by occupying a central position that no one had yet claimed. Analysts' statements below illustrate TELECO expansionary positioning strategy:

"TELECO is hoping to position itself as an IoT matchmaker with the launch of its new platform" (Eurobites, 2016).

"TELECO arguing that they are in a better position than (Mobile) *operators to deliver global capability and orchestrate partner relationships, by leading the charge*" (Heavy reading, 2016)

At this phase, the platform's value creation and value capture mechanisms more resemble the multisided business model (Hagiu, 2014). As shown in Figure 17, TELECO's IoT platform aimed to mediate between the mobile operators and the industry customers. Mobile operators were expected to develop IoT offerings using the comprehensive technological feature provided by the platform. In this case, the mobile operators would benefit from the ecosystem of complementors and industry customers affiliated with the platform. With this setting, TELECO also expected a potential revenue from direct sales of IoT use cases to industry customers.

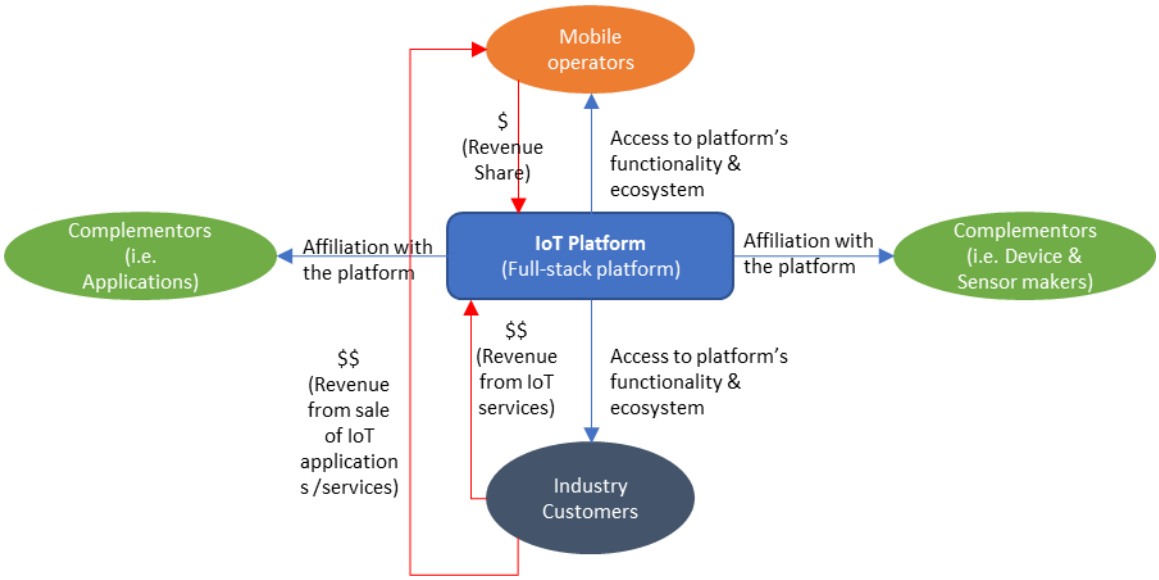


Figure 17: Illustration of value creation and value capture (Expansionary Positioning)

Following the positioning strategy, TELECO initiated multiple strategic initiatives to expand its complementor ecosystem (e.g. device makers, application providers,

industry partners) and to establish a leadership position in the broader IoT ecosystem. The IoT unit created a sub-unit called '*Ecosystem & Use Case*' that was responsible for developing a broader ecosystem of complementors and foster the development of IoT use cases through the platform. TELECO expanded its partnerships to major industrial partners including Volvo, Maersk, and some city councils to develop industry specific IoT applications. In addition, TELECO created an *IoT Marketplace* that facilitates interaction between actors in the ecosystem. The marketplace was a digital portal to connect various actors in the ecosystem to co-develop IoT offerings. The firm put a lot of investment to attract device makers and application developers by introducing Software Development Kits and exposing the Application Programming Interface (APIs). Additionally, TELECO created IoT Business Labs in 4 countries to encourage further interactions among various members in the ecosystem through face-to-face meetings and experimentations using TELECO's platform. TELECO also developed SDKs for device makers and introduced *free-in-charge* verification and testing services to increase interoperability and adoptions.

Moreover, TELECO was actively involved in shaping the broader IoT ecosystem through industry consortium and thought leadership. For instance, TELECO initiated a consortium of IoT patent holders that promote open cross-license of essential IoT IPR and technologies (Internal document, 2016). Through the consortium, TELECO took a role as an 'orchestrator' which coordinate IPR across areas. TELECO also refrained join other consortia (e.g. IoT community, Fog Computing) if it only provided a small chance for the firm to be a dominant actor. TELECO also intensively promoted cellular technology such as LTE (and 5G in the future) to be the primary choice for IoT connectivity as opposed to other technologies such as SigFox or LoRa. The firm published several white papers and organized various events and presentations to established itself as a thought leader once the ecosystem mature.

Overall, TELECO's positioning strategy in this phase aimed to maximize its value creation and value capture potential as well as to shape the evolution of the broader IoT ecosystem to its advantage. The expansionary positioning strategy was indicated by the development of a *full stack* or end-to-end platform covering all possible technological layers that extend beyond the firm's technical capabilities. The positioning strategy was also characterized by the expansion of the target market beyond TELECO's existing customers and the extension of its ecosystem of complementors. Table 8 provides selected evidence of the emerging constructs related to the strategic frame and positioning strategy at this phase.

Table 8: Selected evidences of strategic frame and positioning strategy of TELECO in Phase 2

Aggregate dimension: *PROACTIVE FRAME*	
2nd order theme	1st order codes and representative evidence
High potential for transformational growth	*Optimistic projection of market potential beyond the core customers* • "Through IoT, TELECO moving from single industry portfolio and sales to multiple industry portfolio and sales [..] We aim to reach 18B SEK total net sales by 2020. [..] We are making a strong play in Internet of Things across industries" (Internal document, 2016) • "TELECO's mobility report forecasts more-than-tripling of the number of IoT connected devices globally from under 5 billion today to 16 billion in the next 5 years. Meanwhile, McKinsey concludes that IoT has a potential global economic impact of up to USD 11 trillion by 2025." (Internal document, 2017) • "That (expansion) was an attempt for diversification of our business. I mean we have capabilities to build smart grid, telecommunication networks, for example, because we know telecommunication. If the whole telecom business is moving into more Internet of Things business, we thought that was opportunity to diversify our business." (Senior manager, 2018) *Perceived success as a connectivity management platform specialist* • "If mobile operators manage to do something in IoT, it's usually M2M sim card communications and there's no real growth in providing only connectivity. With a market potential of 619 USD, we were saying that's not enough. We need to move up the value chain and deliver more than just connectivity" (Senior Manager, 2018) • "The partnership with the Bridge Alliance (a consortium of mobile operators) to deploy the TELECO device connectivity platform is a critical milestone to make the adoption of cellular services in IoT devices economically viable for device OEMs and enterprises," (Senior Manager, 2015) • Successful collaboration in developing IoT use cases with non-telco partners such as Maersk, Volvo, Landis+Gyr (2016)
Adequate capabilities to shape the nascent ecosystem	*Perception of high applicability of capabilities* • "Connectivity and network infrastructure remain an essential element for the development of the IoT. TELECO is naturally well suited to pursue all forms of connectivity and equip our customer base to offer reliable connectivity agnostic solutions." (VP strategy & marketing, 2016) • "We are in a unique vantage position as a natural bridge that links one group (mobile operators) with the other (enterprises and industrial customers)– in many cases, they need each other to be successful in their IoT deployments and we can match them up." (Head of IoT engagement, 2016). • "We have the combination of expertise, services, software, and connectivity infrastructure capabilities to transform the IoT business beyond connectivity. We have the breadth of capabilities that are required to ensure that nothing is left unaddressed." (Head of digital services, 2016)

	• "As a global company, we have created an efficient go-to-market organization based on 10 regions. Backed by our collective global knowledge, our regional competence and close customer relationships provide a solid foundation for profitable growth." (Internal document, 2016) *Confidences in narrowing capability gaps and shaping the ecosystem's future* • "We are a leading software provider and developer across all areas of the network, including OSS and BSS – these capabilities we see as being key to what will be needed to flexibly support the plethora of future use cases, some of which we can only imagine right now." (CEO, 2015) • "While the IoT market is developing rapidly, successful customer engagements require the ability to adapt to local ecosystem cooperation. (Therefore), We are investing heavily in evolving our portfolio, in building innovation labs both global and regional" (Internal Document, 2017) • "The company started to invest heavily on IoT, software and video delivery services, with a significant chunk of its $2.5bn annual R&D spending going on IoT connectivity standardization. [..] TELECO's position is that cellular standards are better suited for IoT applications since they can support huge numbers of devices with low complexity and cost, longer battery life, low-entry investment, extended and global coverage" (News Blog, 2016)
Transformative ecosystem structure where TELECO could be the central player	*Expansion of the existing ecosystem* • "One of the things that this very important this ecosystem and go-to-market partners, they help us. I think if you have read the solutions article where we tell about agriculture solution. It's actually showcases of our strategy execution where our partners who happen to build an agricultural solution, actually utilized our assets, they used connectivity management, they use device management, and now even analytics monetization to build an application." (Internal document, 2017) • "In fact, the IoT market is so large (and still very nascent). Analysts couldn't agree on how large it is, since definitions can vary quite widely & our strategic analysis shows global IoT spending estimates range anywhere from 300 to 2,900 billion USD [..]one thing they could agree on is that more value will be created higher up the value chain. [..] Having said that, the industry is moving up the stack very quickly with Platforms becoming the next battlefield" (Internal document, 2016) • "The strategy is actually about how do we climb higher up and capture more of the software and application revenue because the large value is on top of the IoT stack. In IoT, Connectivity is the key but connectivity (only) is not enough. (Therefore) Building pre-integrated solutions is essential to tap into the higher value of the stack." (Head of IoT, 2017) *High expectation to be a central and leading player in the broader IoT ecosystem* • "TELECO's ICT leadership and comprehensive offerings mean we're very well placed as our customers' IoT transformation partner – for both mobile operators & industries." Internal document 2016 • "TELECO is hoping to position itself as an Internet of Things matchmaker with the launch of its IoT platform, which combines relevant TELECO platforms and services with a marketplace for collaboration." (Light Reading, 2016)

	• "At Mobile World Congress (MWC) 2016, TELECO's President and CEO said digital disruption will come to every industry in 2016 and made major announcements in 5G, the Internet of Things (IoT) and cloud. With these announcements, TELECO solidifies its positions as a leading ICT transformation partner for customers across industries." (Internal document, 2016)
Aggregate dimension: EXPANSIONARY POSITIONING	
2nd order theme	1st order codes and representative evidence
Development of a full-stack platform	*Verticalizing all technology layers* • Launched the new generation of the IoT platform (called IoT-A) with a complete set of features addressing the whole technological layers of the platform architecture that enable development of various IoT use cases (February 2016) • "Our focus is to expand the platform further with extended connectivity management & aggregation, network near functionality and differentiating/niche technology supporting our prioritized verticals." (Internal Document, 2017) *Positioned as key and central player in the IoT ecosystem* • "IoT-A sits at the heart of our E2E IoT offerings and is the hub for innovation, ecosystem collaboration and partnerships. We "onboard" devices and apps onto our platform and are a natural link between mobile operators and industries." (Internal doc., 2018). • "We enable global scale for the application developer community, we have removed the fragmentation of the data and the device ecosystem itself. TELECO's IoT-A is the centre of our emerging ecosystem and the hub for innovation." (Internal Document, 2016)
Expansion of target market and ecosystem	*Broadening the target markets* • "We are targeting vertical markets such as utility market, automotive, intelligent transport systems, maritime, and public safety market. We will explore and expand with selected solutions across industries" (Internal document, 2017) • *"*There are two ways to sell IoT accelerator: Platform driven, and Use case driven. For the former, IoT accelerator is sold standalone where the customers get access to the horizontal functionality. For the later, use cases/ applications developed by TELECO on top of the platform are sold to mobile operators or industry customers" (Internal document, 2017) *Development of Ecosystem of third party complementors* • "The launch of IoT platform Marketplace will unlock the potential for different players in the value chain to deliver value. It is another steppingstone to make 5G a reality by enabling massive adoption of massive IoT. This supports service providers as they seek to expose network connectivity IoT APIs and monetize these assets." *(Head of IoT, 2018)* • Launched "IoT business labs" an offline regional support for technology trials, Proof of Concept, and cocreation with partners. (Internal doc. 2017).

5.3 Phase 3: Shifting to an Attainable Position (2018 – 2020)

In the latter phase, managers at TELECO revised their assumptions as the ecosystem's evolved in a way that was not fully aligned with their expectations. In this phase, the adoption of IoT technology continued to grow as the commercial viability became more apparent. Multiple actors including large IT players (e.g. Google, Microsoft), telecommunication infrastructure providers (e.g. Cisco, Huawei), and industrial giants (e.g. GE, Bosch) had started to develop and claimed their position in the ecosystem (IDC, 2018). Mobile operators had also ramped up their investment to take on more profitable roles at the higher technology layers beyond connectivity (GSMA, 2018). Moreover, the expansionary positioning turned to increase the possibility for contestation with the firm's main customers and the other dominant players as the ecosystem gradually taking shape. At this stage, managers have a better understanding of the ecosystem dynamics and the ramifications of the previous positioning strategy. As such, managers adapted their assumptions regarding the ecosystem structure, growth opportunities, and capabilities fit as the realities unfold. These revised assumptions shifted the strategic frame which led to the change in positioning strategy.

5.3.1 Strategizing through an *Adaptive* Frame

The ecosystem progression and partial success in shaping the ecosystem prompted managers to revisit their assumptions and recognized the limitation of their capabilities. In this phase, managers sensed an increased competition in the IoT ecosystem which could hamper the previous ambitious position for TELECO. The big IT players such as Microsoft, Amazon, and IBM had an increased presence with industrial customers and a faster growth in attracting IoT application providers. As an example, in the mid-2018, Microsoft announced its commitment to invest $5 billion on IoT. Given the relative progress of these actors especially in the application layers, managers estimated that TELECO was seriously lagging in terms of capability and credibility; thus, it would be difficult to directly compete with these big players which increasingly established their position. At this point, competing with Microsoft and Amazon at the application layer was considered to be an uphill battle, as described below:

"We used to develop our own developer ecosystem. We can't compete with IBM-Watson, Microsoft Azure, AWS, and all these big cloud platforms. Now, we need to reach out to their ecosystem rather than building our ecosystem because that is a way to get leverage". (Senior manager, 2018)

Moreover, Managers realized that they were underestimated the resources and capabilities needed to build an immense application ecosystem. Managers realized that building and orchestrating an immense application ecosystem and obtaining a domain knowledge for developing IoT use cases in various industry sectors were one of TELECO's capability gaps that were difficult to fulfil in a short period. At this point, managers had a better estimation of other actors' competence and the firm's limitation. As noted by one of the ecosystem managers below:

"I think we were primarily organized in the fashion that it's better to deal with a few major partners rather than with a lot of smaller firms. We are very new in that area (building an application ecosystem), *Ecosystem building is probably one of the capability gaps that we have."* (Ecosystem Manager, 2018).

In addition, developing and selling IoT applications for industry customers were proved to be challenging. In the earlier phase, managers were confident with TELECO's capabilities to address the industrial markets based on some early successful collaborations. However, the investments to acquire specialized knowledge and to build domain competences were much higher than expected. Also, managers realized that the firm did not have strong credibility beyond the telecom market which made it even harder to compete in the application market. As told by a senior manager:

"To build use cases, you need to have the domain knowledge. I don't think we can build the application for certain use cases by ourselves, because simply we don't know. Let's say we have an application or use case, who would come to us? I mean we are not necessarily known for a player having the domain competences (as an application provider)*."* (Senior manager, 2018)

At the same time, managers sensed a growing ambition of mobile operators in IoT given their increased involvement in selling IoT applications to industry customers. If TELECO continues to sell IoT applications directly to the end users, managers presumed that they would inevitably get into competition with the mobile operators. The potential of market overlap was assumed may result in retaliation from mobile operators and could damage their long-standing relationships, as explained below:

"We can't go to mobile operators and say: 'We give you (IoT) business take it or leave it' because then they will say: 'If you are competing with us in IoT, then we will buy less radio base station from you'." (Senior Manager, 2018).

At this point, managers assumed some positions (i.e. application providers, and integrators) in the ecosystem were unattainable because of potential competitions and

capability misfits. At this stage, managers adjusted their expectations and started to consider a 'safer' position that would better align with TELECO's capabilities and minimize potential ecosystem contestations. The firm previous broad engagement with multiple market segments with expansive technological features informed managers to better estimate the growth opportunities and their fit with the capabilities. Accordingly, managers at this stage assumed that TELECO's existing capabilities are only adequate to explore selective opportunities in the nascent IoT ecosystem. We observed that managers revised their assumption on the growth opportunity from "*connectivity is not enough*" to "*connectivity is big enough*". It was believed that the firm can still achieve substantial growth by focusing on its key expertise in connectivity key expertise in connectivity. Moreover, TELECO's installed base of mobile operators was considered as a unique selling point that would differentiate the platform. In this stage, managers believed that TELECO's should adapt to the changing ecosystem landscape by refocusing on its core technical expertise and market. The quotations below illustrated managers' changed assumptions:

"It's meaningless to say that connectivity is not big enough. Overall, it's much bigger than many of the markets that TELECO is addressing. Of course, connectivity is smaller than applications and analytics which is addressed by well-established firms for each and specific sector, but the market is big enough for us to have a meaningful business" (Portfolio Manager, 2018).

"In the beginning, we were developing a whole layer in the stack because we thought that was our customer needs. But where our reputation is and where our core is on the lower layer (connectivity). *It was also hard for us to target both mobile operators and end users and make end-to-end use cases that serve every geography and every need".* (Head of IoT, 2018).

In sum, the ecosystem progression and the ramifications of TELECO's expansionary positioning strategy prompted managers to evaluate their assumptions toward the ecosystem structure, growth opportunity, and opportunity-capability fit. In this phase, managers assumed the ecosystem became gradually structured and more competitive where big IT players occupy certain positions. Therefore, they expected that attainable positions for TELECO would be more limited than previously predicted. The growth opportunity would also become more targeted which was mainly based on the emerging needs of mobile operators and limited industry customers. Lastly, managers realized that its existing capabilities are only adequate to explore a limited set of opportunities in the IoT ecosystem as other players have more valuable capabilities. These changes of managerial assumptions shift the strategic frame from the proactive to

adaptive frame which was shaped by managers' awareness to adapt to the new realities that were not fully aligned with their prior assumptions. The shifted strategic frame eventually led to the platform repositioning that encourages adaptation to an attainable position.

5.3.2 Switching to *Downward positioning* to achieve attainable position

In the mid-2018, TELECO decided to change its platform positioning strategy along with the shift of strategic frame from proactive to the adaptive frame. Although the previous expansionary exposed the firm with a potential ecosystem contestation, it brought a positive learning effect for managers to clarify their assumptions and misconceptions. At this point, managers had better-defined opportunities and estimation of capabilities fit given the ecosystem progression and the firm's previous shaping efforts, which informed the platform repositioning. TELECO decided not to address the service management and application enablement layers (the two highest layers). Instead, TELECO aimed to solidify its position in the lower layers' technology (connectivity) and extend it with adjacent features (device & data management). Rather than making a 'big bet' by building a full-stack platform, the firm doubled down its investments to the two bottom layers, the connectivity and device & data management layers. In this phase, the investments for the higher layers were treated with more cautionary and experimental.

The new strategy aimed to reposition to the point where it could minimize potential contestation with the mobile operators and other powerful actors in the ecosystem as well as lessen the capability misfit, while still enable differentiation. TELECO introduced the platform as the mobile operator's "trusted partner" that enables and accelerates the development of IoT solutions for industry customers. TELECO repositioned the platform as a "*Global Connectivity and Device Management Platform*" that enable mobile operators "*to move higher up the IoT value chain"*. TELECO was committed not to sell any IoT solution to the industry customers and make the mobile operators as the main *Go-to-Market* channel.

As a result of the new positioning strategy, TELECO downward calibrated its platform architecture and market scope. TELECO decided to focus on the two interrelated layers, the connectivity management and device & data management layers (Figure 18). These layers were considered as areas where TELECO had a "*higher chance to win and reach globally leading scale*" (Head of IoT, 2018). Compared to the applications and service management, the device & data management layer was considered to be more aligned with the platform core feature and TELECO's technical expertise. Moreover, the combination between connectivity management and device and data management enables

new technical functions (e.g. seamless integration, *Over-the-Air* software update) that bring unique value propositions that would prevent them to be a mere 'dumb pipe' in IoT. By focusing on these two layers, it was expected that TELECO could capture emerging opportunities beyond connectivity, as noted below:

"The core of TELECO IoT platform are connectivity and device management – two closely related core functions of any IoT system. These are complex components that have a large impact on functionality, security, and deployment, where, as experts on networks and connectivity, we can provide the greatest value than anyone else in the IoT ecosystem." (Internal document, 2019).

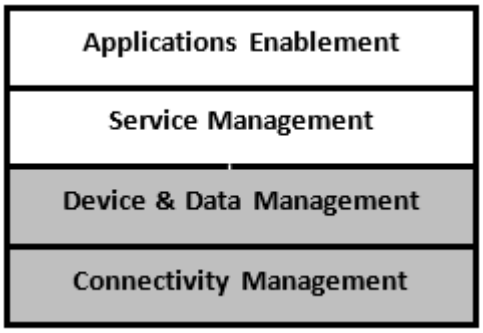


Figure 18: Platform architecture in phase 3 (Connectivity management and device & data management layers)

The new positioning strategy offered better alignments with mobile operators. However, managers learned that most end-users (i.e. industry customers) did not buy IoT solutions from mobile operators since they were not known as providers of IoT applications. Moreover, the majority of mobile operators had a lack of capabilities to develop IoT solutions beyond connectivity services. Nevertheless, TELECO decided to strengthen the mobile operators and build a '*mobile operator-centric*' ecosystem with the platform as a central technology enabler. TELECO established a sub-unit called 'customer success' that provides supports for mobile operators in various aspects including sales and marketing. TELECO also created a program called '*enterprise lead generation*' where the firm helps generating demands by matchmaking mobile operators to the industrial customers (e.g. logistic companies, retailers, energy providers). These proactive approaches ultimately aimed to improve mobile operators' role in the ecosystem and help them to address opportunities beyond connectivity. Therefore, the more active and innovative mobile operators in developing IoT offering, the more value created in the platform and captured by TELECO.

In addition, TELECO decided to partner with powerful actors that have a more established ecosystem rather than building its own application ecosystem. The firm shifted its approach from attracting individual firms to partnering with big firms to

leverage their ecosystem. At this point, TELECO took a non-competitive position with the large cloud and application providers; while emphasized the complementarity of the platform with their offerings. Managers called this approach an '*ecosystem-of-ecosystem'* strategy. TELECO partnered with leading IoT application platform players such as Microsoft, Amazon, and PTC to access their application ecosystem. TELECO took a more complementary approach with these partners by focusing on the connectivity and device management features and not competing in the application layers. By this approach, TELECO's aimed to highlights its differentiation as the '*premier choic*e' for connectivity and device management in the IoT ecosystem. Moreover, TELECO decided to stop the development of IoT applications for specific industries and not sell any IoT offerings directly to the industry customers (except for connected vehicles due to a long-standing partnership with a major car manufacturer). Nevertheless, as illustrated in Figure 19, TELECO still engaged with selective industrial partners like ABB, GE, and Bosch for research collaboration since there was still a need to understand specific requirements for the platform's future development. This approach allowed TELECO to anticipated emerging needs of IoT from the industrial customers, despite its focus on mobile operators. The statement below highlights TELECO's partnership strategy:

"We will focus on cloud platforms, device manufacturers, and industrial partners that can bring significant traffic with their ecosystems. By positioning ourselves as their preferred partner for connectivity we can reach a very big number of applications and verticals and by doing so, scale faster." (Internal document, 2018).

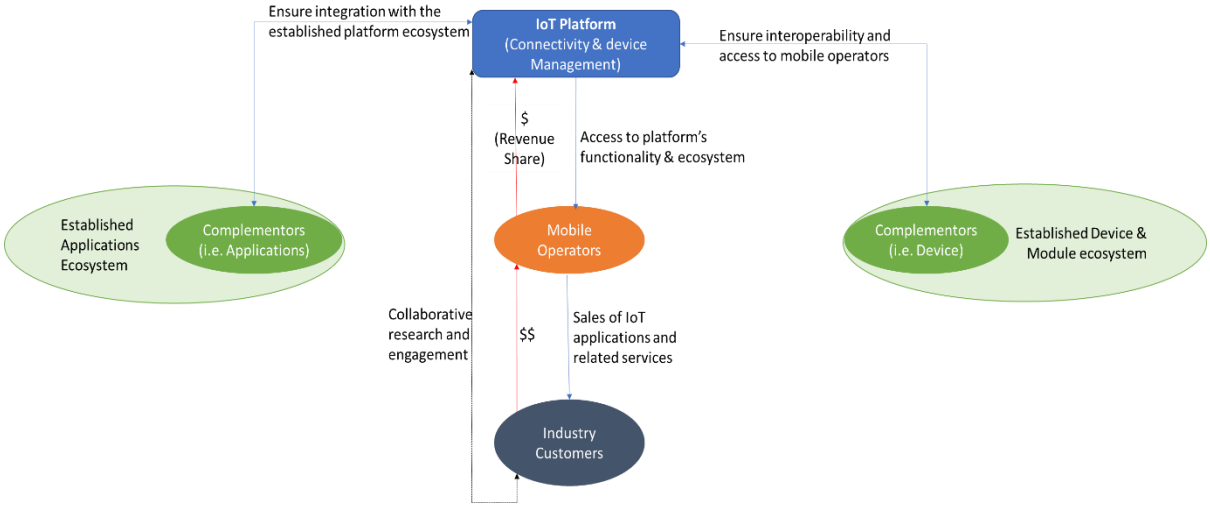


Figure 19: Value creation and capture mechanisms, and ecosystem approach in phase 3

TELECO's positioning strategy minimized the potential contestations from other ecosystem players, while still providing unique advantages to the ecosystem. TELECO could avoid direct competition with the big IT players which operate on the application layer by positioned the platform as complementary with their offerings. By integrating with these players, TELECO could extend its platform ecosystem to the application layers without having to build it by itself. More importantly, the positioning strategy circumvented competitive situations with the mobile operator that may hamper the longstanding relationship in the core businesses. As such, the firm could achieve more synergy between the core business and the emerging IoT business. As noted by the CEO:

"We will not sell directly to enterprises. It is never a good idea to compete with our own customers. We will leverage our strong mobile operators' relationships. We provide (IoT) connectivity to enterprises through our customers. This is a great way to make our customers successful." (CEO in an internal letter, 2019)

Overall, the positioning strategy in this phase aimed to adapt to the emergent ecosystem dynamics and to capture better-defined opportunities that were considered more fit with the firm's existing capabilities. The downward positioning strategy enabled TELECO to differentiate its platform and secure a strategic position in the increasingly competitive ecosystem. The platform architecture recalibration by focusing on connectivity and device & data management layers offered unique value propositions for underserved market needs (e.g. seamless integration of connected devices). The platform's credibility strengthens by TELECO's reputation and expertise in telecommunication. Moreover, analysts considered TELECO's strong focus on mobile operators gives a '*clear positioning'* message to the market. A reputed consultation firm even rated TELECO's IoT platform as '*the most mobile operator friendly*' platform in the market. As shown by an analyst's review below:

"TELECO's decision to refocus its IoT efforts toward the mobile operators market sends a clear message to the market about its positioning and allows it to make the most of relationships with its core customer base." (Ovum, 2019)

Table 9 provides selected evidences for adaptive frame and downward positioning.

Table 9: Selected evidences of strategic frame and positioning strategy of TELECO in Phase 3

Aggregate dimension: ADAPTIVE FRAME	
2nd order theme	1st order codes and representative evidence
Targeted growth opportunity based on emerging needs of existent customers and limited new customers.	*Changing perception of sources of growth, refocusing to connectivity & device management* • "The market for IoT cellular connectivity is around 50B SEK. So, the market is actually big enough for us. If we can get 10-15% of the total market, that is already quite big" (Portfolio Manager, 2018) • "We need to focus our resources and bet on the areas where we have a chance to win and reach globally leading scale. Connectivity and device management are the areas that we will focus on going forward." (Head of IoT, 2019). • "We believe we need to be champions in offering seamless connectivity for any IoT device, anywhere in the world. This will be our foundation and must-win battle. Because insights from connectivity combined with data and device insights will be our access to the ecosystem." (Head of IoT, 2019). *Revised understanding of market and technology maturities* • "I mean one learning we have from our operators is that all operators start with big ambition to sell solution and all these things, but basically every operator without exception has abandoned that ambition. It has not worked for any of the operators, zero. No one is any more interesting to sell solutions." (Customer engagement manager, 2019) • "Previously we tried to address some industries that were way out of our scope like agriculture, healthcare. IoT is very explorative and very new area. I think we put so much pressure to make like to make money in you know in industries that weren't ready for that." (Partnership manager, 2018) • "IoT is a completely new type of business for mobile operators and 70% of mobile operators do not have a clear strategy on IoT. We also have to be realistic because operators don't have that expertise. we don't really see that operators can address industries with IoT offerings." (Customer engagement manager, 2018)
Partially adequate capabilities to pursue better-defined opportunities	*Realization of capability gaps* • "In the beginning, we were developing a whole layer in the stack because we thought that was our customer needs. But where our reputation is and where our core is on the lower layers (connectivity). It was also hard for us to target both mobile operators and end users and make end-to-end use cases that serve every geography and every need". (Head of IoT, 2018). • "Ecosystem building is probably one of the capability gaps that we have. Otherwise, I think we have most of the technical competence and so on." (Senior Manager, 2019) • "We are a product company, not necessarily as a physical product. Then, we want to have IoT as-a-service. (But) We are not turning into a service company, like Accenture and IBM. We didn't do that" (IoT Technology Manager, 2018)

	Increased organizational complexity • "When we started the unit (IoT). We were working in 33 or 36 in parallel tracks style and subdivided into smart cities, utilities, automotive. That proved not to be sustainable because I mean the more you work the more you discover about the variances and everything." (Senior Manager, 2018) • "We have invested time, effort an d resources into multiple platforms, selected use cases and a range of platform functions. This has led to multiple small and scattered successes, but no big breakthroughs that will grow fast enough to become a major business." (Internal Document, 2018). • "We need to work with industry partners to access (enterprise) customers. (However), investing in the enterprise channel is very expensive. Therefore, it is very important for us to be very selective" (Head of IoT, 2018).
Increasingly structured and competitive ecosystem with limited attainable positions	*Potential market occupation by powerful actors* • "The main challenge and risk from the previous strategy was getting into competition with large platform company such as IBM -Watson, Microsoft Azure, AWS all these cloud platforms because our IoT platform in the previous version included data storage, applications some analytics function, etc. Now we are much more, okay we are the connectivity management layer, we are of the device management layer That is complementing what they have in the platform." (Senior Manager, 2018) • "Major players such as IBM, GE and PTC, have announced serious investments of more than $1B each (over a 1-5 year period), large share on promoting their respective IoT platform offering" (Internal document, 2017) "We need to engage with three or four different main types of companies. (For example), the big cloud providers like Amazon, Microsoft because they're so big in IT, that's a necessary and we've got to find ways to work with them. Then, we have the application enablement like PTC. We need to work with them with redefined value proposition." (Head of ecosystem, 2019) *Potential ecosystem contestations by mobile operators* • "Mobile operators are starting to realize that this requires ecosystem thinking and willingness to partner with many parties. They're also recognizing that they don't need to be the lead partner in order to participate and be successful." (Head of IoT, 2019) • "The CEO got a call code from the Mobile operators asking questions are you trying to take over our role here? Because we will always need to relate to these guys (mobile operators). So, we need to facilitate probably very much on behalf of these guys." (Head of IoT ecosystem, 2018)

Aggregate dimension: DOWNWARD POSITIONING	
2nd order theme	1st order codes and representative evidence
Recalibration of platform architecture	*Refocusing on the two main bottom layers (connectivity management & Device & data management)* • "The core of TELECO's IoT-A is connectivity and device management – two closely related core functions of any IoT system. These are complex components that have a large impact on functionality, security, and ease of deployment, where, as experts on networks and connectivity, we can provide the greatest value to enterprises than anyone else in the IoT ecosystem." (Internal document, 2019) • "We're tying device management and connectivity management together along with network insights to measure performance, so we can ensure these capabilities work seamlessly across global markets. This unified capability is a key requirement we are seeing from multinational corporations" (Head of IoT, 2019) *Incrementally evolve to the higher layer of the platform architecture* • "We start from our strength in connectivity and our current DCP assets. We then will invest more in three areas: Platform Services, Automotive & Transport Solutions, and Security Solutions." (Record of internal meeting, 2018) • "We believe we need to be champions in offering seamless connectivity for any IoT device, anywhere in the world at any time. This will be our foundation and must-win battle. Then, We want to focus on replicable micro services, that is pivotal to realize value in many use cases, like precise locations for mining and logistics." (Internal document, 2019)
Refocusing to a selective target market and aligning with powerful actors	*Refocusing on the mobile operators' markets* • "Operators will still be important in IoT. We need to educate the operators how to sell IoT to the enterprises. We also need to make enterprises aware of the capabilities that IoT can bring, the capabilities that mobile operators & TELECO can bring through IoT." (Platform Manager, 2019) • "Mobile operators are and will remain central players in the IoT ecosystem through their cellular network infrastructure assets, solutions and enterprise reach. We want to increase the CSPs relevance and help open new value creation opportunities with them and for us. They will therefore also remain important customers and partners to us." (Internal document, 2019) *Non-competitive positioning and collaboration with other powerful actors* • "TELECO IoT platform takes a non-competitive position with the other players, like device makers, cloud providers and systems integrators in the IoT field. Our solutions are complementary to their offerings. We help plug the gap between the device and cloud, helping customers efficiently and securely manage their connectivity and devices." (Head of IoT, 2018). • "We need to actively partner with the leading application, device, and connectivity providers. More specifically, we aim for a position between the global application platforms with their developer ecosystems, such as AWS, Azure, and PTC, and Mobile operators" (Internal document, 2018)

5.4 Summary of Findings: The dynamic of platform positioning strategy at TELECO

The empirical analysis of the process of platform creation at TELECO shows how the firm engaged in a more dynamic process of positioning which involves the implementation of three different positioning strategies. The positioning strategies were formed based on the strategic frames and managers' assumptions of ecosystem structure, growth opportunity, and the opportunity-capabilities fit. In the early phase of development, TELECO applied an *analogous* positioning strategy. In this strategy, TELECO aimed to position its IoT platform in parallel with the firm's established position in its telecommunication ecosystem legacy. As a result, the platform architecture was focused on the connectivity management layer which aligned with TELECO's technical legacy. The platform market scope was also set within the firm's boundaries where mobile operators were targeted as the main customers/users. The analogous positioning strategy was driven by the *evolutionary* strategic frame characterised by managers' assumptions that the similar capabilities and positioning in its legacy ecosystem will help the firm to succeed in the nascent IoT ecosystem. In this case, managers assumed that mobile operators remain the central actor in the nascent ecosystems and the incremental growth was expected to come from the emerging needs of its existing customers, the mobile operators.

In phase 2, TELECO applied an *expansionary* positioning strategy following the shift of the firm's strategic frame. In contrast with the previous analogous positioning, expansionary strategy entails positioning the platform as broad as possible to maximize the potential of value creation and value capture as well as the chance to shape the ecosystem to the firm's advantage. This strategy characterizes by the development of multiple technical features that covered all possible technical layers, and the expansion of the market scope. The expansionary positioning was shaped by the *proactive* strategic frame which represented managers' belief on the firm's ability to shape the nascent ecosystem to its advantage. The proactive frame was formed because managers changed expectations of the potential growth opportunity and their confidence in shaping the nascent ecosystem in accordance with the firm's projected capabilities.

Lastly, in phase 3, TELECO implemented a *downward positioning* strategy where it recalibrated its platform architecture and refocused its platform market scope to the point that better correspond to the firm's technical and relational limitations. The change of positioning strategy occurred because of the shift in the strategic frame from proactive

to the *adaptive* frame. The adaptive frame entails managers' revised assumptions of the ecosystem structure and its related positions that were attainable for TELECO. It was also informed by the managers' improved understanding of productive opportunities and the limitations of the existing capabilities. Overall, the dynamic shifting of positioning strategy allowed TELECO to enter the ecosystem through a new platform creation and established a strategic position in the nascent IoT ecosystem.

Table 10 provides a summary of the evolution of strategic frame and platform positioning strategies at TELECO. A theoretical framework that describes the dynamic of platform positioning strategies is presented in Chapter 6. The discussion about theoretical contributions and managerial implications of the findings are also presented in the following chapter.

Table 10: The evolution of strategic frame and platform positioning strategies at TELECO

	Phase 1 (2011 – 2015)	**Phase 2 (2015 – 2018)**	**Phase 3 (2018 – 2020)**
Strategic Frame	***Evolutionary frame***	***Proactive frame***	***Adaptive frame***
Assumption of ecosystem structure	The structure of the nascent IoT ecosystem (actors and their interdependencies) are *similar* to the legacy ecosystem. i.e. Mobile operators will remain the hub and capture most of the value	The structure of the nascent IoT ecosystem is *radically different* to the legacy ecosystem and *malleable*. i.e. TELECO could become the hub and capture more value in the broader IoT ecosystem beyond mobile operators and existing partners	The *transformed* structure of the nascent IoT ecosystem is increasingly competitive. i.e. Big IT players and mobile operators will occupy more central positions, which limit TELECO's attainable positions
Assumption of opportunity	*Moderate growth* opportunity based on emerging needs of existent customers. i.e. Expectation of growth opportunity from emerging needs of mobile operators	*High potential* for transformational growth based on the emerging needs of *both* existent and new customers. i.e. Expectation of growth from emerging needs of mobile operators and industry customers from various sectors	*Targeted growth* opportunity based on emerging needs of existent customers and *limited* new customers. i.e. Expectation of growth opportunity from emerging needs of mobile operators and limited industry customers.
Assumption of capability-opportunity fit	Required capabilities to *explore a narrow set of* emerging opportunities in the nascent ecosystem are *consistent* with the *legacy capabilities* i.e. Expertise in connectivity will bring	Required capabilities to *shape* the nascent ecosystem and explore multiple emergent are in line with the firms' *projection* of capabilities. i.e. The expected new capabilities (5G, App. Development,) are adequate	*Existing* capabilities are *only* adequate to *explore* better-defined opportunities in the ecosystem. i.e. The expertise in connectivity partly contribute to the ecosystem as other

	Phase 1 (2011 – 2015)	Phase 2 (2015 – 2018)	Phase 3 (2018 – 2020)
	advantages in the IoT ecosystem	to create the envisioned IoT ecosystem	players have valuable capabilities
Positioning Strategy	***Analogous positioning***	***Expansionary positioning***	***Downward positioning***
Platform architecture	Focused development of a specific technical layer analogous to TELECO's legacy technical capabilities. i.e. Development of connectivity management layer	Development of *multiple technical layers* covering all possible layers that extend beyond TELECO's technical capabilities i.e. Development of a full stack / end-to-end IoT platforms	Recalibrating the focus on selective technical layers which better correspond to TELECO's existing technical capabilities i.e. Downward calibration to connectivity and device & data management layers
Platform market scope	Targeting existing customers and leveraging partners from the legacy ecosystem. i.e. Mobile operators as the main target customers. Sustaining relationship with existing partners (e.g. device, SIM cards makers)	Expansion of target market and ecosystem of complementors. i.e. Targeting mobile operators and industry customers. Expanding to the application ecosystem	Refocusing to a selective target market and aligning with powerful actors i.e. Targeting mobile markets and limited industry customers. Collaborate with Amazon, Microsoft

CHAPTER 6. DISCUSSION

The ambiguous nature of nascent ecosystems presents a strategic challenge for entrants (i.e. new ventures or established firms) who aspire to secure a strategic position by introducing a digital platform. In this context, managers must determine the architecture, the scope, and the overall positioning of the platform with a lack of clarity about the configuration of ecosystem activities to deliver a value proposition, and the required capabilities to succeed in the would-be ecosystem (Santos and Eisenhardt, 2009; Moeen et al., 2020). Managers of an established firm face unique challenges in this regard since they also need to incorporate constraints of their organizational legacies in their decision making (Gawer and Phillips, 2013; Cozzolino et al., 2018). This research project aimed to understand the dynamic of platform positioning strategies of an established firm in a nascent ecosystem by answering two interrelated questions: *How does an established firm develop platform positioning strategies for a nascent ecosystem?* and *Why the positioning strategies shift over time?* By addressing these questions, this study provides theoretical and practical insights related to the challenges of platform creation in a nascent ecosystem by an established firm.

This chapter describes a processual framework of platform positioning in a nascent ecosystem, which is the core contribution of this study. It also describes the thesis contributions to the extant theory and implications to the managerial practices. This chapter consists of three subsections. The first section (6.1) describes the platform positioning strategies identified from the empirical findings. Based on these positioning strategies, a processual framework of platform positioning in a nascent ecosystem is developed. The framework brings a dynamic perspective toward platform positioning where the firm switch between three distinct positioning strategies. The framework also describes the cognitive dimensions i.e. strategic frame which underlies the emergence of positioning strategy at a certain point in time. The following subsection (6.2) describes the theoretical contributions of this study to research on nascent ecosystems, platform creation, and incumbents' response to technological changes. Finally, the chapter concludes with the practical insights for managers which derived from this research.

6.1 A Process Model of Platform Positioning in a Nascent Ecosystem

The core contribution of this study is a process framework that explains the dynamics of the platform positioning strategy of an established firm to achieve a strategic position in a nascent ecosystem. Prior research examines platform positioning within the context of established ecosystems and typically offers two approaches to achieve a competitive position in an ecosystem (Eisenmann et al., 2011; Suarez and Kirtley, 2012; Cennamo and Santaló, 2013; Cennamo, 2019). The first approach emphasizes *domination*, and suggests aiming for a position where it promises the fastest growth and the largest potential market (Hagiu, 2014). With this approach, firms benefit by embracing an aggressive strategy which allows them to quickly established installed base of users and complementors (Eisenmann et al., 2006). The second approach emphasizes for *differentiation* by claiming a position with limited rivalry (Suarez and Kirtley, 2012). Here, firms benefit through an evolutionary approach where the firms adapt to emergent market needs and build a distinctive positioning (Cennamo and Santaló, 2013). Accordingly, prior research suggests for a platform creator to choose among these two positioning approaches based on the ecosystem structure and certain market characteristics, and march its resources to scale the platform as well as to occupy the targeted position (Adner, 2006; Zhu and Iansiti, 2012; Cennamo and Santaló, 2013).

In contrast, I find that platform positioning in a nascent ecosystem is far from straightforward and involves a dynamic process that is not entirely consistent with the suggestions from prior works. This study demonstrates that rather than following a linear trajectory, a platform creator switches between three positioning strategies in developing a strategic position in a nascent ecosystem. Accordingly, this study introduces three platform positioning strategy that an established firm can follow to position its new platform in a nascent ecosystem, namely: (1) *Analogous positioning*, (2) *Expansionary positioning,* and (3) *Downward positioning.* These strategies have distinct strategic objectives and entail different choices of platform architecture as well as the market scope. In the following paragraphs, I describe in detail these positioning strategies and the strategic frames underlying each of the positioning strategies. Then, a theoretical framework which describes the process of positioning strategies is presented.

In the analogous positioning strategy, firms position the new platform close and in parallel with its (non-platform) ecosystem and capability legacy. The strategic objective of this strategy is to leverage as much as possible the firms' existing technical capabilities, the network of customers and partners, and the market reputation. Firms adopting the analogous positioning strategy tend to choose a certain technical layer, which the platform

will operate, in line with their technical capabilities. Accordingly, the firms will focus on targeting their existing customers and partners to form an installed base of users and complementors. The analogous positioning strategy allows the firm to form an installed base and establish an initial market position relatively fast due to its longstanding relationship and a good understanding of the market. Moreover, positioning the platform business in line with the main non-platform business increases internal acceptance as well as reduces the potential to violate expectations of essential resource providers and other external stakeholders (Benner and Ranganathan, 2012; Gawer and Phillips, 2013). Therefore, this strategy can be effective in the initial phase of entry into a nascent ecosystem. Nevertheless, firms adopting this strategy need to have integrative capabilities (Helfat and Raubitschek, 2018) to be able to leverage its technological capabilities and its network of customers and partners to form a new platform-based business.

In the expansionary positioning strategy, firms position the new platform as broad as possible to maximize the potential of value creation and value capture and to shape the ecosystem's progression to its advantage. The strategic objective of this strategy is not to establish domination in multiple domains (Eisenmann et al., 2011), but to explore multiple emerging opportunities in different domains. Firms adopting this strategy aims to participate in most or all technological layers by developing a *full-stack* platform. The platform will likely address multiple market domains which not necessary within the firms' organizational boundary. Moreover, this strategy is characterized by a proactive ecosystem building efforts where firms aim to exert their influence in shaping the trajectory of the nascent ecosystem's progression. The expansionary positioning strategy allows the firm to '*cast the net*' as wide as possible in order to get first-mover advantages and gain footholds in some areas (Suarez et al., 2015). As such, this strategy can be beneficial when the ecosystem starts to gain market traction. However, this strategy is more resource intensive and require high innovation capabilities to develop new technological and organizational competencies. It also requires superior orchestration capabilities (Wareham et al., 2014) to coordinate a broad platform ecosystem.

Finally, in the downward positioning strategy, firms calibrate its position to the point that minimize ecosystem contestations and better aligned with their technical and relational limitation. The strategic objective is to achieve alignment with other critical actors in the ecosystem and to improve a strategic fit between the existing capabilities and opportunities. This strategy entails retreating some market positions and relinquishing some technological control to drive alignment. Firms adopting the downward positioning strategy will focusing the platform on selective technical layers

and market scope that would minimize ecosystem contestation, but still enable differentiation for a distinctive position (Cennamo and Santaló, 2013). Nevertheless, this strategy only applicable in the latter stage of the ecosystem's progression when the managers have a better visibility of the structure of nascent ecosystems, especially related to indirect links among actors (Adner, 2017) and have better estimation of the capability gaps (Lavie, 2006). Additionally, this strategy requires superior coopetition capabilities (Hannah and Eisenhardt, 2018) to simultaneously manage collaboration and competition with other platform providers which operate in different technological layers. Table 11 provides a comparison of the three positioning strategies.

Table 11: The comparison of platform positioning strategies

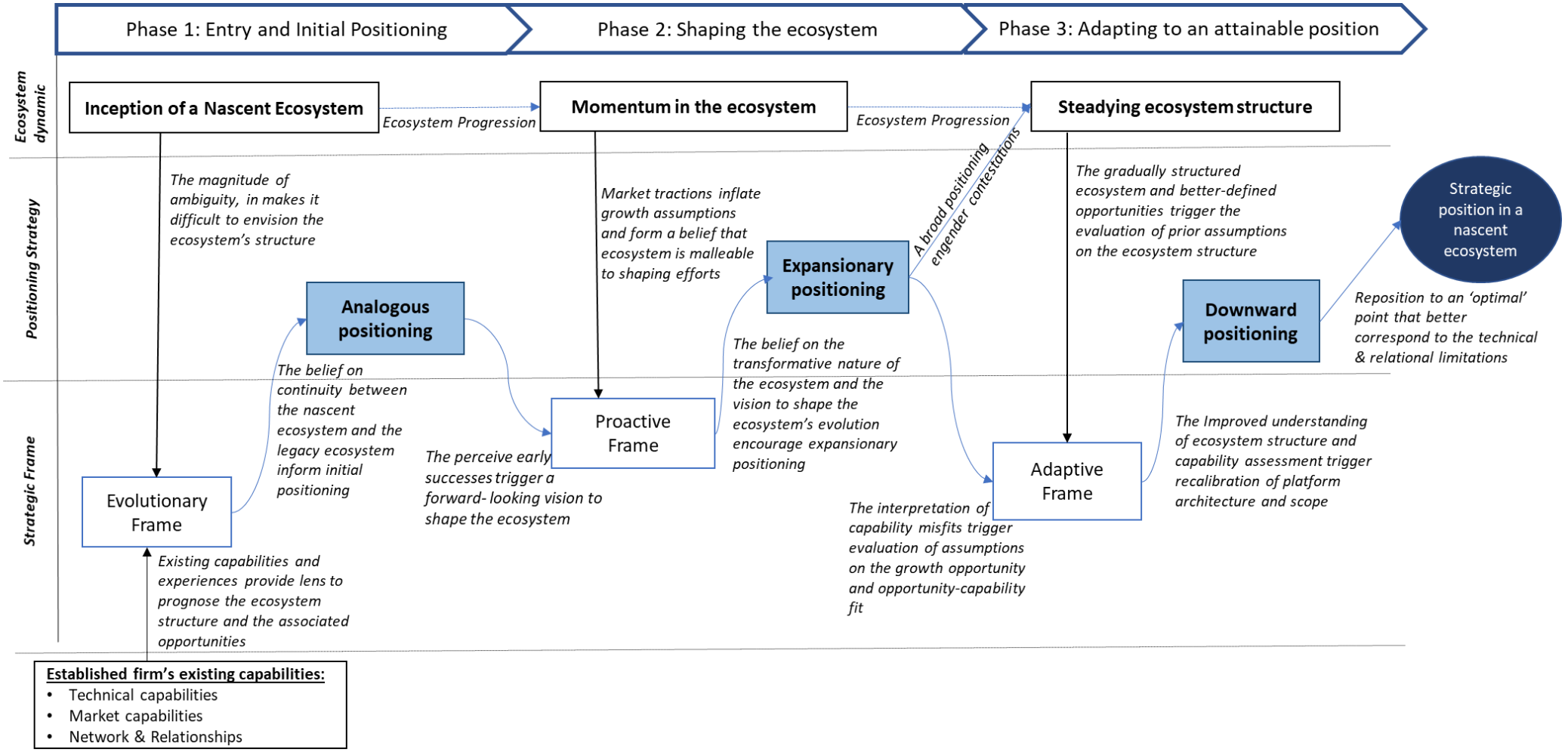
Analogous Positioning Strategy	**Expansionary Positioning Strategy**	**Downward Positioning Strategy**
Definition A strategy to position a new platform close and in parallel with the firm's (non-platform) ecosystem and capability legacy.	***Definition*** A strategy to position a new platform as broad as possible to maximize the potential of value creation and value capture and to shape the ecosystem's progression.	***Definition*** A strategy to calibrate a platform position to the point that minimizes ecosystem contestations and better aligned with the firm technical and relational limitations.
Underlying strategic frame Evolutionary frame	***Underlying strategic frame*** Proactive frame	***Underlying strategic frame*** Adaptive frame
Platform architecture Focus on <u>one</u> technological layer which <u>in line</u> with the firm's technological capabilities legacy.	***Platform architecture*** Focus on <u>most or all</u> technological layers which <u>extend beyond</u> the firm's technological capabilities legacy.	***Platform architecture*** Focus on <u>selective technological layers</u> which better correspond to the firm's <u>existing</u> technological capabilities
Platform market scope A <u>narrow</u> target market consists of existing customers and partners from the legacy ecosystem.	***Platform market scope*** A <u>broad</u> target market consists of both existing and <u>multiple</u> new types of customers.	***Platform market scope*** A selective target market consists of existing and <u>limited</u> new types of customers.
Required capabilities Superior integrative capabilities.	***Required capabilities*** Superior innovation and orchestration capabilities.	***Required capabilities*** Superior coopetition capabilities

Moreover, this study also reveals the cognitive drivers that underlie each positioning strategy. Specifically, I find three unique strategic frames that drive the adoption of a certain positioning strategy, namely: (1) *Evolutionary frame*, (2) *Proactive frame*, and (3) *Adaptive frame*. An evolutionary frame entails managers' belief on the continuity between the firm's ecosystem legacies and the nascent ecosystem. This strategic frame derives from the managers' assumptions that the nascent ecosystem will

provide modest growth opportunities and the required capabilities to those opportunities will be consistent with the firm's legacy capabilities. Firms with the evolutionary frame tend to adopt the analogous positioning strategy since they expect continuity between the past and the future. On the contrary, a proactive frame entails managers' belief on the transformative nature of the nascent ecosystem and vision to shape the ecosystem's evolution. This strategic frame derives from the managers' assumption that the nascent ecosystem will provide transformational growth opportunities. It also derives from the managers' forward-looking vision (Gavetti, 2005) regarding the firm's future capabilities required to shape the nascent ecosystem. This strategic frame reminiscent of Dutton's (1992) work on the opportunity frame, where managers consider a discontinuous change as a potential for entrepreneurial growth. As such, this strategic frame will likely to lead to an expansionary positioning. Lastly, the adaptive frame entails managers' belief on the need to adapt to the changing ecosystem dynamic and to adjust their prior assumptions toward the nascent ecosystem. The adaptive strategic frame is formed when managers perceived some degree of certainty regarding the ecosystem structure and can better define the opportunities and their fit with the existing capabilities. Firms with the adaptive frame typically adopt a downward positioning strategy as they perceive a more realistic position to target.

In addition, this study reveals the temporal dynamics of these positioning strategies according to the longitudinal analysis at TELECO. In particular, I propose a processual framework that explains a pathway of platform positioning in a nascent ecosystem by an incumbent. The framework suggests that the process of platform positioning in a nascent ecosystem involves a dynamic process which influences by the firm's strategic frame in a different milestone of the ecosystem's evolution. In the model, I describe an alternative pathway for established firms in positioning its new platform to achieve a strategic position in a nascent ecosystem that is not predicated by prior research. The framework explains *when* a certain platform positioning strategy most likely to occur and *why* the positioning strategy changes. Specifically, the model shows how the strategic frame evolve as the ecosystem progress and realities unfold, and how it triggers the emergence of a positioning strategy and instigate a platform repositioning. In doing so, I captured the cognitive dimensions of platform creation and ecosystem strategy, which are rarely considered by prior studies (Khanagha et al., 2020). The process model is presented in Figure 20, in the next page. A detailed explanation of the model is provided in the next paragraphs.

Figure 20: A process model of platform positioning strategies in a nascent ecosystem by an established firm



In the initial phase, managers of an established firm sense emerging opportunities in a nascent ecosystem but lack of reference in envisioning the ecosystem structure and the required capabilities to capture those opportunities. During the inception phase of a nascent ecosystem, the enabling technology has emerged, but the market applications and the commercial value of it are highly unclear (Dattee et al., 2018). Actors involving in this early stage of a nascent ecosystem's formation lack information on what technology to develop, which market to target, and how the configuration of ecosystem activities would look like (Moeen et al., 2020); hence, determining an effective competitive position become a challenging endeavour. Faced by a novel and ambiguous environment, the decision makers tend to create cognitive simplifications and representations based on the environment that they are familiar with (Gavetti et al., 2005). Therefore, the firm's strategic frame in this phase is more likely informed by legacy ecosystem and capabilities given the magnitude of ambiguity in this phase.

Accordingly, the managers tend to prognose the ecosystem structure and the associated growth opportunity through the lens of existing capabilities and experiences from the legacy ecosystem. Prior experience and knowledge from the legacy ecosystem bring experiential wisdom and insights in which actors apply and develop them to a novel setting (Benner and Tripsas, 2012). The assumptions of conformity between the nascent ecosystem and the firm's legacy ecosystem and capabilities are likely to be the main driver for entry decision and positioning strategy in the initial phase of a nascent ecosystem. In this case, managers expect for the applicability of the firm's technological expertise and knowledge base to a new domain (Cattani, 2006). Thus, the managers tend to expect that many elements in the legacy ecosystem will be applied to the nascent ecosystem and, the required capabilities to capture emerging opportunities will be consistent with the firm's legacy capabilities (i.e. *evolutionary frame*).

The evolutionary frame suggests that similar capabilities and positioning that made the firm successful in the legacy ecosystem are still applicable and will help them succeed in the new ecosystem. Such a frame may filter strategic options that are distant to the firm's knowledge and capabilities (Gilbert, 2006). Thus, an established firm at this phase will likely to position the platform *analogous* to its positioning in the legacy ecosystem. The analogous positioning, which focuses on a technological layer that aligns with its technological strength, enables the firm to establish technical control over a specific layer of the overall platform architecture and gained an initial installed base. Moreover, positioning the new platform closer to the firm's legacies at this early stage minimizes

the potential to violate expectations of essential resource providers and other stakeholders that could hamper the firm's overall initiatives in a nascent ecosystem.

In phase 2, managers tend to interpret the early success of forming an installed base and establishing initial positioning as positive signals to increase the firm's effort to capture more opportunities. At the same time, market tractions and excitements toward the nascent ecosystem tend to upsurge, which inflate the growth expectations of the managers. In this phase, the nascent ecosystem starts to gain momentum as an important technological milestone has been achieved (e.g. feasible technical design) and commercial value becomes more apparent. Following this milestone, the market expectations and enthusiasm upsurge, which create a new 'hype' (Grodal and Granqvist, 2014) toward the nascent ecosystem and increase entry by new actors. Accordingly, the managers tend to perceive the increase in market tractions and new entrants as a signal of huge opportunities. In addition, the perceived success in launching the platform in the earlier phase increases managers' confidence to capture more value. At the same time, the firm's engagement in a number of collaborative activities with new and unfamiliar partners expand knowledge boundaries and expose the firm with new opportunities (Lavie and Rosenkopf, 2006). Accordingly, it improves the managers' awareness of the transformative nature of the nascent ecosystem and the opportunity to shape the nascent ecosystem. Consequently, the managers tend to cognitively frame the nascent ecosystem and its associated opportunities through a forward-looking lens rather than through prior legacies as in the previous phase. Managers in this phase envision the ecosystem structure where they could become a prominent player and capture more value that will bring a transformational growth to the firm. Also, they project new capabilities required to shape the nascent ecosystem and confidence to fulfil any capability gaps in the future. The changes in how managers interpret the nascent ecosystem and its related opportunity eventually led to the adoption of a proactive frame.

The shift to a proactive frame eventually leads to *shaping* behaviours (Gavetti et al., 2017; Rindova and Courtney, 2020) that encourage the firm to influence the trajectory of the ecosystem's evolution to its advantages. In phase 2, the ecosystem tends to be gradually crowded by new entrants; yet, positions are still up for grabs. The proactive frame results in an increased intention and commitment to capture a broader set of emerging opportunities and steering the ecosystem's progression toward its envisioned structure. At this point, the firm will likely shift its positioning strategy to the *expansionary positioning* which allows them to maximize the potential value capture and value capture, and the opportunity to shape the ecosystem.

In phase 3, the firm will likely adopt an adaptive frame since managers have a better estimation of the ecosystem structure, the growth opportunity, and the opportunity-capability fit. At this phase, the managers evaluate if the ecosystem's progression aligns with their prior assumptions. After observing the progression of the ecosystem and the efficacy of the positioning strategy, the managers have a better understanding of the structure and feature of the ecosystem (Jacobides and Billinger, 2006) such as the other actors' competencies and roles, capabilities shortages, and potential contestations. Moreover, the managers tend to perceive capabilities limitations that unfold as the ecosystem progress. As the roles and interdependencies of actors become more apparent, it allows the managers to evaluate their prior assumptions of the ecosystem structure and better defined the emerging opportunities and their fit with the existing capabilities. At this point, managers have a better estimation of the ecosystem structure and related opportunities it can capture based on experiential learning of prior positionings (Gavetti and Levinthal, 2000). They also tend to have a better understanding of the expectations of the essential customers and complementors toward the platform and the firm's role in the ecosystem. Overall, in this phase, managers perceive that ecosystem progress in a way that does not fully align with their prior expectations as they consider the ecosystem to be increasingly competitive and the existing capabilities are only adequate to explore a narrower set of better-defined opportunities. These revised assumptions eventually form a new strategic frame that favours adaptation to the changing ecosystem landscape (i.e. *adaptive frame*).

The adaptive frame eventually triggers a *downward positioning* strategy. At this stage, the platform positioning aims to adapt to the emergent ecosystem dynamics and capabilities limitations. The broad exploration activities resulted from the expansionary positioning become an important source of information in determining a more optimal position the firm should target. As a result, the firm will recalibrate the platform architecture and market scope to the point that better corresponds to its technical and relational limitations. The platform architecture tends to be downward calibrated to selective technological layers that better aligned with its technical capabilities, while still enable differentiation and secure future competitiveness. Moreover, the platform's market scope will be refocused on selective markets that would minimize potential contestations with existing customers/users and more align with their expectations. As the firm focuses on certain technological layers and selective market, the positioning strategy tends to result in a more *coopetition* relationship (Khanagha et al., 2020) with other platform providers that operate in different layers. In such a way, the firm could

avoid head-to-head competition with a powerful actor. Eventually, the repositioning enables the firm to achieve a competitive position in the nascent ecosystem.

Although this theoretical framework is based on a single case, it is also important to note that this process model is verifiable in other cases and settings. The proposed pathway can be observed in many large established firms attempting to compete in a nascent ecosystem shaped by a layered platform architecture. The introduction of the Industrial Internet of Things (IIoT) platform by General Electric (GE) is illustrative of our proposed pathway. In 2013, GE introduced an IIoT platform that specialized in managing data & connections of machines by leveraging its expertise in machines design and exploiting its network of industrial customers (e.g. factories, aircraft). In 2016, the CEO decided to expand the investment in the industrial IoT (New York Times, 2018). As a result, the platform was broadened to include multiple technology layers such as cloud-based software/applications, device/sensors management, and data analytics. At that time, the platform was positioned as the "*operating system for the industrial internet*" with complete features to serve "*the wider industrial world*" (New York Times, 2018). Nevertheless, two years later GE decided to move away from the *all-purpose* platform positioning and decided to refocus on specific industrial applications for selective industry customers. Overall, the GE case shows how the process model resulted from this study can be verified in other similar contexts.

6.2 Implications for Theory

This subchapter discusses the contributions of this study to the various streams of innovation and strategic management literature. In particular, this study aims to contribute to the study on strategy in a nascent ecosystem, platform creation, and an incumbent's response to technological changes. The following paragraphs describe the contributions to the three research streams.

Platform positioning strategy in a nascent ecosystem. Although established firms increasingly adopt platform strategies (Evans and Gawer, 2016) to capture opportunities of digital technologies, how firms develop a new platform in a nascent ecosystem remain unclear (Dattee et al., 2018). One of the main contributions of this study is to examine how established firms develop platform strategy in ambiguous settings such as nascent ecosystems, where actors' roles are unspecified, and positions are up for grabs. This study demonstrates that when entering a nascent ecosystem a platform creator encounters strategic dilemmas in determining the platform architecture and the market scope due to the lack of knowledge on the ecosystem structure, the growth potential, and the fit between the opportunity and its existing capabilities. By identifying the key strategic considerations faced by the decision makers, this study extends the discussion on the entry strategy for nascent ecosystems (Eggers and Moeen, 2018). Moreover, prior research offers a relatively static view of positioning strategy within an established ecosystem where the roles of actors and their interdependencies relatively clear (Adner, 2017). Through a longitudinal analysis, this study reveals the dynamic of platform positioning strategies. Rather than adopting a consistent strategy throughout an ecosystem evolution, this study shows that a platform creator alternates between distinct positioning strategies over time. In doing so, this study brings a processual perspective to uncover how a certain strategy emerges and shifts at different milestones of the ecosystem evolution. Hence, this study responds to a call for taking into account temporality when studying platform strategies (McIntyre and Srinivasan, 2017).

Another central contribution of this study is a theoretical framework that explains how an established firm position its new platform in a nascent ecosystem. This study offers an alternative pathway of platform positioning beyond the widely-known *get-big-fast* approach (Eisenmann et al., 2006) or an evolutionary *step-by-step* approach (Snihur et al., 2018) in platform strategy. Specifically, I identify an overlooked pathway of platform positioning which entails initially positioning the platform analogous to the firm's position in its legacy ecosystem; then, expand the positioning to maximize

potential value creation and capture, only later to adapt the positioning to the point that better correspond with the firm's technical and social limitations. Rather than positioning a new platform distant from the firm's legacies (Altman and Tripsas, 2015), this study reveals that position the platform analogous to its legacy (non-platform) ecosystem can be beneficial in the initial phase of a nascent ecosystem. Positioning the platform analogous to the firm's legacies can solve the 'chicken-egg problem' of a new platform (Hagiu, 2014) since the firm can leverage its network of customers and partners to form an initial installed base. It may also reduce legitimacy challenges in new platform creation (Khanagha et al., 2020; Garud et al., 2020) by conforming with the expectations of resource providers. Nevertheless, I found that the platform creator could benefit by shifting to expansionary positioning in the later phase. In contrast with prior works (Dunne and Dougherty, 2016; Dattee et al., 2018), we found that delaying resource commitment when the ecosystem starts to gain a momentum can be counterproductive because it may contradict with the growth aspirations and prevent the firm to influence the course of ecosystem's evolution. Expanding the platform positioning allows the firm to explore multiple emerging opportunities and enable gain a first-mover market position (Suarez et al., 2015), which gives reputation advantages and privilege to shape the ecosystem's future. Instead of sustaining such an aggressive strategy (Eisenmann et al., 2011), this study suggests that the platform creator could benefit from downward its position in the later stage, especially when the ecosystem becomes gradually structured and competitive. At this stage, an expansionary positioning can lead to intense competition with important actors that can be detrimental to the ecosystem's progression (Ozcan and Santos, 2015). Moreover, the capability misfit which results from expansive explorations tends to increase organizational tensions (Gawer and Phillips, 2013). Therefore, a downward positioning strategy that could minimize potential contestation and better corresponds with its technology and market strength will enable the firm to establish a competitive position in the ecosystem. Overall, the processual framework uncovers the interplay between a firm strategy and nascent ecosystem evolution and reveals how and when certain positioning strategies could be beneficial in different milestones of ecosystem evolution.

Finally, this study reveals the competitive dynamics of nascent digital ecosystems shape by layered-modular architecture (Yoo et al., 2010; Sturgeon, 2019). The research setting of this study, the IoT ecosystem, represents multi-level competitions of platform within and across layers (Porter and Heppelmann, 2014). I show that in this setting, a platform creator encounters multiple options of entry and positioning based on different

technical layers and market applications. In this case, the role of an actor in the platform ecosystem goes beyond a binary choice of *keystone* versus *peripheral* (Iansiti and Levien, 2004b; Gawer and Cusumano, 2008; Cennamo and Santaló, 2013). This study adds a conceptual precision by theorising platform positioning strategy based on the range of technological layers and market applications a platform creator would cover. Moreover, this study also demonstrates how a platform creator could reposition itself by increasing or decreasing the scope of the technological layers and market applications. The research setting of this study also implies that the *winner-take-all* logic where platforms with large size of network win the entire market (Lee et al., 2006) is less likely to occur in an ecosystem consisted of nested platform ecosystems such as the IoT ecosystem. In this setting, it is unlikely for a single firm to dominate all technological layers due to the generative nature of the IoT and diversity of end-users. In such ecosystem, a shared leadership (Adner, 2017) and mutualism relationship (Khanagha et al., 2020) among different platform providers are expected to dominate the competitive dynamics rather than the monopolistic winner-take-all approach. Overall, this study teases out further nuances of platform competition dynamics (Cennamo, 2019) and enhances our understanding of how platform competition plays out in an ecosystem characterized by layered modular architecture.

Cognitive dimensions of platform creation. Second, this study brings cognitive dimensions on platform creation to better understand the complexities of platform dynamics in a nascent ecosystem (Dattee et al., 2018). Prior studies on platform strategy have predominantly focused on technological and economic dimensions (e.g. Baldwin and Woodard, 2009; Eisenmann et al., 2011) and rarely consider the cognitive aspects of platform creators. This study reveals that managerial cognitions play a crucial role in platform creation, especially in the highly ambiguous context such as nascent ecosystems. Specifically, this study shows how the choice of platform architecture and the market scope is influenced by the firm's strategic frame which entails managerial assumptions of the ecosystem structure, the growth opportunities, and their fit with capability. Rather than performing a rational value chain analysis (Adner, 2006; Jacobides et al., 2006), I found that in nascent ecosystems managers make a prognosis on the activity configurations and interdependencies among actors since they lack knowledge during the early-stage of ecosystem formation. The managers also envision technological features that will be essential when the ecosystem matures in relation to the firm's capabilities, without really understand the trajectory of technological evolution and the market

demands (Moeen et al., 2020). The empirical findings also reveal that it is not only capabilities that affect firms' decision in a nascent ecosystem (Helfat and Lieberman, 2002; Moeen, 2017), but also cognition about those capabilities and their fitness with the anticipated opportunities. Interestingly, this study also shows how initial capabilities and legacy ecosystems inform decision making in a highly ambiguous environment. In line with the study by Gavetti and colleague (2005) on analogy thinking, I find that decision makers tend to transfer their beliefs about prior experiences to an ambiguous situation which inform the strategic frame. In addition, this study demonstrates how the strategic frame evolves and how it results in the changes in the platform architecture and scope. Overall, this study reveals that platform creators face more complex strategic options in determining the optimum platform position which goes beyond the rational technological or economic trade-offs as advocated by prior research (e.g. Zhu and Iansiti, 2012; Cennamo and Santaló, 2013; Seamans and Zhu, 2014). By incorporating the cognitive dimensions, this study provides a more nuanced understanding of the platform creation process by an established firm (Hagiu, 2014; Dattee et al., 2018; Khanagha et al., 2020).

By explicating cognitive factors as a strategic driver of repositioning, this study also contributes to the research on platform repositioning. Prior research portrays repositioning decisions as a rational response to the new competitive dynamics in the ecosystem (Wang and Shaver, 2014; Seamans and Zhu, 2017). In this sense, external drivers such as the emergence of competition or changed in the customers' preferences are considered as the main factors in platform reposition (Cennamo, 2019). Nevertheless, this study demonstrates that platform repositioning in a nascent ecosystem begins with the changes of the firm's strategic frame which represents managers' belief on the ecosystem structure, the growth opportunities, and their fit. In this case, managers *anticipate* the potential of competition and act based on the anticipation even before they experience the competition. Moreover, this study suggests that platform repositioning occurs mainly because of the change of managers' assumptions toward the growth opportunities and their fit with the firm's capabilities. In this case, platform repositioning in nascent ecosystems resembles 'pivoting' by new ventures (Kirtley and O'Mahony, 2020) where strategic changes occur due to the shift on managers' assumptions that underly their current strategy. Thus, this study enhances our understanding of the antecedents of platform repositioning.

Lastly, this study adds to the extant ecosystem literature by providing a microfoundations perspective (Felin et al., 2015; Foss and Pedersen, 2016) into strategies emergence in an ecosystem setting. This study demonstrates that managerial cognitions

on the structure of an ecosystem (i.e. actors, roles, and interdependencies) shape a firm's behaviour in a nascent ecosystem. In this vein, this study in line with prior works that examined the interplay between industry structure and managerial cognitions (e.g. Nadkarni and Narayanan, 2007; Nadkarni and Barr, 2008). This study extends these works by proposing that, in the context of ecosystems, a firm not only develops assumptions about the rules of competition, but also interdependencies of partners or complementors for value creation and value capture. This study also reveals that a firm's strategic actions are influenced by the way managers frame the nascent ecosystem. Specifically, I find that managers frame the nascent ecosystem relative to their legacy ecosystems (Benner and Tripsas, 2012) since the lack of references in the initial stage of ecosystem emergence. Our study further reveals that managers who cognitively frame the nascent ecosystem through a forward-looking lens (Gavetti, 2005) tend to acknowledge the transformative nature of the ecosystem and sense a broader set of emergent opportunities. On the contrary, when the strategic frame is heavily attached to the firm's past legacies (Tripsas and Gavetti, 2000), managers tend to overlook the transformative potential of a nascent ecosystem. Therefore, in line with previous studies (e.g. Gavetti et al., 2005), I found that a competitive position in a nascent ecosystem may lie in the cognition of managers. Overall, this study enhances our understanding of the microfoundations of ecosystem strategy (Foss and Pedersen, 2016; Adner, 2017) by explicating the interplay between the ecosystem dynamics and managerial cognition.

Incumbents' response to technological changes. By investigating the strategy process of an established firm in a nascent ecosystem, this study also contributes to a broader literature of incumbents' adaptation to technological changes. Prior strategy literature generally considers technological changes as an exogenous factor in which incumbents' response through adaptation (Ansari and Krop, 2012; Eggers and Park, 2018). This study reveals that incumbents are not only reactively adapting to the environmental changes, but also can proactively *shaping* the trajectory of technology and business landscape to their advantages (Gavetti et al., 2017). Our empirical findings suggest mechanisms in which an incumbent advance its preferred evolutionary path of a nascent ecosystem through stimulating collective actions among its longstanding partners and users (Garud et al., 2002) and establishing a cognitive referent by leveraging its reputation in the legacy ecosystem (Santos and Eisenhardt, 2009). Nevertheless, the case of TELECO shows that an incumbent tends to adapt its response in the latter stage, especially when they start to experience tensions with the existing customers or the other

important partners. The longitudinal analysis precisely shows *when* firms apply the shaping and adapting approaches in different milestones of the ecosystem evolution. Overall, this study reveals the dynamic and emergent nature of incumbents' response to technological changes in contrast to the deliberate and static approach than been portrayed in prior research (Kammerlander et al., 2018).

Finally, this study extends the research investigating the role of managerial cognition to firms' responses toward emerging technologies (Kaplan, 2008a; Eggers and Kaplan, 2009; Eggers and Kaul, 2017) by identifying a different set of strategic frames that underlie a firm's strategic actions over time. This study introduces three strategic frames an incumbent firm had which form by how managers understand ambiguous opportunities concerning the emerging technology (Kaplan and Tripsas, 2008) and how managers evaluate the fit between the internal capabilities and the opportunities (Eggers and Kaplan, 2013). For example, I found that when managers believe in continuity with current technological expertise (Cattani, 2006), it tends to result in a strategic frame that encourages for an evolutionary approach toward the emerging technology. In contrast, when managers believe in the 'superior opportunity' of the emerging technology (Gavetti, 2012), it will likely result in a strategic frame that leads to a more transformational approach. The longitudinal analysis offered by this study also relaxes the assumption that considers the cognitive frame as relatively static and immutable (Tripsas and Gavetti, 2000; Danneels, 2011a; Benner and Tripsas, 2012) by showing the dynamic of a firm's strategic frames over time. In particular, this study reveals how successful explorations or experimentations (Ott et al., 2017) and experiential learning (Gavetti and Levinthal, 2000) can trigger changes in the strategic frame. In this vein, we add to the recent study that argues for cognitive flexibility (Raffaelli et al., 2019) by explicating when and why a cognitive frame changes and the implication to the firm respond to technological changes.

6.3 Managerial Implications

Our study also provides some important lessons for practitioners that engage in digital platform creation in a nascent ecosystem. First, the research has demonstrated that entering a nascent ecosystem through a platform introduction can secure the future competitiveness of an established firm if successfully managed. By introducing a digital platform in the early stage of ecosystem formation, an established firm not only can gain potential advantages through network effects but also can influence the course of the ecosystem's future to its advantage. However, this study shows that devising a platform strategy in nascent ecosystems entails strategic challenges that result from ambiguity concerning the ecosystem structure and the associated opportunities; thus, require a more dynamic approach to successfully navigate these challenges.

This study offers an alternative pathway that can guide managers in developing and positioning a new digital platform in a nascent ecosystem. The proposed pathway especially relevant for established firms entering a nascent ecosystem that is formed by digital technologies that have a generative potential to produce a plethora of product-market applications (e.g. IoT, Blockchain, 5G). This study suggests that in the initial phase of a nascent ecosystem, managers can benefit by designing the platform in line with the firm's technological capabilities and organizational legacies. In this case, choosing a technical layer and a market application that is closer to the firm legacies will be less risky and costly and can prevent backlash from the internal or external organizations. Nevertheless, this approach allows the firm to form an installed base as well as establish an initial market positioning by leveraging the firm's existing reputation and the network of customers and partners. However, this study suggests for the firm to expand its positioning as broad as possible when the ecosystem starts to gain market traction and when the platform has achieved a critical mass of users. It can be done by adding multiple new features for the whole technological layers and broadening the market segments. Expanding the platform positioning in this stage will increase its visibility and presence in the broader ecosystem and will allow the firm to explore multiple emerging areas. However, sticking with an aggressive approach in the later stage, especially when the ecosystem becomes gradually structured, will expose the firm with increased organizational tensions and ecosystem contestations. To avoid a hostile competition, the firm could opt to surrender some part of technical control and initiate more strategic partnerships with other powerful platform providers. At this phase, I find that it is beneficial for the firm to calibrate the platform by focusing on selective technological features and markets that better align with its technical and relational limitations and

minimize potential contestations. As the ecosystem becomes gradually structured, managers can analyse the activities and actors in which the firm may have no control and have no direct contact to get a better overview of the indirect links among actors in that crucial for the ecosystem to coalesce. In this case, continuous environmental scanning and experiential learning will help the managers in devising an optimal positioning.

Finally, the dynamic approach of platform positioning in nascent ecosystems required not only organizational flexibility but also cognitive flexibility. This study suggests that while it is technically feasible to change the architecture and scope of the platform, the changes only occur when decision makers reframe their mental models. This study finds that managers need to appreciate the uncertainty and ambiguity surrounding strategy-making in nascent ecosystems. In addition, managers should be willing to test their assumptions and be ready to change the course of action once it contradicted the prior belief. I found that maintaining a high degree of exploration activities is necessary to foster a flexible cognitive frame. The performance feedback from the exploration activities will increase the managers' awareness of the emergent dynamics in the ecosystem and help them to clarify some misconceptions in their strategy. A flexible cognitive frame regarding emerging opportunities, the firm's capabilities, and competitive boundaries will help to instigate strategic changes that necessary to adapt to the evolving nascent ecosystems. Furthermore, my observation at TELECO suggests that an established firm could benefit by organizing its platform initiatives as an independent unit separated from the non-digital platform business. The organizational separation will provide substantial flexibility for the managers to change the course of the platform development following the emergent dynamics in the nascent ecosystem.

CHAPTER 7. CONCLUSIONS

This chapter concludes the report of this thesis research in the area of innovation management. It consists of two subsections. In the first subsection (7.1), the summary of findings and contributions is presented. Then, the second subsection (7.2) discusses the limitation of this study and the avenue for future research.

7.1 Summary of Findings and Contributions

By drawing on a longitudinal case study of a platform strategy development in a nascent ecosystem, this study offers theoretical insights that extend the understanding of platform creation in a highly ambiguous and uncertain context. The processual model explains three platform positioning strategies that an established firm can apply to achieve a competitive position in a nascent ecosystem. In particular, the model explains the different types of platform design and market scope that a firm may choose according to a different phase of ecosystem evolution. Therefore, this model offers a dynamic view on platform positioning as opposed to the static approach that has dominated platform research. Moreover, this model reveals the strategic frame i.e. managerial assumptions that guide the emergence of the platform strategy and trigger strategic changes.

In doing so, the model contributes to the growing body of literature on strategy in nascent ecosystems or industries as it seeks to address the challenges of strategy making under extreme ambiguity and uncertainty. Extensive research has recognized various tensions and organization challenges faced by firms in the early-stage of an ecosystem or industry formations (Santos and Eisenhardt, 2009; Hannah and Eisenhardt, 2018; Eggers and Moeen, 2018). While research has offered strategies and mechanisms of navigating evolving ecosystems for firms with product-based offerings (e.g. Benner and Tripsas, 2012; Anthony et al., 2016), the strategy for developing platform-based offerings in nascent ecosystems is less explored (Khanagha et al., 2020). Thus, this study extends the existing research on nascent ecosystems by explicating the strategy of navigating uncertainty and ambiguity from the perspectives of a platform creator. By adopting a dynamic view on the platform creation process (McIntyre et al., 2020) this study provides further details on the emergence process of platform strategies and their temporal dynamics. In addition, this study extends research on platform strategy by going beyond technological and economic considerations on platform creation. Extant research on platform strategy tends to portray decision making on platform creation as rational choices between technological or economic trade-offs (e.g. Cennamo and Santaló, 2013;

McIntyre and Srinivasan, 2017). This study reveals that in an ambiguous and uncertain setting such as nascent ecosystems, platform decisions are predominantly shaped by managerial cognitions. Specifically, the model describes the strategic frame that shape platform strategies, which entails managers' assumptions on the ecosystem structure, growth opportunity, and capability-opportunity fit. I further show how the changes in the strategic frame instigate changes in the platform strategy. Hence, this thesis provides novel insights on the dynamic of the platform creation process by explicating the interplay between, the ecosystem dynamics, the managerial cognitions, and the platform strategy.

Moreover, the findings of this study enhance the understanding of the incumbent's responses to technological changes. Extant research generally suggests technological changes as an exogenous factor in which established firms adapt to the changes (Eggers and Park, 2018). Nevertheless, the case of TELECO suggests that an established firm not just needs to adapt to exogenous technological changes, but also to mobilize efforts to shape the change trajectory to its advantage. In particular, the longitudinal analysis suggests when an established firm may take a more proactive approach in shaping the ecosystems and shift to an adaptive approach in order to make the ecosystem coalesce. By doing that, this thesis highlights a more dynamic and complex response of incumbent's toward technological changes. Drawing on the research on the role of managerial cognitions on incumbent's adaptation (e.g. Eggers and Kaplan, 2009; Eggers and Kaul, 2017), this study also suggests cognitive flexibility as an important aspect for adaptation (Raffaelli et al., 2019). In this regard, this study shows the importance of the ability to revise strategic frames during the process of adaptation to technological changes. Lastly, the processual framework resulted from this thesis can guide practicing managers who deal with platform creation in nascent ecosystems. This study provides suggestions for the platform designs and market scope that a manager can choose in the different milestones of the ecosystem. It also suggests the required capabilities to effectively navigate the challenges of developing a new platform in nascent ecosystems.

7.2 Limitations and Agenda for Future Research

While the empirical findings offer new theoretical and practical insights, this study has some limitations that correspond to promising avenues for future research. First, this research mainly captured the firm-level strategy development of a focal actor in a nascent ecosystem. The scope of this study is limited to report the interactions of a focal firm with relevant actors instead of all members' interactions at the ecosystem level. While this study captured the interaction between a focal actor (TELECO) with potential customers (Mobile operator) and complementors (device manufacturers and App providers), it did not focus on the interaction with direct competitors or disruptive entrants (Snihur et al., 2018). Recent research indicates that the choice of platform design can be influenced by direct competitors' architectural configuration (Cennamo, 2018). Although we did not find such indications in the TELECO's case, it can be an interesting avenue for future studies to investigate how the positioning of direct competitors influences the choice of platform's positioning of the focal actor. This study also did not capture the effect of government regulations on the ecosystem dynamics and the subsequent platform strategy. Recent research indicates that the absence of supporting regulations could hamper the progress of nascent ecosystems (Moeen et al., 2020). Platform creators may need to circumvent regulations or change their platform designs and business model to navigate nascent ecosystems (Garud et al., 2020). Therefore, another interesting research avenue is to investigate the interplay between regulation, ecosystem dynamics, and platform strategy. In addition, this study focuses on the 'high-level' aspect of platform strategies i.e. positioning strategy. Research that puts more focus on platform governance such as the degree of openness and technical performances (Cennamo, 2019), and their impact on the firm's competitiveness in nascent ecosystems can provide new insights on platform governances and orchestration. Besides that, this study advocates a processual and dynamic view to understand the process of platform creation in the nascent stage of an ecosystem. Future studies can take a longer time frame to uncover the persistence of the platform in a full life cycle of an ecosystem (nascent-mature-decline) and compare the platform strategy development in multiple nascent ecosystems (McIntyre et al., 2020).

This research invites other scholars to investigate the cognitive dimensions of platform creation. However, this study only focuses on the cognitive process of decision makers at a firm level rather than at the ecosystem level. More recent studies indicate the legitimacy challenges of new platform creators and show the importance of socio-cognitive strategies in dealing with such challenges (Ansari et al., 2016; Khanagha et al., 2020). The case of TELECO indicates that the firm engages in socio-cognitive practices

where firms try to shape the perceptions of others toward the firm's preferred ecosystem's future during the expansionary positioning strategy. Future studies can bring this forward by investigating the strategies a platform creator may use to solve legitimacy challenges and achieve optimal distinctiveness in nascent ecosystems. Moreover, future research can examine how collective actors in a nascent ecosystem perceived opportunities and competition (Kaplan and Tripsas, 2008), and how it affects the ecosystem's evolution. In addition, this study only focuses on one aspect of managerial cognitions i.e. strategic frame. Future research can also take into account other aspects of managerial cognitions such as managerial attention (Ocasio, 1997) or motivation (Eggers and Kaul, 2018). Another aspect that worth further investigation is the role of emotion in strategy development in an ambiguous and uncertain environment. Recent studies show that emotional frames can influence incumbents' innovation adoption (Vuori and Huy, 2016; Raffaelli et al., 2019). Thus, understanding the interplay between managerial cognition and emotions toward the firm's strategic action in nascent ecosystems is a promising research avenue.

Finally, another important direction for future research is the relation between the platform creation activities and positioning strategies of the firm's business model. In TELECO's case, the firm's initiatives in the IoT space was fully supported by the top management team at the corporate level. Moreover, TELECO's technological capability was relatively aligned with the IoT technology. The IoT initiatives were organized as a dedicated unit separated from the core businesses and with a high degree of autonomy. However, many of the incumbent firms which not born as a digital platform company often face inertia and organizational tensions when adopting a platform business model (Gawer and Phillips, 2013; Svahn et al., 2017). In this case, the platform business has the potential to disrupt the firm core businesses. Research on the change management to overcome internal resistance and other organizational barriers during the adoption of the platform business model can shed light on the success factors of platform adoption by incumbent firms. Furthermore, research has emphasized the role of dynamic capabilities (David J Teece, 2007) and business model innovations (Chesbrough, 2010) as critical factors for firms to successfully evolve their business model in the highly dynamic settings such as nascent ecosystems. Therefore, future studies could also look at the impact of different organizational capabilities on the platform creation in nascent ecosystems. Comparative studies of multiple cases of incumbent firms could provide new insights into the organizational characteristics and antecedents of the success of platform creation in nascent ecosystems.

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Appendix 1. Interview Protocol

1. **Introduction of research project. Asking consent for recording.**
2. **Profile of the Interviewee**
    a. Respondents current position and job description
    b. Respondents' involvement in the IoT initiatives
3. **TELECO's general initiatives at the IoT**
    a. Description of TELECO's vision and objective for IoT.
    b. The history and background of TELECO's at IoT, since the beginning (if applicable, depends on the interviewee's experience).
    c. Main milestones of the development and strategy.
4. **IoT Platform Strategies**
    a. The description of the IoT platform (current generation).
    b. The comparison of the current generation IoT platform with the earlier generations in terms of technical features, business models, and market positioning.
    c. The partnership, ecosystem strategy of the platform in different milestones (if applicable).
    d. The advantages and disadvantages of certain platform strategy.
    e. The interviewee's experienced challenges or tensions in executing the part of the platform strategy.
5. **Managerial assumptions and cognitions**
    a. The rationale of a particular platform strategy.
    b. The interviewee's view/interpretation of the ecosystem structure (i.e. roles of TELECO and others at the IoT), the growth opportunity of the IoT for TELECO, and the fit between the opportunities and TELECO's capabilities.
    c. The interviews' opinion on the reasons of the strategy changes.
6. **Closing**
    a. Ask if there is any question that should be asked by the interviewer to understand platform strategies.
    b. Ask for recommendation for the other informants.

Appendix 2. Information Sheet for Respondents

Research project:
"*Exploration of emerging businesses by an established firm in a nascent IoT ecosystem"*

Researcher: Fathiro Putra (TELECO/University of Leeds) – Fathiro.putra@teleco.com

Project Supervisor: Dr. Saeed Khanagha (TELECO) – saeed.khanagha@teleco.com ;
Prof. Krsto Pandza (University of Leeds) – K.Pandza@leeds.ac.uk

What is the purpose of the research project?
The purpose of this study is to understand the strategy development process of a large and established firm for exploring opportunities in the nascent Internet of Things ecosystem. This study also seeks to understand how a non-platform born company develops a platform-based business. The findings of this research help to address contemporary challenges TELECO is facing in developing emerging business in IoT.

Who is funding and organising the research?
This research is part of the Complex and Open Innovation in Networked Society (COINS), a collaboration project between TELECO and the University of Leeds. This project is funded by the European Commission under the EU horizon 2020 scheme.

Why were you invited to participate?
You are invited to participate because we feel that your work at TELECO is relevant and particularly important to inform this research. We believe that this research project will greatly benefit from your expertise and experience. However, there is no obligation for you to participate in this research.

What are the benefits of taking part in this research project?
It is expected that the result of this research can help managers at TELECO to address contemporary challenges in developing emerging businesses in IoT. However, there are no immediate benefits and material compensations from participating in this research. If requested, a summary report of the research findings can be provided.

What will happen if you decide to participate?
If you decide to participate, you will be asked to do an interview with the researcher. The interview will be conducted in English from about half to an hour. You will be asked to give your consent to record the interview. You will be asked several questions related to your involvement in the IoT initiatives at TELECO. You are free to decline any particular question if you do not want to answer or to make certain answers off the record. You are also free to withdraw at any time without giving a reason by contacting the researcher. You will be asked for a follow-up interview if needed, but feel free to decline or accept.

Will your participation in this research be kept confidential?
Yes, all interviews, documents, and observations will be anonymised. It will not be possible to identify anyone from the written results of the interviews since no private names will be mentioned or linked in any research material. It is also important to note that the researcher has signed a standard non-disclosure agreement with TELECO.

What will happen to the results of this research?
The results of this research will be used in a thesis for a doctorate study in innovation management. The empirical findings of this research will also be presented in academic conferences and published in scholarly journals and books.

Who to contact if you have additional questions?
Please feel free to contact the researcher via email at Fathiro.putra@teleco.com or connect via the Skype messenger at @Fathiro.putra

What if I am not happy with how the research was conducted?
If you are not happy with how the research was conducted or have any complaints, please contact the project supervisor on behalf of TELECO: Dr. Saeed Khanagha at saeed.khanagha@teleco.com.