Strategy Formation in Emerging Ecosystems

A Process Perspective

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Abstract

This research explores the formation of strategies in emerging ecosystems with no central orchestrator. In the past decades, ecosystems as inter-organisational structures that facilitate value creation beyond firm boundaries gained prominence in both theory and practice. To this date, research largely focused on established ecosystems and paid relatively little attention to ecosystem emergence. Particularly, research investigating how firms develop their strategies in nascent ecosystems that form without a central orchestrator remains scarce. However, the increasing presence of digital technologies facilitates the organic formation of ecosystems through the convergence of products and services across firm- and industry-boundaries.

This thesis addresses this gap by examining how firms engage in emerging ecosystems. First, by focusing on the distinct activities that firms deploy it uncovers the processes that underpin the development of the ecosystem strategy. Second, by examining how the activities change over time, the study develops a process-perspective on ecosystem strategies to account for the role of temporality and the inherent dynamics that surround ecosystems.

The study adopts an exploratory multiple case study design to investigate the strategy formation process of firms in the smart home ecosystem in Germany. It builds on qualitative data to develop a process-oriented framework that depicts three stages of strategy formation underpinned by four ecosystem-relevant processes. It also identifies a typology of four strategic approaches that firms pursue in the nascent ecosystem.

The research contributes to the literature on ecosystems by offering a process perspective on strategy formation in emerging ecosystems, thus also highlighting how the firm-level development of strategy relates to the formation of the ecosystem. It also adds to research on ecosystem strategies by proposing that in nascent ecosystems, strategies are not focused on value creation and capture, but instead rest upon a relational approach that emphasises joint value discovery and value creation.

Table of Content

List of Figures

List of Tables

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Declaration

I declare that this thesis titled “Strategy Formation in Emerging Ecosystems: A Process Perspective” is a presentation of original work, and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as references.

Peer-reviewed conference presentations

Some of the material presented in this thesis has been accepted for presentation at peer-reviewed conferences:

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Baszok, Lara-Kristin, D'Ippolito, Beatrice, Roberts, Deborah (2021). *In search of a strategy in an emerging ecosystem: The case of Smart home in Germany*. 18th Open & User Innovation Conference, Online.

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1. Introduction

The purpose of this introductory chapter is to outline the background of this study and provide the focus of the research project. Sections 1.1 details the origins of interest from the perspective of the researcher and the literature, and Section 1.2 presents the research question and related research objectives the study seeks to address. This is followed by a brief summary of the research design and methods in Section 1.3. Section 1.4 provides an overview of the main research findings. The chapter concludes with a concise summary of the chapters and outline of the thesis' structure and content in Section 1.5.

1.1. Origins of the interest in strategy and ecosystems

1.1.1. Researcher's perspective

The researcher's origins of interest in strategic management and innovation in general and ecosystems in particular stem from the time spent working in different roles at RWE, a leading European energy utility company, including several months at their smart home division, as well as being a project manager at thyssenkrupp, a large industrial conglomerate active in different markets (e.g., materials trading, automotive, and steel). During direct involvement in global projects regarding digitalisation and process improvement across the various business divisions of the company, it was becoming apparent that the growing pervasiveness of digital technologies was leading to convergence of products and services across industries. This was reflected in the development of new business models as well as new forms of collaboration with partners and alluded the researcher to the recognition that established practices on how and where innovation evolves in the company and how the company should organise for innovation were changing.

Concurrently, it was also noted that the five most value brands in the world in 2019 and 2020 were listed as Apple, Google, Microsoft, Amazon, and Facebook (Forbes, 2020) leading to a growing interest in the companies' success. Besides their technology industry background, all five firms share a reliance on an

ecosystem of complementary actors, which create additional value around the firms' products and services and contribute to their growth.

Thus, already prior to embarking on the PhD journey, the phenomenon of ecosystems sparked the researcher's interest. Further investigation revealed that there was also a growing interest amongst both practitioners and management scholars from different disciplines such as strategy, innovation, marketing, and information systems. The researcher observed the rise of ecosystems across a variety of different industries as digital technologies accelerated this new form of organising for value creation. Subsequently, work on ecosystems was observed in the context of 3D Printing (Beltagui, Rosli and Candi, 2020), Internet of Things (Rong et al., 2015), finance (Palmie et al., 2020), and video game consoles (Inoue and Tsujimoto, 2018). While this shows that ecosystems have become relevant for firms of different backgrounds and industries, most of the attention has been drawn to highly successful and prominent examples such as the five companies mentioned above.

The researchers' professional background and prior research interests in business model innovation in established industries (Baszok and D'Ippolito, 2016) drew attention towards exploring ecosystems in more traditional contexts. Particularly, the researcher wanted to explore how incumbent firms adapted to the new requirements of ecosystems evolving around them and how ecosystems developed in contexts with less prominent firms at their core. While the research focus was later expanded to also include new ventures, the original interest of exploring ecosystems that emerge in traditional industries and in response to digital technologies and changing business environments remained the core motivation for this study.

1.1.2. Rationale from the literature

Ecosystems in business and management research are considered to be formed of inter-organisational ties of actors that jointly contribute to the realisation of an ecosystem-level output (Thomas and Autio, 2020). In the context of strategic management and innovation this understanding of ecosystems and the ecosystem-level output is further refined, as ecosystems are "defined by the

alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize" (Adner, 2017, p.42). As this shows, the core anchor for ecosystems in strategic management and innovation is understood to be a complex, customer-facing value proposition which requires collaboration among actors who are not normally organised in any form of hierarchy (Adner, 2017; Jacobides, Cennamo and Gawer, 2018).

While the ecosystem metaphor was originally introduced within the strategy literature thirty years ago (Moore, 1993), ecosystems have particularly spurred the interest of strategic management and innovation scholars in the past two decades (Jacobides et al., 2018; Tsujimoto et al., 2018). This closely relates to digital innovation, which changed the predominant understanding of firm theories around innovation and value creation and led to an increasing interconnectedness of products and services across firm- and industry boundaries (Gawer, 2021; Wang, 2021).

Despite the growing interest several aspects of ecosystems remain underexplored: extant research largely studied established ecosystems, and scholars only recently started to pay closer attention to the question of how ecosystems emerge (Pushpananthan and Elmquist, 2022; Autio and Thomas, 2020). This body of work primarily focused on the ecosystem as the unit of analysis (Moore, 1993; Snihur, Thomas and Burgelman, 2018; Thomas, Autio and Gann, 2022), while Felin and Foss (2023) suggested that the debate would benefit from empirical evidence at the firm level, too.

Among the growing body of research on ecosystem emergence, two dominant views can be distinguished (Autio and Thomas, 2021):

(1) a top-down perspective, which assumes that ecosystems emerge from an a priori determined blueprint, which is defined and implemented by a central orchestrator (Adner, 2017; Lingens, Miehé and Gassmann, 2021b);

(2) a collective perspective, which describes ecosystem emergence as the result of collective interaction among the prospective ecosystem members; yet this view also assumes the presence of a central orchestrator to guide the

development process (Ansari, Garud and Kumaraswamy, 2016; Dattee, Alexy and Autio, 2018; Thomas and Ritala, 2021).

A third perspective, that has been acknowledged by scholars but remains largely unexplored to date, suggests that ecosystems may emerge organically out of initiatives undertaken by a set of firms, without a central orchestrator that triggers or facilitates the process (Lingens, Seeholzer and Gassmann, 2022; Altman and Tushman, 2017). With the growing influence of digital technologies and the respective convergence of products and services across firms and industries mentioned before, the expectation is that this form of ecosystem emergence will gain increasing prominence in the future.

A second body of literature on ecosystems is concerned with strategies that firms pursue within them. However, research on ecosystem strategies primarily focused on roles and the adoption of a preferential position in the ecosystem (Iansiti and Levien, 2004b; Bosch-Sijtsema and Bosch, 2015; Adner, 2017) to explore how firms can find an ideal balance between shared value creation and individual value capture (Hannah and Eisenhardt, 2018). How firms develop their ecosystem strategies beyond positioning strategies vis-à-vis other ecosystem members has broadly been overlooked and ecosystem strategies have often been treated rather static (Visscher, Hahn and Konrad, 2021; Rong et al., 2015). However, due to the co-evolutionary nature of ecosystems, both in terms of the ecosystem's composition and the dynamics of interaction among its members (Hou and Shi, 2021; Philips and Ritala, 2019) it follows that ecosystems strategies are likely also evolving and gradually adapting in accordance with the developments on the ecosystem level (Felin and Foss, 2023). Yet, there is a dearth of research that explores in depth how firms arrive at their ecosystem strategy.

On this basis, this study adopts a processual perspective to explore *how* firms gain awareness of the ecosystem context and dynamics and formulate their strategy accordingly.

1.2. Study objectives and research questions

Addressing the shortcomings in the literature briefly illustrated in the preceding section, the research gap underpinning this study is located at the intersection of three ecosystem research streams: (1) research focusing on ecosystem emergence (2) research accounting for the co-evolutionary dynamics in ecosystems (process view) (3) research on ecosystem strategies (firm level). Figure 1. locates the research gap at the intersection between different streams of research on ecosystems:

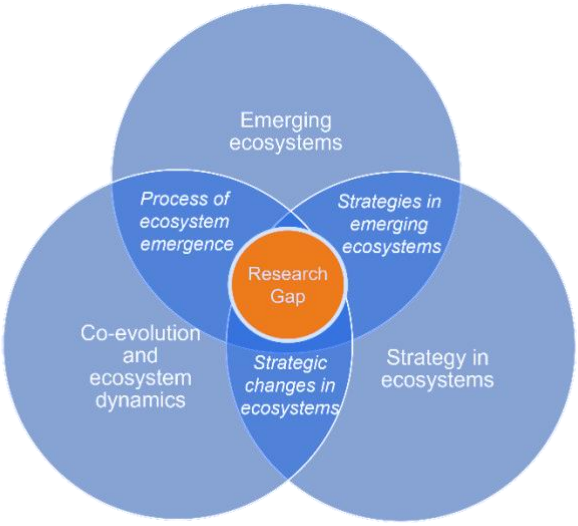

Figure 1: Locating the research gap

The overarching question guiding this research is:

Why and how do firms develop their ecosystem strategy in an emerging ecosystem with no central orchestrator?

To answer this overarching research question, the thesis focuses on two key objectives, which are defined in the form of two sub-research questions:

First, the study seeks to uncover the dynamics of strategy development by exploring how a firm's ecosystem strategy unfolds and changes over time. In this regard, it also seeks to understand how this relates to the context of emerging ecosystems with no central orchestrator. This objective is reflected in the first sub-research question:

- ***Sub-RQ1:*** *How does a firm's ecosystem strategy in an emerging ecosystem in the absence of an orchestrator evolve over time?*

The second objective is to understand the foundations of strategy development in an emerging ecosystem. For this, the study adopts a capability lens to investigate the activities that firms develop and deploy in the context of their ecosystem engagement and which underpin their ecosystem strategy. This objective is reflected in the second sub-research question for this study:

- ***Sub-RQ2:*** *Which processes do firms deploy to implement their ecosystem strategy and how are these processes developed?*

1.3. Overview of the research design

Due to the nascent state of research into firms' strategies in emerging ecosystems, the exploratory nature of the research objectives, and the complexity of the empirical phenomenon, this study adopts a multiple case study approach (Yin, 2018; Eisenhardt, 1989). The unit of analysis for this study is the firm level and a case represents a single firm in the ecosystem. All cases in the study are situated in the same empirical context, i.e., the smart home ecosystem in Germany to ensure comparability and consider developments on the ecosystem level. This approach to case selection was also chosen to ensure that differences in the firms' strategies can be attributed to the firm and not to differences in the context.

The empirical setting was selected because the smart home ecosystem represents an emerging ecosystem driven by the growing connectivity and interoperability of devices within a home, leading to product convergence and cross-industry solutions. The smart home ecosystem is populated by firms from traditional industries such as building electronics or home appliances as well as new ventures. Hence, the selection of this empirical context promised opportunities to collect rich data to answer the research question.

The study utilises qualitative research methods for data collection to achieve a rich understanding of the cases' ecosystem strategy. The primary source of data

are semi-structured interviews with knowledgeable experts from each case company. This data is triangulated through additional company documents, publicly available data or external interviews given to other media outlets. Due to the outbreak of the COVID-19 pandemic amidst the beginning of the data collection period, most interviews were held online using video conferencing tools.

1.4. Key findings and contributions

The detailed contribution to knowledge made by this study is described in the Discussion in Chapter 8. The findings and contribution are briefly summarised as follows:

(1) The research contributes to the understanding of ecosystem emergence by exploring the process of strategy development on the firm level. It proposes a sequential unfolding of a firm's ecosystem strategy across three stages (Set-Up, Scale, Sharpen) and on two strategic layers (technological, market). The development process is characterised by a transition from exploration and a technological emphasis on connectivity and interfaces towards value discovery and creation and a market emphasis with regards to the value proposition and customers.

(2) The research adds to the understanding of the underpinnings of strategy formation in ecosystems in the form of four interrelated ecosystem-relevant processes which support a firm's strategy development.

Two of these processes (partnering and positioning) are core processes, which enable a firm to engage with other ecosystem members and build relationships. The other two are considered enabling processes, which support the implementation and success of the ecosystem strategy by resolving bottlenecks among stakeholders (aligning) or advancing the development on the ecosystem level (shaping). The recognition that all four processes form through the continuous deployment of ecosystem-oriented activities suggests that in instances where firms do not actively pursue the creation of an ecosystem, strategies may form bottom-up and not through the deliberate enactment of dynamic capabilities.

(3) By focusing on the (dis)similarities in the development of firms' ecosystem strategies, the study uncovered a typology of four co-existent, relational strategic approaches in the emerging ecosystem. The study thereby extends extant strategy research in ecosystems, which emphasised value creation and value capture. It proposes that in the early formation of an ecosystem, strategies are instead oriented towards collaboration and joint value discovery and creation.

Overall, the thesis contributes to the growing stream of literature on ecosystem emergence by illustrating how firms develop their ecosystem strategy in the context of a decentralised ecosystem with no central orchestrator. In doing so, it highlights the interdependencies between the formation of the firms' strategies and the development of the overall ecosystem. The research thus sheds light on how firms respond to the growing pervasiveness of digital technologies and how this interrelates with the organic emergence of an ecosystem.

1.5. Structure of the thesis

This thesis is formed of nine chapters, a synopsis of which follows:

Chapter 2 (Systematic Literature Review on Ecosystem Research) presents a systematic review of the ecosystem literature in business and management. The aim of the chapter is to create an overview of the current state of research in the field and to identify relevant research gaps.

Chapter 3 (Ecosystem Emergence and Ecosystem Strategies) builds on the gaps identified in Chapter 2 and presents an in-depth review of the literature on ecosystem emergence and on ecosystem strategies. The chapter ends with the development of the research question that guides this thesis.

Chapter 4 (Research Design and Methodology) introduces the research design and methodological approach of this study. It outlines the researcher's philosophical position and justifies the selection of the case study methodology and qualitative methods. Details of the data analysis process are provided to strengthen the study's credibility and transparency. A Conceptual Framework to

guide the analysis process is presented, which draws on the constructs identified in the literature review.

Chapter 5 (Value Creation Motives in the Emerging Ecosystem) is the first empirical chapter of this thesis. By unravelling the different value creation motives that firms pursued with their ecosystem strategies it presents relevant contextual information for the further two empirical chapters

Chapter 6 (Formation of an Ecosystem Strategy) presents the core empirical findings of the study. The chapter outlines the process of strategy formation across three sequential stages and two layers. It also shows how the firms deployed the four ecosystem-relevant processes in support of their ecosystem strategy along the three stages. The chapter briefly evaluates how firm-level actions throughout each stage influenced developments at the ecosystem level.

Chapter 7 (Typology of Ecosystem Strategies) presents the typology of four strategic approaches that have been identified. It introduces the two dimensions (value creation motivation and relational approach) along which the strategic approaches can be differentiated and presents the findings, which underpin each of them in more detail. It further evaluates the relevance of these four strategic approaches for the emergence of the ecosystem.

Chapter 8 (Discussion) discusses the implications of the findings with regards to the extant literature and highlights how the insights generated through this study contribute to ecosystem theory. In doing so, the chapter presents the process-oriented framework and discusses the different elements of the framework in detail.

Chapter 9 (Conclusion) concludes the thesis. It briefly summarises how the study answers the research question before discussing the implications of the findings for managerial practice. The chapter evaluates the study's limitations and presents avenues for future research. The thesis ends with concluding thoughts of the researcher reflecting on the research project.

2. Systematic Literature Review on Ecosystem Research

The original notion of a business ecosystem was introduced by James Moore in 1993, who used the ecological metaphor to describe the increasing complexity and connectivity among firms. Hence, he used the metaphor to describe a set of hierarchically independent yet interdependent firms that are linked through technical interdependencies, which require their co-evolution (Moore, 1993). However, wider research into the phenomenon only started about 15-20 years ago (Tsujimoto et al., 2018) when firms such as Facebook (founded in 2004) or Amazon (founded in 1998) started to gain significance, and when Apple started building its ecosystem through the introduction of iTunes (2003) and the App Store (2008).

The growing pervasiveness of digital technologies makes it easier for firms of all kinds to collaborate and access resources across firm- and industry-boundaries (Amit and Han, 2017) this leads to opportunities for connectivity and integrated products or services (Williamson and De Meyer, 2012) and the growing emergence of ecosystems (Wang, 2021). Accordingly, collaboration opportunities that are facilitated through ecosystem structures enable new firms to develop complex and seamlessly integrated value offerings, which can compete with established industry actors. For example, new ventures such as Uber and BlaBlaCar built rail-hiding ecosystems that were able to disrupt the traditional mobility and taxi industry (Jacobides, 2019a, 2019b). This has directed the attention of scholars to better understand how ecosystems function, and how firms can use them to create and appropriate value (Jacobides et al., 2018).

However, theoretically one of the major problems about research conducted in the context of business ecosystems is that the term is often used ambiguously and there is no clear definition of what constitutes an ecosystem, and there is no coherent differentiation between the different ecosystem typologies that are being used in the literature (Teece, 2018; Tsujimoto et al., 2018; Gupta, Mejia and Kajikawa, 2019). Scholars from different disciplines such as strategic management and innovation, entrepreneurship or marketing have adopted

different stances on what constitutes an ecosystem, and have developed different understandings of the ecosystem concept (Thomas and Autio, 2020). Consequently, research efforts addressed a variety of different research questions applying different typologies of the ecosystem such as entrepreneurial ecosystems (Spigel and Harrison, 2018), knowledge ecosystems (Clarysse et al., 2014) or innovation, business and platform ecosystems (Jacobides et al., 2018). Empirically these studies explored different forms of inter-organisational collaboration across a number of industries ranging from software development to 3D manufacturing, the installation of power plants or solar panels (Dattee et al., 2018; Kwak, Kim and Park, 2018; Kolloch and Dellermann, 2018; Hannah and Eisenhardt, 2018).

Thus, it is important to gain greater clarity of the current debates unfolding in ecosystem research to explore possible future research avenues and identify gaps that require further exploration. To achieve this overview, a systematic literature review (henceforth: SLR) was conducted, as it is a useful starting point to provide a comprehensive overview of existing studies in a defined area of research.

As suggested by Tranfield, Denyer and Smart (2003), a SLR in management research does not necessarily need to be underpinned by a specific research question but should pursue a clear review objective. Following this recommendation, the objective defined for this review was to explore the current stage of research on ecosystems in business and management in light of the different conceptualisations of ecosystems. Further the aim was to identify the main research questions, which scholars addressed and to uncover which research questions need further attention. To achieve this goal, the researcher systematically reviewed the relevant literature on ecosystems from 1993 to 2021.

By clustering extant research along different ecosystem typologies and stages of the ecosystem lifecycle the SLR led to a comprehensive overview of the current stage of debate in the context of ecosystems in business and management research. Therefore, it allowed the identification of open or underexplored research avenues and provided the foundation for further in-depth engagement

with the specific literature referring to these underexplored areas, which will be presented in Chapter 3.

The current chapter is structured as follows: The upcoming sections will first describe the research process that was adopted to search, select, and analyse the literature underpinning this review. The subsequent section then presents the descriptive and analytical findings of the review process. The systematic review concludes with a summary of the findings and an outline of open research avenues that would benefit from further research. It thus narrows down the research gap to be explored further in this study, and highlights how the present thesis aims to contribute to the growing body of ecosystem literature in business and management research.

2.1. Review Methodology underpinning the SLR

The SLR was conducted following the three phase review process proposed by Tranfield, Denyer and Smart (2003), which is based on: *planning* the literature search, *conducting* the analysis and *reporting* the findings (Tranfield et al., 2003). Figure 2 depicts the review process along the three phases and details the key tasks the reviewer should perform in each of them.

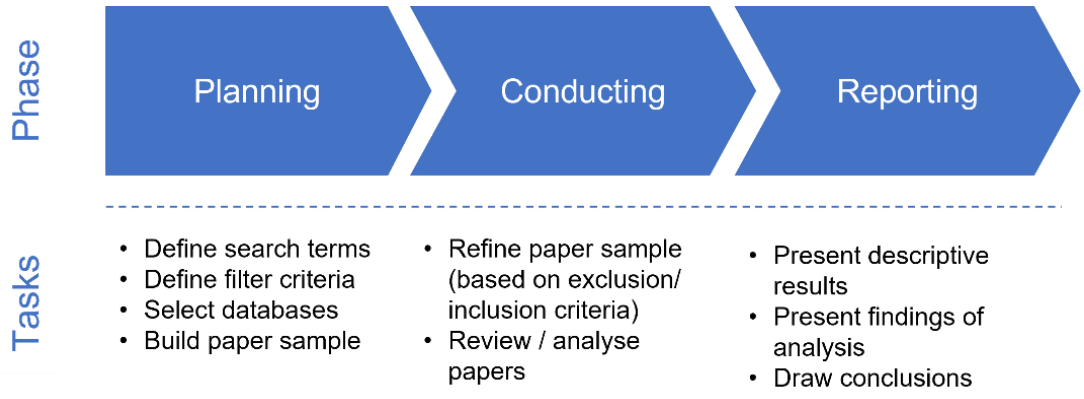

Figure 2: Review Process [based on Tranfield et al. (2003)]

As Figure 2 indicates, the planning or data collection phase refers to the identification of databases to use for the literature search, the definition of the search terms and limiters and the identification of the set of papers to be considered for the review. Subsequently, the conducting or data analysis phase includes the actual review and coding of papers with regards to the research

objectives developed for the systematic review. Lastly, the reporting section presents the outcomes and findings of the conducting phase.

The following sections provide details on each of the phases, outlining the review process and findings of the systematic review.

2.2. Planning: Defining the search strategy

The first challenge when conducting a systematic review is to identify the correct search terms that will lead to the desired results. A scoping test of initial keywords showed that the inclusion of broad search terms such as ecosystem* OR network* yielded more than 100,000 results even when limiting the subject area to business and management. Narrowing down the search term to just "ecosystem*" still led to 10,492 results in Scopus and 5,284 results in the Web of Knowledge database when limiting the outputs to papers related to business and management.

Hence, it was necessary to reduce the number of outputs to a manageable amount and to ensure that the results matched the focus and objectives of the review. To achieve this, the existing literature including reviews on ecosystems in high quality journals was scanned to identify more specific search terms. This scoping analysis showed that some ecosystems typologies used in the literature did not meet the core interest of the review which was on ecosystems that facilitate value creation among firms. Accordingly, it was found that entrepreneurial ecosystems which are spatially confined structures of actors seeking to foster entrepreneurial activities within a given region (Spigel, 2017; Spigel and Harrison, 2018) should be excluded from the review. Similarly, knowledge ecosystems, which refer to actors jointly pursuing research activities prior to marketisation and which are oftentimes linked to research institutes or universities (Järvi, Almpanopoulou and Ritala, 2018; Clarysse et al., 2014) did not fit with the core interest of the review.

Consequently, the search criteria could be narrowed down by focusing on the three dominant ecosystem typologies used in the context of innovation-driven, market-oriented ecosystems which were: (1) business ecosystems, (2)

innovation ecosystems, and (3) platform ecosystems. Further evaluation and scoping of the literature suggested that some scholars used the term digital ecosystem to describe a phenomenon similar to the three key typologies listed above to explicitly stress that relations and interdependencies among actors evolved through digital technologies. Therefore, digital ecosystems were added as a relevant search term. The scoping analysis further revealed that the search terms should be expanded to include 'platform(-)based ecosystem' as an additional term adjacent to platform ecosystem. The exact search terms used for the SLR can be found in Figure 3, which depicts the full selection process.

Once the search terms were defined, the search for relevant papers was conducted in two comprehensive databases: Web of Knowledge (SSCI) and Scopus. Each of the databases individually provides scholars with a large selection of peer-reviewed journals in business and management. Thus, in combining both databases' results it was ensured that a comprehensive selection of papers was built (Crossan and Apaydin, 2010). It is important to note, that each database uses a slightly different nomenclator to narrow down the subject area and search fields, yet it was ensured that the search was based on the same foundations i.e., that the search was limited to subject areas relating to business and management and that the search for the keywords was conducted in the papers' title, abstract and keywords. A detailed breakdown of the limiters set for each database is also provided in Figure 3.

The starting point for the timeframe in which to search for relevant publications was set as 1993, which is the year James Moore published his seminal paper and introduced the ecosystem metaphor to strategy research to describe co-evolutionary dependencies between firms (Moore, 1993), because this is generally acknowledged as the starting point of ecosystem research in business and management. The initial end point of the literature search was February 2019, the month the SLR was originally conducted at the beginning of the PhD project.

To account for recent developments in ecosystem research, the SLR was updated in 2022 by repeating the literature search and analysis under the same

conditions. This means the literature search was conducted using the same databases, limiters, and search terms but this time the timeframe for the search was set from 2019 to 2021 to ensure that three further years of research were covered in the review. Any duplicates from January and February 2019 that had already been included in the original review were excluded from the second search. This led to an additional 59 papers being added to the systematic review, 21 conceptual papers (including 1 review paper) and 38 empirical papers. Of the 38 empirical papers, 17 papers were cases studies, while the remaining 21 papers adopted different quantitative methods such as regression analysis, modelling, or surveys. Any numbers reported hereafter refer to the full timeframe of the search, i.e., 1993 to 2021.

Overall, the search was limited to papers published in journals that had undergone a peer-review process. For administrative reasons, the language filter was set to English to ensure that all papers in the sample could be read and reviewed.

After entering the search terms in the two databases using the search criteria outlined above, applying the respective filters and after the elimination of duplicates across the results of both databases, the search yielded a result of 1,142 papers. These papers built the initial sample for conducting the systematic review of the ecosystem literature.

2.3. Conducting

This section describes how the sample of 1,142 papers was further refined and how the final selection of papers was analysed with regards to the research objectives set out for this SLR.

2.3.1. Refining the sample

In the first step, the original sample of 1,142 papers was manually refined through the application of pre-defined exclusion and inclusion criteria, including the outlets that the papers were published in as well as criteria that referred to the content of the papers. This process is now elaborated in more detail.

When conducting a SLR it is important to ensure the quality of the inputs included in the review process to arrive at reliable conclusions (Greenhalgh and Brown, 2017). Due to the broad variety of methods used in the field of management it is difficult to establish the quality of a paper based on a defined set of criteria referring to the adoption of a certain methodology. Instead, Tranfield, Denyer and Smart (2003) suggest using Journal Rankings to ensure quality of the papers. Following this suggestion, a first exclusion criteria was to eliminate papers from the sample that were published in journals that were ranked below 3 or not at all in the ABS 2018 Academic Journal Guide. Upon applying this criterion, 789 papers were excluded reducing the remaining sample to 353 papers.

These remaining 353 papers were manually screened to identify and exclude false positives, i.e., papers that used one of the search terms in their title, abstract or keywords, but in which the ecosystem was not the actual focus of the study. To identify these papers, the titles and abstracts of each paper were carefully read by the researcher. If a clear decision could not be made, the full paper was downloaded and skimmed to gain further clarity. This led to the exclusion of further 122 papers.

Finally, papers that matched the search terms, but applied them in a context that was not considered as relevant for this review were excluded. More specifically this means that for example papers that used the ecosystem terminology in the context of an environmental ecosystem, or a context beyond strategy and innovation (e.g., tourism ecosystem, HR ecosystem) were excluded. Furthermore, papers that used the term innovation ecosystem to refer to spatially confined regional or national innovation ecosystems designed to conduct research or create new knowledge, or which used it as a synonym for knowledge ecosystems or entrepreneurial ecosystems were also excluded. Finally, the term business ecosystem was often used to refer to a firm's overall business environment with no reference to interdependencies or a shared vision, hence, these papers were also removed from the sample. In summary, this led to the exclusion of another 114 papers.

Overall, the sample of papers to be reviewed in depth consisted of 117 papers. Figure 3 gives a detailed overview of selection process from the definition of the search terms to the final sample of 117 papers.

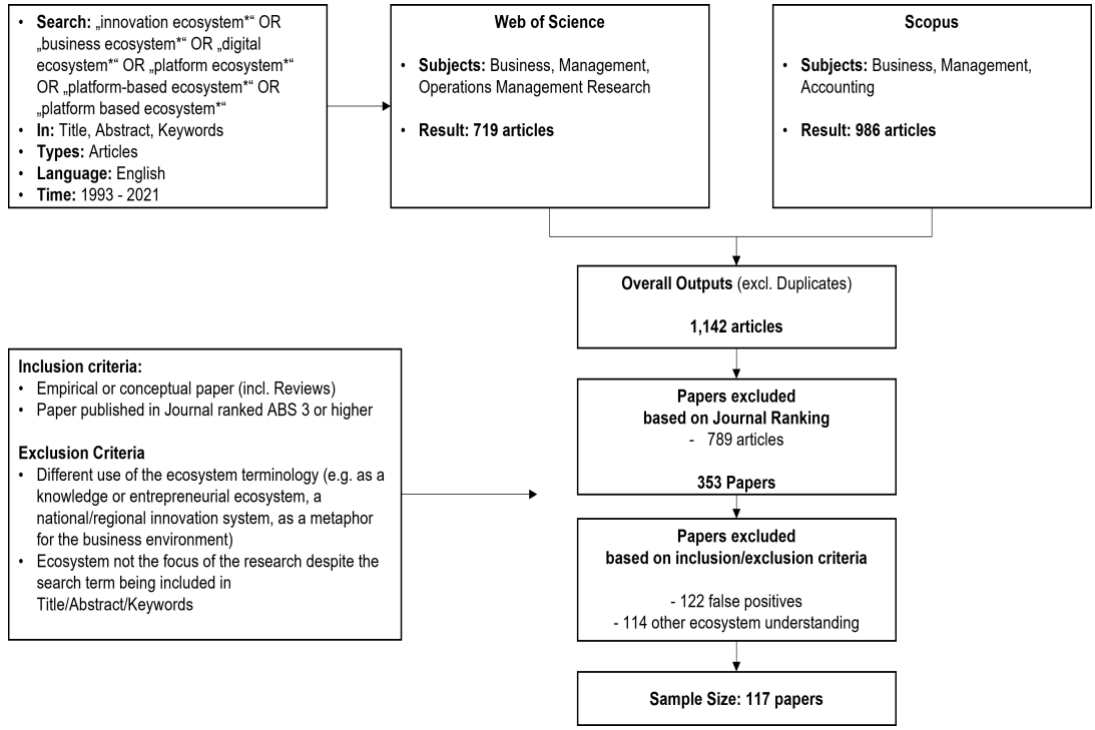

Figure 3: Selection Process

The next section provides insights into the analysis process regarding the final review sample.

2.3.2. Analysing the papers

The analysis and review of the final sample of papers started with a descriptive analysis to elicit the contextual information on the review sample. This involved clustering the papers along the outlets in which they were published, assigning them to respective subject areas and exploring how the publication of the papers spread across years. Furthermore, the descriptive analysis evaluated the split between empirical and conceptual papers in the sample. This analysis facilitated a general overview of how research had developed over the years and provided a general idea of the angles from which ecosystems were studied. The findings from the descriptive analysis are presented in Section 2.4.

The analysis proceeded by reading each paper carefully to extract relevant information with regards to the review's objectives. This analysis was conducted by making notes within an Excel Spreadsheet on the type of paper (conceptual (incl. reviews] or empirical), the methodology that was adopted in empirical papers and the ecosystem typology the authors referred to (business ecosystem/innovation ecosystem/platform ecosystem/digital ecosystem/non-specified or multi). The next step was to evaluate – where possible – to which stage of the ecosystem lifecycle a paper referred. As Moore's original work proposed a dynamic lifecycle of ecosystem development this was considered relevant to further assess the contributions of each paper. Hence in a further column it was noted whether the research referred to a nascent ecosystem, existing ecosystem, or declining ecosystem. Further notes were taken to elicit the unit of analysis, i.e., whether a study focused on the ecosystem as a whole or a particular actor such as the platform leader, the ecosystem orchestrator, the complementors or members of the ecosystem in general.

Finally, for each paper the research purpose or guiding question the research sought to answer were extracted. The research questions were then aggregated into overarching dimensions which were assigned a keyword such as 'ecosystem building', 'innovation interdependencies' or 'governance'. If necessary, further keywords were added for more details. Figure 4 provides a snapshot of the analysis sheet that was used to review the paper sample and to store the information extracted on each paper.

Authors	Title	Ye	Source title	AB	Type	Method	Term	Phase	Focus	Keyword	Guiding Question / Research Purpose
Adner R.	Match your innovation strategy to your innovation ecosystem	2006	Harvard Business Review	3	Conceptual	n/a	Innovation Ecosystem	Existing Ecosystem	Orchestrator	Innovation / Interdependencies	How can firms manage interdependency risks to align their innovation strategy with bottlenecks in the innovation ecosystem
Adner R., Kapoor R.	Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations	2010	Strategic Management Journal	4*	Empirical	Case Study	Innovation Ecosystem	Existing Ecosystem	Orchestrator	Innovation / Interdependencies	How can a focal firm manage interdependencies in the ecosystem to introduce technological change
Adner, Ron	Ecosystem as Structure: An Actionable Construct for Strategy	2017	JOURNAL OF MANAGEMENT	4*	Conceptual	n/a	General / Multi			Definition / Relevancy	Defining the ecosystem concept and identify its relevancy for strategy
Ansari S.S., Garud R., Kumaraswamy A.	The disruptor's dilemma: TiVo and the U.S. television ecosystem	2016	Strategic Management Journal	4*	Empirical	Case Study	Business Ecosystem	Nascent ecosystem	Orchestrator	Ecosystem building	How can a new entrant achieve collaboration from incumbent firms in the formation of an ecosystem necessary for their desired value proposition?
Benlian A., Hilkert D., Hess T.	How open is this platform? The meaning and measurement of platform openness from the complementors' perspective	2015	Journal of Information Technology	3	Empirical	Mixed Methods	Platform Ecosystem	Existing Ecosystem	Platform Leader / Complementors	Governance	How does the perceived platform openess influence firms contribution to a platform
Dattee B., Alexy O., Autio E.	Maneuvering in poor visibility: How firms play the ecosystem game when uncertainty is high	2018	Academy of Management Journal	4*	Empirical	Case Study	Innovation Ecosystem	Nascent ecosystem	Orchestrator	Ecosystem building	How can a focal firm guide the value proposition development process in alignment with potential ecosystem partners
Dedehayir O., Mäkinen S.J.	Measuring industry clockspeed in the systemic industry context	2011	Technovation	3	Empirical	Case Study	Business Ecosystem	Existing Ecosystem	Ecosystem	Innovation / Interdependencies	How / when do sub-systems (complements) in an ecosystem catch up with new technologies introduced in another part of the ecosystem?
Eckhardt J.T., Ciuchta M.P., Carpenter M.	Open innovation, information, and entrepreneurship within platform ecosystems	2018	Strategic Entrepreneurship Journal	4	Empirical	Quantitative	Platform Ecosystem	Existing Ecosystem	Orchestrator	Innovation / Interdependencies	How can platform leaders encourage complementors to adopt a new technology
Gawer, Annabelle; Cusumano, Michael A.	How companies become platform leaders	2008	MIT SLOAN MANAGEMENT REVIEW	3	Conceptual	n/a	Platform Ecosystem	Nascent ecosystem	Platform leader	Ecosystem building	Identifying antecedents for how companies can build platforms
Hannah, Douglas P.; Eisenhardt, Kathleen M.	How firms navigate cooperation and competition in nascent ecosystems	2018	STRATEGIC MANAGEMENT JOURNAL	4*	Empirical	Case Study	Business Ecosystem	Nascent ecosystem	Member	Strategy / Coopetition / Positioning	How do firms position themselves in nascent ecosystem to balance cooperation and competition with other ecosystem members?
Helfat C.E., Raubitschek R.S.	Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems	2018	Research Policy	4*	Conceptual	n/a	Platform Ecosystem	Existing Ecosystem	Orchestrator	Governance / Capabilities	Which capabilities do platform orchestrators need to manage a platform based ecosystem

Figure 4: Analysis Sheet SLR

Through the extracted information from the papers and by cross-examining the keywords, ecosystem stage, ecosystem type and focus across the sample, an overview of the major research interests on ecosystems was developed. It was also identified which subject areas in business and management showed a particular interest in the phenomenon. More specifically, an overview of key research questions that scholars previously investigated was developed and it was possible to explore, which actors and roles had received particular attention. This allowed the researcher to identify research themes that have been addressed by prior research and further distil those research areas that remain underexplored and require further attention. The detailed findings of the analysis process are presented in Section 2.5. A summary of open research avenues that provide grounds for further investigation are presented in the concluding section of this chapter which is Section 2.6.

2.4. Reporting: Descriptive findings

To understand how the research field developed over time, the papers in the sample were first sorted along their publication years. This revealed a continuous increase of publications in the last decades, thus showing a growing interest into the ecosystem phenomenon by business and management scholars and further highlighting the interrelatedness to the growing pervasiveness of digital technologies. Specifically, the analysis shows that after Moore's seminal paper in 1993 a decade passed before other scholars adopted the metaphor (Iansiti and Levien, 2004a) and it took almost another decade until the ecosystems became a relevant and frequently researched concept in business and management. Figure 5 presents the spread of the papers in the sample across years and illustrates the increasing research interest.

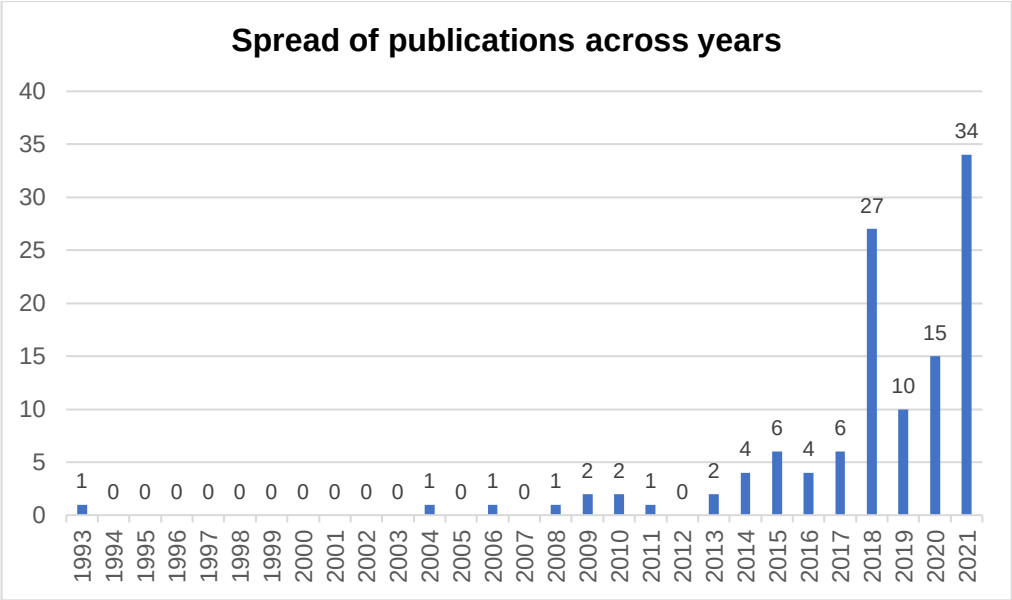

Figure 5: Spread of papers across publication years

The next step in the analysis was to explore which subject areas within business and management were particularly interested in investigating the implications and impacts of ecosystems. To answer this question, the 'Research Fields' information assigned to each journal in the Academic Journal Guide was used to determine the subject area. As the Academic Journal Guide is an officially recognised information source for journals in business and management this provided a reliable criterion to cluster the papers in the sample.

The analysis thus allowed to identify the subject areas to which most of the published papers could be assigned. The five most common subject areas, to which 98 of the 117 papers belonged, were: Social Sciences (particularly due to papers published in Technological Forecasting and Social Change), General Management, Innovation, Information Systems and Strategy. The high presence of Information Systems as a subject makes sense, as ecosystems are particularly promoted through the increase of digital technologies and digital innovation. Information Systems scholars are thus increasingly interested in studying how specifically platform ecosystems can be governed and controlled from a technological viewpoint. Similarly, strategy scholars are interested in ecosystems, as the growing interdependencies between actors have implications for the established understanding of competitive advantage, industries, or markets as determinants of firm strategies. Furthermore, the strong interest from the innovation field shows how ecosystems have implications on established

theories of innovation within and across firms. Figure 6 depicts the spread of papers across the research fields as identified in the analysis.

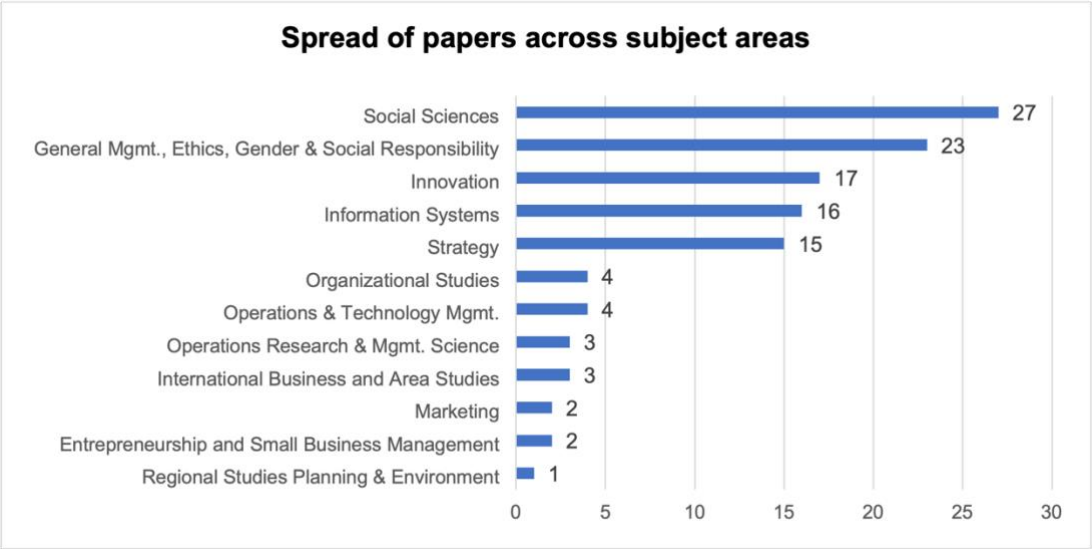

Figure 6: Spread of papers across research fields

A further step of the descriptive analysis explored which journals had published papers that referred specifically to the interest of the SLR and revealed that the 117 papers of the sample have been published across 38 journals. However, more than half of the papers (75) were published in only 9 journals that each published four or more papers included in the review sample.

The journal that published most of the papers in the sample is Technological Forecasting and Social Change (24). This is particularly due to a Special Section titled "Innovation Ecosystems: Theory, Evidence, Practice, and Implications" from which 11 papers were included in this review. Table 1 provides an overview of the nine journals with the most outputs included in this sample.

Journal Title	Number of papers
Technological Forecasting and Social Change	24
Strategic Management Journal	12
Technovation	9
Journal of Business Research	7
Research Policy	5
Information Systems Research	5
Organization Science	4
MIT Sloan Management Review	4
Journal of Information Technology	4

Table 1: Top Journals based on papers in the review sample

The final step in the descriptive analysis was to determine if papers were empirical or conceptual. Furthermore, for empirical papers the research method(s) adopted in each paper were elicited. The findings showed that 46 papers in the sample were conceptual, including literature reviews and one editorial to a special issue. Among the 71 empirical papers, the most frequently adopted research methodology was the case study methodology with more than half of the empirical papers (36) using a case study design. The high proportion of case studies probably reflects the early stage of research into ecosystems and the need for exploratory research approaches to better understand the specifics of the ecosystem phenomenon.

The next section presents the detailed findings of the content-related analysis of the papers.

2.5. Reporting: Ecosystem Research Streams

Overall, the analysis of the papers showed that research around the concept of ecosystems can be sorted into three broad clusters: The first cluster consists of papers that aim to build clarity on the foundations, implications and relevancy of the ecosystem concept and propose research agendas to further develop the ecosystem literature. The second cluster are papers which focus on nascent

ecosystems, i.e., ecosystems at the early stage of their formation. The third cluster refers to papers on established ecosystems. Among the latter two clusters studies could be further differentiated into studies that focused on platform ecosystems and studies that were conducted in the context of business and innovation ecosystems. Such a differentiation makes sense as the focal point of a platform ecosystem is a platform that determines ties between ecosystem members whereas business and innovation ecosystems are determined by a common value proposition (Jacobides et al., 2018).

Figure 7 graphically depicts the outcome of the analysis process illustrating the clusters and the research topics within each cluster.

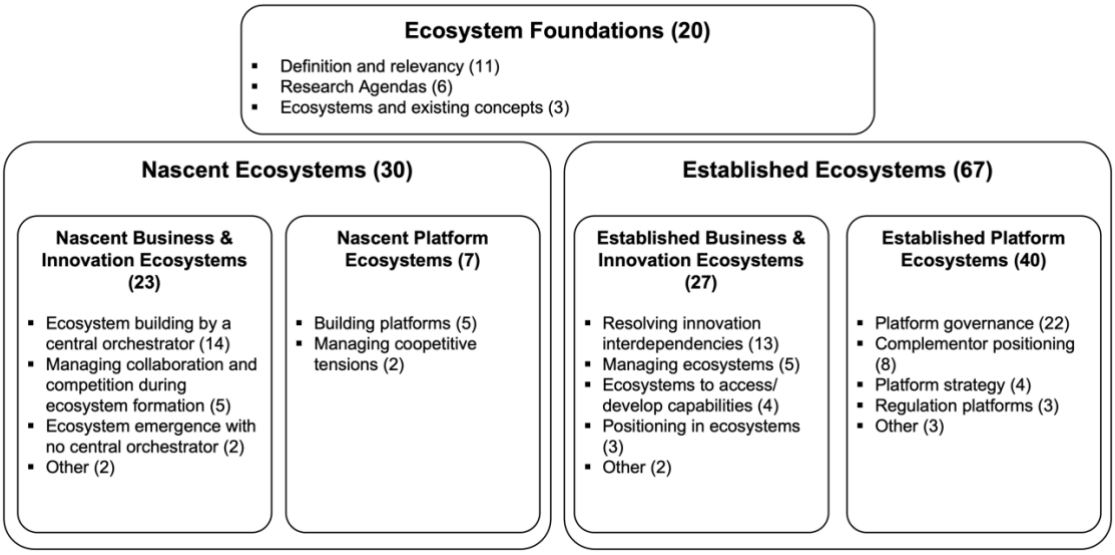

Figure 7: Key Research Streams

The following sections evaluate the results of the analysis with regards to the current stage of research on ecosystems. The findings are organised along the key three clusters (foundations, nascent ecosystems, and established ecosystems) and the two types of ecosystems (platform ecosystems / business & innovation ecosystem) as shown in Figure 7.

2.5.1. Ecosystem Foundations

The first cluster of papers is labelled 'Ecosystem Foundations' and includes 20 papers of the sample. These papers are further broken down into three groups: (1) Definition and relevancy, (2) Relations to other concepts, and (3) Research avenues.

Overall, this cluster of papers highlights the importance of strengthening the theoretical foundations of ecosystems to ensure that research adopting the ecosystem terminology is rooted in similar assumptions about what constitutes an ecosystem. At this nascent stage of the ecosystem field, it is important that scholars adopting the ecosystem terminology clearly outline how they apply and understand the terminology to increase clarity of their work and to clearly mark how ecosystem research extends extant research on inter-organisational structures. Furthermore, the papers in this cluster contribute to ecosystem research by pointing to avenues for future research.

Definition and relevancy (11): The first group of papers in this cluster includes the papers that are oriented towards achieving concept clarity by identifying the conceptual differences between the ecosystem types. This is also closely interlinked with scholarly efforts to arrive at commonly agreed definitions for ecosystems. The systematic review found that the approach to ecosystems can broadly be distinguished with platform ecosystems on the one hand and business and innovation ecosystems on the other hand.

Platform ecosystems are considered meta-organisations that facilitate innovation on the basis of a technological architecture that builds the ecosystem's core (the platform) (Gawer, 2014). The platform is managed by a platform leader that is also responsible for the governance of the platform ecosystem in terms of platform design and standards as well as value creation and capture mechanisms. The platform ecosystem usually takes the form of a hub-and-spoke system. The platform leader and platform represent the hub as they provide the foundation for value creation. The spokes are represented by the peripheral ecosystem members (complementors) that leverage the platform to contribute complementary products or services thereby enhancing the platform's value and innovativeness (Jacobides et al., 2018; Shipilov and Gawer, 2019; Thomas, Autio and Gann, 2014). Besides platforms as technological foundations for innovation (e.g., video consoles, app stores) (Gawer and Cusumano, 2014), platform ecosystems can also promote multi-sided markets in which they act as intermediaries to connect buyers and sellers (e.g., Uber, Airbnb) (Gawer, 2014; Thomas et al., 2014).

In conclusion, a platform ecosystem resembles what Adner (2017) defines as "ecosystems-as-affiliation". In this context, the ecosystem is comprised "of associated actors defined by their networks and platform affiliations" (Adner, 2017, p.40)

The second typology are business and innovation ecosystems. The review showed, that the two terms are often used interchangeably with business ecosystems being more frequently used to adopt a value capture-centric perspective, while the term innovation ecosystem is adopted more frequently in the context of joint value creation (de Vasconcelos Gomes et al., 2018). However, in general both terms are used to describe inter-organisational structures of interdependent actors that jointly pursue a common value creation objective (Moore, 1993; Iansiti and Levien, 2004a; Jacobides et al., 2018).

With regards to the innovation ecosystem terminology, there is a prevailing conceptual unclarity and critique around the adoption of the term, as scholars tend to use it in two different contexts: Some scholars adopt the innovation ecosystem terminology to discuss or describe phenomena that closely resemble spatially confined structures of organisations that have large conceptual overlaps with existing constructs such as regional or national innovation systems or clusters. The use of 'innovation ecosystem' in this context thus raises questions of its novelty and relevancy to research (Oh et al., 2016; Ritala and Almpanopoulou, 2017).

Another interpretation and use of the innovation ecosystem terminology evolved based on work by Ron Adner, who is considered one of the most influential scholars to use the 'innovation ecosystem' terminology in the context of interdependent value creation (de Vasconcelos Gomes et al., 2018). In these contexts, innovation ecosystems are clearly delineated from existing concepts by conceptualising them as market-oriented, inter-organisational but non-hierarchical structures with a clear emphasis on creating value for a defined audience (Ritala and Almpanopoulou, 2017). This market-oriented view is in line with Adner's (2017) definition of 'ecosystem-as-structure' in which he suggests that innovation ecosystems are "defined by the alignment structure of the

multilateral set of partners that need to interact in order for a focal value proposition to materialize" (Adner, 2017, p.42). This understanding of innovation ecosystems in line with the argument that business and innovation ecosystems have large conceptual overlaps is also adopted in this study. Therefore, the two types are considered jointly in this review.

Relations to other concepts (3): The second group of papers refers to studies which determine how ecosystems are related to other established concepts in business and management research. To further strengthen the foundations of the ecosystem concept and show its relevancy, scholars explored similarities and differences with regards to existing concept of inter-organisational structures to clarify why and how ecosystems foster novel perspectives on innovation and value creation.

By tracing the roots of innovation ecosystems to more territorial innovation literature like local production systems, clusters or regional innovation systems, Scaringella and Radziwon (2018) propose that the use of the business or innovation ecosystem concept allows scholars to adopt a wider perspective on joint innovation that goes beyond immediate spatial vicinity and includes a higher number of relevant actors. Moreover, they argue that the ecosystem perspective puts a stronger emphasis on value co-creation while territorial approaches are more focused on knowledge creation and collective learning (Scaringella and Radziwon, 2018).

In comparing ecosystems to other, more established forms inter-organisational structures, Shipilov and Gawer (2019) stress that while network studies usually emphasise the firm level and emphasis on firms' performance improvements through the network, ecosystem research usually focuses on the ecosystem level and the realisation of a joint value proposition. Furthermore, while much of the analysis in networks can be broken down into dyadic relationships between actors, ecosystems are inherently multilateral and encompass all actors that are contributing to the focal offer. They further argue that networks are normally formed among actors of the same industry while ecosystems are industry-spanning. This observation is in line with Moore's work, who introduced the

business ecosystem metaphor to stress the importance of understanding firms as being embedded in relationships beyond their own industry that influence their business activities (Moore, 1993). Similarly, Iansiti and Levien (2004a) argue that the adoption of the ecosystem metaphor stresses the importance of considering firms as members of an adaptive and inherently complex system structure.

Ecosystems further differ from established inter-organisational structures in their governance structures. Networks or alliances are considered to be underpinned by formal governance mechanisms while coordination in ecosystems is achieved through interfaces, modularisation and standards oftentimes supplemented by active alignment efforts of a focal actor (Shipilov and Gawer, 2019; Jacobides et al., 2018).

In summary, there is a consensus that ecosystems are increasingly relevant to understand cross-industry interdependencies between firms that evolve from the need to implement increasingly complex value offerings for customers which require collaboration outside of pre-defined formal hierarchical structures (Jacobides et al., 2018).

Research avenues (6): The third group of papers in this cluster added to the development of the research field by proposing theoretical approaches to understand ecosystems and their dynamics or identified gaps in the literature to explore in the future.

The conceptual papers in this cluster often laid the foundation for more empirical papers that will be discussed in the forthcoming sections. Some papers based their recommendations for future research on reviews of the extant literature (Tsujimoto et al., 2018; Gomes et al., 2021), while other papers suggested the adoption of theoretical perspectives to investigate ecosystems. These perspectives included for example a socio-technical view to explore the dependencies between actors and technologies (Kapoor et al., 2021) or a complex adaptive systems approach to understand the dynamics of how ecosystems unfold and evolve over time (Philips and Ritala, 2019). Other papers in this sample highlighted open research questions that require further scholarly efforts in a particular discipline for example with regards to information systems (De

Reuver, Sørensen and Basole, 2018; Gomes et al., 2021) or international management and strategy (Cha, 2020).

2.5.2. Research on nascent ecosystems

The second cluster of papers developed through the analysis of the sample consists of 30 papers that referred to nascent ecosystems, i.e., ecosystems in their early phase of formation. As these ecosystems are still emerging, the common value proposition is not yet clearly defined and consequently the ecosystem's boundaries and the ties between the ecosystem members are not yet stable. Out of the 30 papers in this cluster, 23 of the studies referred to business and innovation ecosystems and 7 were set in the context of platform ecosystems.

2.5.2.1. Nascent platform ecosystems

Research on nascent platform ecosystems explored how platforms are built by aspiring platform leaders adopting different angles on platform development. Overall, seven papers were assigned to this group.

For example, scholars explored strategies and related actions that firms can take to become dominant platform leaders. In this context, a study showed how firms can either create a new platform in a new business environment or they can strive to tip the competition between co-existing platforms by different actors in their favour (Gawer and Cusumano, 2008).

Other work focused on the capabilities that support firms' platform building efforts and help them to facilitate value co-creation (Schreieck, Wiesche and Krcmar, 2021). With regards to incumbent firms, scholars also explored how incumbents can platformitize their existing business to benefit from attracting complementors and building an innovative ecosystem around their core (Jovanovic, Sjödin and Parida, 2021; Kapoor et al., 2022).

A further angle focused on a platform's complementors, recognising that a platform's success largely depends on its complementors. Therefore, scholars studied how aspiring platform leaders can attract complementors to a newly forming platform to overcome the 'chicken-and-egg' problem (Murthy and

Madhok, 2021) or the difficulties platforms face in competition with established platforms competing for the same complementors (Fang, Wu and Clough, 2021; Inoue and Tsujimoto, 2018).

A final aspect explored in this group of papers was the management of co-opetitive tensions between a new and an established platform. The two respective papers were interested in understanding how firms seeking to establish a novel platform ecosystem address and overcome potential tensions with platform leaders of ecosystems they are affiliated with or with incumbent actors that operate in the same domain (Cozzolino, Corbo and Aversa, 2021; Li, 2009).

2.5.2.2. Nascent business and innovation ecosystems

In the context of business and innovation ecosystems 23 papers studied the nascent stage of the ecosystem lifecycle.

Most papers in this group (14) focused on how firms deliberately build business or innovation ecosystems. Several scholars studied how to ensure the alignment structure between ecosystem actors. For example, scholars explored how firms can resolve the spread of uncertainties among ecosystem actors (Vasconcelos Gomes et al., 2018) or how new ventures that aim to build an ecosystem can ensure the support of incumbent actors that feel threatened by the formation of the ecosystem (Ansari et al., 2016). Studies also uncovered how controversies that may unfold among the ecosystem members and the respective resolution of these tensions influences how the ecosystem takes shape (Kolloch and Dellermann, 2018).

Other work focused on the ecosystem design putting an emphasis on the value proposition and seeking to understand how central orchestrators can develop the ecosystem's value proposition in different contexts and in accordance with the ecosystem partners (Dattee et al., 2018; Lingens et al., 2021b). Yet, other papers have taken a capability perspective and studied which capabilities firms deploy to build and orchestrate their ecosystems. They found for example that firms require either dynamic capabilities (Linde et al., 2021) to build and manage an

ecosystem or adopt ecosystem-specific capabilities like digital readiness, partnering or curation capabilities to navigate or create an ecosystem (Sebastian, Weill and Woerner, 2020).

Lingens, Böger and Gassmann (2021a) show how under certain conditions even start-ups can become the orchestrator of a novel ecosystem. Finally, several studies identified why and how firms build ecosystems to leverage the capabilities and resources of other firms to create disruptive innovation around new technologies (Beltagui et al., 2020; Walrave et al., 2018).

While ecosystems are generally considered collaborative organisational structures, nascent ecosystems can face tensions and competition, as roles, positions and ties between actors are still forming (Shipilov and Gawer, 2019). Consequently, the systematic review showed that 5 papers in the sample studied how firms address and manage the co-opetitive tensions during ecosystem formation. Seeking to understand how firms try to prevent such risks, Plank et al. (2019) identified several mechanisms firms implement to reduce the co-opetitive risks in ecosystem formation. They found that mechanisms such as clear boundaries for information sharing and joint technology development as well as the use of a neutral instance for coordination among actors were useful, but that particularly softer mechanisms such as mutual trust and a shared vision and goal helped to overcome co-opetitive tensions. Studying new ventures in the emerging solar industry ecosystem, Hannah and Eisenhardt (2018) showed how firms choose from three different positioning strategies (component, system or bottleneck) to balance value creation and capture in nascent ecosystems . Yet, their study explicitly focused on entrepreneurial firms which may have a higher flexibility in their strategy and was also set in a clearly bounded ecosystem setting.

Despite the acknowledgement, that ecosystems can also form without the deliberate actions of a central orchestrator, only 2 papers in the cluster studied the phenomenon of self-emergent ecosystems. Scholars focusing on the collaborative forces of ecosystem formation showed how the continuing convergence of complementary technology platforms addressing hardware,

software and services aspects led to the gradual emergence of the overarching 3D Printing ecosystem (Kwak et al., 2018). Similarly, a study based in the FinTech ecosystem showed how collaboration of new ventures in the finance industry promoted the development of the FinTech ecosystem to an extent where it disrupted the existing banking landscape (Palmie et al., 2020).

2.5.2.3. Summary

Overall, the review across both types of ecosystems indicates that in the phase of ecosystem emergence, extant research focused on studying nascent ecosystems that are deliberately designed by focal actors either as platforms or business and innovation ecosystems. Based on this observation, it is suggested that research should differentiate between ecosystems that are deliberately designed and organically emerging ecosystems that form through actors' convergence and without an orchestrator's interference.

The review shows that research is particularly scarce with regards organically emerging ecosystems. There were only two studies on this aspect, and they focused on the ecosystem as their unit of analysis. This was complemented by a single paper that focused on the firm level, which was set in the emerging solar panel ecosystem and did also not explicitly mention an orchestrator that guided the ecosystem formation process (Hannah and Eisenhardt, 2018).

2.5.3. Research on established ecosystems

The third cluster of papers in the review sample consists of papers that were set in the context of established ecosystems, i.e., ecosystems in which the relationships and roles of ecosystem members are relatively stable and in which there is a general understanding of the common value proposition. This cluster consists of 67 papers, more than half of all the papers in the review sample. This clearly indicates that most of the research on ecosystems in business and management focused on ecosystems in this context. Of the 67 papers 40 papers were set in the context of platform ecosystems and 27 papers referred to business or innovation ecosystems.

2.5.3.1. Established platform ecosystems

The cluster of papers studying established platform ecosystems includes 40 papers. The review identified a particular interest among scholars to study how platform leaders govern the platform to foster contributions of complementors to the platform to facilitate platform growth (22 papers). Scholars in this field paid particular attention to uncovering how decisions in the technological set up and design of the platform, such as the platform's perceived complexity and the platform's openness influence complementor behaviour. This involved the choice of complementors to contribute to a platform, complementor quality and competition among platform complementors (Tiwana, 2015; Kapoor and Agarwal, 2017; Parker and Van Alstyne, 2018; Schmeiss, Hoelzle and Tech, 2019; Benlian, Hilkert and Hess, 2015; Hilbolling et al., 2021).

Other scholars focused on member-oriented governance mechanisms such as rule setting or the actions of the platform leader. For example, scholars studied how the balance between general rules that apply to the overall ecosystem and individual rule adjustment for particular complementors contribute to complementors' loyalty to the platform (Hurni et al., 2021; Huber, Kude and Dibbern, 2017). Research also explored how the behaviour of the platform leader in the ecosystem influences complementor action. In this context, studies explored the effects of a platform leader's entrance into a complementor's domain, i.e., by providing their own app. The study explored how this influences the complements that are provided by third parties and the conditions under which such a behaviour either supports or restricts complement provision by third parties (Foerderer et al., 2018; Inoue and Tsujimoto, 2018; Lee and Hwang, 2018).

Four papers were assigned the label 'platform strategy'. What these papers had in common was an interest in studying how the platform leaders can either position their platform in new contexts (Li et al., 2019a) or choose different openness strategies or business models to compete with other platforms for complementors or users (Cenamor and Frishammar, 2021; Li et al., 2019b; Zhou and Song, 2018).

Eight papers in this cluster paid attention to the complementors' perspective and their strategic decision making in platform ecosystems. These studies sought to shed light on how complementors can maximise the benefits of being affiliated with a platform and contributing to it through a complementary service or product. In this instance, studies explored the effects of different variables of a complementor's strategic behaviour such as the selection of platform(s) or the timing of releasing a complement for the platform (Soh and Grover, 2020; Tavalei and Cennamo, 2021; Rietveld and Eggers, 2018; Cenamor, 2021; Pervin, Ramasubbu and Dutta, 2019).

Due to platform leaders becoming increasingly powerful and influential economic actors, as the examples of Facebook or Amazon highlight, a relatively new research interest seems to evolve around platform regulation. Accordingly, three papers, all published in 2021, discussed if and how platforms should be regulated by authorities or government bodies (Jacobides and Lianos, 2021; Parker, Petropoulos and Van Alstyne, 2021; Jenny, 2021).

2.5.3.2. Established innovation and business ecosystems

A strong focus of research on established business and innovation ecosystems with almost half of the papers in this cluster (13) is how a focal firm, i.e., an ecosystem orchestrator, can manage technological bottlenecks and innovation interdependencies with other ecosystem partners. Studies in this area explored how firms identify the position of such interdependencies in the ecosystem (upstream/downstream) and resolve them accordingly for the development and implementation of their own innovation strategy (Adner, 2005; Adner and Kapoor, 2010, 2016b; Talmar et al., 2020; Dedehayir and Mäkinen, 2011). Studies in this group also sought to understand how a focal firm can support complementors to resolve these bottlenecks through means of relationship management or the provision of external resources that allow complementors to catch up with technological changes (Masucci, Brusoni and Cennamo, 2020; Adner and Kapoor, 2016a; Kapoor and Lee, 2013).

Other studies looked at the sharing of technologies and intellectual property (IP) to form standards and ensure interoperability in the ecosystem. A study

illustrated how patent litigation caused inter-firm arguments that arose from conflicts referring to the sharing of knowledge and IP about technologies and standards to achieve interoperability. It highlighted how this can lead to the formation of new or different collaborative ties between actors in the ecosystem (Jones, Leiponen and Vasudeva, 2021). In a more collaborative setting, research showed how existing ties and relations with other complementors influence a firm's position in standard-setting organisations, which aim to promote standardisation among the ecosystem members (Ranganathan, Ghosh and Rosenkopf, 2018)

A third group of papers was interested in how firms manage their ecosystem activities. This included guidelines and frameworks for firms to evaluate and understand their ecosystem's health and identify areas of improvement (Iansiti and Levien, 2004a; Pidun, Reeves and Wesselink, 2021). Further research proposed measures for firms to more generally assess the benefits of their ecosystem affiliation that are not only relevant to ecosystem orchestrators (Graca and Camarinha-Matos, 2017).

Four papers within the context of established business and innovation ecosystems paid attention to the strategies non-focal actors pursue in ecosystems. While one paper explored how firms should respond to growing digitisation and an ever-increasing presence of ecosystems (Sebastian et al., 2020), three papers focused on ecosystems and firm capabilities and investigated how firms can strategically use their ecosystem engagement to enhance their capability base. While some studies explicitly focused on how firms can use ecosystems to enhance their innovation capability for example by drawing on resources or capabilities of other ecosystem members (Henfridsson et al., 2018; Xie and Wang, 2021), others explored the implications of ecosystems for other organisational capabilities, such as a supply chain capability (Riquelme-Medina et al., 2021) or digital customer orientation capability (Kopalle, Kumar and Subramaniam, 2020).

2.5.3.3. Summary

To conclude, the analysis of this cluster across both types of ecosystems shows that research, similar to the findings on nascent ecosystems, paid a lot of attention to firms that manage established ecosystems and explored how governance can be executed in an established ecosystem.

Despite the high likeliness that most firms in an ecosystem are non-focal actors, i.e., ecosystem members or complementors, there is a dearth of research that explored their behaviour and strategies in established ecosystems and the implications it has on the ecosystem development.

2.6. Conclusion and research avenues

The preceding sections provided an overview of the current state of research in the context of ecosystems in business and management by evaluating the research questions that extant research addressed and organising them into three clusters and along two ecosystem types. It provided a concise summary of the current state of ecosystem research. Two key observations are generated from the SLR and point to underexplored areas which offer opportunities for future research.

First, the systematic review of the ecosystem literature shows that research on either type of ecosystem (platform, business/innovation) currently has a strong emphasis on established ecosystems with 67 of the 117 papers being set in that stage of the ecosystem lifecycle. Consequently, only 30 papers and thereby roughly a quarter of the sample, focused on the early stage of ecosystem formation. No papers were identified that studied deceased ecosystems or ecosystems which failed to emerge. This may be because ecosystems are a relatively new phenomenon driven by the success of popular examples. Accordingly, it may proof to be difficult to identify suitable empirical contexts to study ecosystem failure. Finally, the sample did not identify any longitudinal studies that explored how ecosystems evolve across the full ecosystem lifecycle. This may also be due to the relatively novelty of ecosystem research which makes

it unlikely that many ecosystems have already gone through the full lifecycle. Hence, both aspects could offer fruitful avenues for future ecosystem research.

A second finding of the SLR is that from an organisational perspective, research placed a strong emphasis on the focal firm as the platform leader or ecosystem orchestrator. Overall, there is a strong focus on studying how firms can build, manage, govern, and develop ecosystems and achieve the alignment of other ecosystem members. While arguably focal firms occupy the most influential role in an ecosystem, per definition only a small percentage of actors in ecosystems will hold this position. Inevitably, most firms in ecosystems are members or complementors and research has only scarcely explored how they engage in ecosystems and how their behaviour influences the focal firm as well as the ecosystem itself.

Based on these observations from the extant literature, the present study wants to add to the limited but relevant stream of research which investigates organically emerging ecosystems in the absence of a central orchestrator. It is assumed that adopting a firm-level perspective on ecosystem strategy may yield promising insights to further understand ecosystem emergence.

To narrow down the research gap and develop a succinct research question, the following chapter will engage with the relevant literature on ecosystem emergence and ecosystem strategies in more depth. It will first review the literature on ecosystem emergence in more detail, to get a better understanding what research has found about how ecosystems form with or without orchestrators. It will then shift the focus to the firm-level and review different aspects of ecosystem strategies in extant literature.

3. Ecosystem Emergence and Ecosystem Strategies

The systematic literature review provided a broad overview of the current state of research on ecosystems. It found that research thus far scarcely explored how ecosystems emerge and in particular the firm level perspective on ecosystem emergence remains underexplored (Felin and Foss, 2023). It also highlighted that there is a dearth of research that investigates ecosystem emergence in the absence of a central orchestrator. Thus, to further build the foundation for this research project, this chapter presents an in-depth review of the relevant literature on ecosystem formation and ecosystem strategy.

The chapter is structured as follows: Section 3.1 reviews the literature on ecosystem emergence from an organisational and technological perspective, while Section 3.2 evaluates the current research that explored firm strategies, particularly in the context of business and innovation ecosystems. Section 3.3 summarises the key insights from the review which leads to the identification of a research gap. Finally, the research question and sub-research questions which underpin this research project are introduced.

3.1. Ecosystem Emergence

The following section provides an in-depth review of the existing literature on ecosystem emergence from two perspective: Section 3.1.1 provides insights into how an ecosystem forms from an organisational perspective. This section illustrates how ecosystems arrive at their value proposition as the overarching anchor for the ecosystem and how ecosystem members can be aligned towards this value proposition. Subsequently, Section 3.1.2 adopts a technology perspective to explore the role of technology for ecosystem formation, particularly when it comes to the integration of products and services into a coherent value offering.

3.1.1. Organisational perspective on ecosystem formation

Although interest into the emergence of successful ecosystems has been growing (Dattee et al., 2018; Autio and Thomas, 2021), how exactly ecosystems come into

being remains underexplored, though interest into the emergence of successful ecosystems has been growing. In their influential paper on ecosystems, Jacobides et al. (2018) argue that ecosystem formation usually requires the purposeful action of a central orchestrator in order to develop.

To analyse what is required for an ecosystem to form, and how research thus far approached the study of ecosystem formation, it is useful to first determine what constitutes an ecosystem. For this, the study draws on Adner (2017) since the previous chapter illustrated his influence particularly with regards to innovation ecosystems. He defines ecosystems as "the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize" (p. 42).

Following this definition, it can be noted, that there are two elements that constitute an ecosystem, and which must hence be considered during the development of an ecosystem: (1) the commonly agreed *focal value proposition*; and (2) the relational structure that facilitates the value proposition in the form of the *alignment between the partners*.

From the organisational perspective of the ecosystem members, the value proposition is the cornerstone of the ecosystem. It determines the value that shall be created through the ecosystem and which actors, or more specifically which complementary products or services, are required for it (Adner, 2017; Jacobides et al., 2018). It therefore also lays the foundation to align the ecosystem members towards a common goal (Lingens and Huber, 2021; Lingens et al., 2022). In the context of nascent ecosystems there are two general perspectives on how an ecosystem's value proposition is defined which can be described as top-down and bottom-up (Autio, 2021; Autio and Thomas, 2021).

In the top-down perspective an aspiring orchestrator defines the value proposition a priori and without consulting potential ecosystem members or beneficiaries of the ecosystem (Adner, 2017; Jacobides et al., 2018; Lingens et al., 2021b). Studies suggest that one starting point for the a priori definition of an ecosystem's value proposition can be the existing value proposition of an incumbent firm, which can be expanded through means of digitisation and the

ecosystem. In these instances, the incumbent firm acts as the central orchestrator and further actors are invited or enabled to contribute to the firm's value proposition, which effectively leads to building an ecosystem by enhancing the original value proposition (Subramaniam, 2020; Stonig, Schmid and Müller-Stewens, 2022). Other scholars propose that the orchestrator can develop a compelling ecosystem blueprint around a novel value proposition ex ante. In these cases the orchestrator ideally has high market knowledge and is able to not only define the value proposition but also what is required for its materialisation (Lingens et al., 2021b; Iansiti and Levien, 2004b). In both instances of the top-down perspective the development of the value proposition is presented as a rather linear endeavour.

Challenging this view, other scholars suggest that there are instances in which the value proposition development unfolds through a more collective, bottom-up and iterative development process between the orchestrator and prospective ecosystem members (Ansari et al., 2016; Dattee et al., 2018; Thomas et al., 2022). Studying the formation of TiVo and the U.S. television ecosystem, Ansari, Garud and Kumaraswamy (2016) showed that the final value proposition of the ecosystem was the result of a negotiation and convergence process between the aspiring orchestrator and the necessary ecosystem members who were needed in support of the value proposition. Since TiVo's original value proposition would have threatened the incumbents' existence, TiVo was willing to refine the value proposition to ensure the incumbents' collaboration as they were required as key contributors to the ecosystem (Ansari et al., 2016).

Another reason for the collective discovery of the value proposition may be the generative traits of the technology that underpins the ecosystem's formation. Since the technology may be applied in various contexts, the final value proposition develops based on the feedback that ecosystem partners provide to the orchestrator. Through several iterations between the prospective ecosystem members, the possible opportunities are narrowed down to arrive at a clear value proposition which reflects the underlying technology, the contributions of initial partners and the envisioned strategy of the orchestrator (Dattee et al., 2018). The bottom-up, collective perspective therefore supports the existence of co-

evolutionary dependencies between the ecosystem members, which much be acknowledged throughout the development of a value proposition for the ecosystem (Hou and Shi, 2021).

Both approaches, top-down and bottom-up, assume that there is a central orchestrator that facilitates the value proposition design either by defining the value proposition ex ante or by collecting and managing the feedback loops in a more gradual, bottom-up approach. Moreover, it is also frequently assumed that the value proposition and ecosystem emergence are supply-side driven. This means that the beneficiary of the value proposition, i.e., the customer or user, has been treated as a passive value recipient and is not understood to actively contribute to the development of an ecosystem's value proposition (Autio and Thomas, 2020).

One of the key challenges for ecosystem emergence if the value proposition is yet to be defined, is that relevant actors are reluctant to commit their resources to the ecosystem and to invest in the required degree of co-specialisation, which can cause a vicious cycle of resource deferment and hamper the ecosystem's emergence (Dattee et al., 2018; Ozcan and Santos, 2015). Accordingly, the partnering and alignment structure of an ecosystem are strongly entangled with the value proposition and if a value proposition is defined to loosely or if there are unclarities of the value distribution which cannot be remedied there is a risk that the ecosystem fails to emerge (Malherbe and Tellier, 2022).

Either following the definition of the value proposition (top-down approach) or concurrently with the value proposition development (bottom-up approach) the orchestrator needs to attract (further) partners to the ecosystem (Furr and Shipilov, 2018), who are required to realise the ecosystem's value proposition. As illustrated before, this can be particularly challenging in emerging ecosystems as firms are reluctant to invest their resources given the uncertainty surrounding the ecosystem. Therefore, it is crucial that nascent ecosystems quickly achieve legitimacy to convince actors and surrounding stakeholders to become affiliated with the ecosystem. Similar to legitimacy building in other inter-organisational contexts such as clusters (Pinkse, Vernay and D'Ippolito, 2018), the legitimacy of

a new ecosystems can be achieved through the creation of a common identity between actors, a process that has been found to be supported by the actions of the orchestrator but requires the collective involvement of all ecosystem members (Thomas and Ritala, 2021).

Once partners have been attracted, their ties and relationships must be aligned in accordance with the value proposition (Adner, 2017). The underlying alignment approaches which orchestrators adopt are not static, but should be adjusted in accordance with the maturity of the ecosystem, the number of relations between partners and the state and complexity of the value proposition (Lingens and Huber, 2021). If the orchestrator fails to account for these complexities, there is a risk that the ecosystem may not emerge or that it emerges differently than originally intended, potentially even under the guidance of a different orchestrator (Malherbe and Tellier, 2022). Because the alignment process is usually considered resource-intensive since it requires the management of many different stakeholders in a dynamic environment, orchestrators are usually assumed to be large, resourceful firms that possess rare and valuable inputs to the ecosystem (Jacobides, 2019b), however, research showed that in certain circumstances it is also possible for new ventures to build an ecosystem and orchestrate its members (Lingens et al., 2021a).

Exploring the conditions that influence the alignment structure of an ecosystem, research showed that besides the value proposition, it also depends on the prevailing external uncertainty which stemmed from two influences: the prospective future relevance of the value proposition and the knowledge distance of the aspiring orchestrator in relation to the defined value proposition (Lingens et al., 2021b). A high knowledge distance of the orchestrator requires a high input of resources so that the orchestrator can enhance their knowledge with regards to the value proposition and attract other partners despite the initial lack of knowledge. This suggests that in these cases incumbent orchestrators may be more suitable. On the other hand, new ventures which lack those resources may be better suited to build ecosystems around value propositions which they have significant knowledge about beforehand. Additionally, the study suggested that the higher the uncertainty the narrower the ecosystem structure should be, as a

smaller number of actors and issues reduces the complexity of decision making (Lingens et al., 2021b).

To summarise, from an organisational perspective ecosystem emergence relies on the successful development of the value proposition, partnerships, and alignment structure as the building blocks of the ecosystem. With regards to how this can be achieved, most of the literature on ecosystem formation currently follows one or both of the following assumptions:

(1) an ecosystem is actively designed by a central orchestrator that either a priori defines the value proposition or steers the joint value discovery process (Autio, 2021; Adner, 2017; Jacobides et al., 2018);

(2) a central orchestrator, usually a firm or group of firms, steers and facilitates the alignment process of the ecosystem by identifying complementary ecosystem partners and relationships among them (Lingens et al., 2021b; Lingens and Huber, 2021).

In contrast, research has not yet paid closer attention to the development of these building blocks of an ecosystem in the absence of a central orchestrator.

3.1.2. Technological perspective on ecosystem formation

The increasing presence of digital technologies promoted the growing interest in ecosystems as it has become easier for firms to combine and connect their products and services (Amit and Han, 2017) which leads to the formation of inter-organisational dependencies (Wang, 2021). Accounting for the influential role of technology, research acknowledged that ecosystem formation and orchestration does not only have an organisational perspective, but is also facilitated through technology (Autio, 2021). The technological underpinnings of an ecosystem determine how products and services can be connected and thus influences the ecosystem's structure. Furthermore, technological design choices with regards to access and openness define who can contribute to the ecosystem and how they can do so (Gawer, 2021; Schmeiss et al., 2019; Parker and Van Alstyne, 2018).

In many instances the technological layer of a new ecosystem is designed as an industry platform for innovation, which is based on "a set of assets organized in a common structure from which a company can efficiently develop and produce a stream of derivative products" (Gawer and Cusumano, 2014, p.418). Accordingly, the platform serves as a central interface or intermediary that integrates the complements provided by third parties into a seamless value offering (Parker and Van Alstyne, 2018; Gawer and Cusumano, 2008). Frequently cited examples of famous ecosystems that emerged around technological platforms are Apple's iOS or Google's Android smartphone platforms which can be enhanced through apps from third parties (Gawer and Cusumano, 2014; Foerderer et al., 2018), but also video game consoles which rely on the development of games by third parties (Rietveld and Eggers, 2018; Inoue and Tsujimoto, 2018).

In many instances the technological platform is the result of a layered modular architecture which is added on top of a physical product of a focal firm (Yoo, Henfridsson and Lyytinen, 2010). In these instances, firms build a new ecosystem by opening up their existing products through a digital layer which offers programming interfaces or other forms of connectivity for third parties. Further actors such as firms or private developers can access these interfaces to develop complements which allows the focal firm to 'platformitize' their product business (Gawer and Cusumano, 2014; Stonig et al., 2022).

By default the platform owner, i.e., the firm providing the platform, is in control of defining the governance mechanisms on the platform hence making them a powerful orchestrator of the ecosystem (Parker and Van Alstyne, 2018; Thomas et al., 2014). The platform owner defines the conditions for participations in the ecosystem as they make design choices which determine the access to the platform for example through the openness of programming interfaces or the definition of quality checks (Tiwana, Konsynski and Bush, 2010; Gawer, 2021). They also regulate access to intellectual property and mediate knowledge exchange with the platform owner as well as among the ecosystem members (Parker and Van Alstyne, 2018; Zhang, Li and Tong, 2022).

In the case of technological platforms that emerge concurrently but use different technological set ups and compete around a similar value proposition and customer segment, complementors need to decide if they want to contribute to one or more ecosystems ('multi-homing') (Jacobides et al., 2018). This decision will on the one hand depend on competitive considerations such as a platform's presence and market share, but also the technological complexity of the different platforms and the related efforts of multi-homing (Ozalp, Cennamo and Gawer, 2018; Chen et al., 2022). The platform's complexity is thus an important driver for platform owners when it comes to attracting complementors to a new platform.

However, not all ecosystems evolve around a technological platform. There may be instances in which a platform has not yet formed or when the interaction among ecosystem members can rely on the presence of compatibility standards that foster connectivity irrespective of a technological platform (Autio, 2021). The respective coordination towards interoperability and standardisation on the technological layer of the ecosystem can then be achieved more collaboratively via standard-setting organisations (Baldwin, 2020a; Miller and Toh, 2022). Standard-setting organisations are particularly relevant if there is a new generative technology with broad applicability across industries for which a dominant standard has not yet emerged or if several complementary technologies can be combined into a coherent system output by ensuring interoperability between the different technologies (Toh and Miller, 2017; Jiang et al., 2020).

A lack of standards in the digital environment of many ecosystems hampers their emergence, as it prevents compatibility and interoperability of products and services of independent firms that contribute to the ecosystem (Teece, 2018). Therefore, firms may be willing to contribute to standard setting by disclosing some of their knowledge and intellectual property as this allows them to increase the value they can generate from providing complementary products (Miller and Toh, 2022). However, standard-setting organisations are often linked to certain industries and thus in the emergence of an ecosystem in which various industries converge, there may be competition between different standard-setting

organisations for the dominant standard (Wiegmann et al., 2022). Alternatively inter-organisational collaboration may facilitate the establishment of a new and overarching, cross-industry standard in the ecosystem (Teece, 2018; Jiang et al., 2020) or several standards could remain co-existent within the same ecosystem (Jiang et al., 2020).

Overall, research on the technological underpinnings of ecosystem formation has strongly been influenced by the assumption that there is an underlying technological platform that builds the foundation of an ecosystem. Only a limited number of studies explored how technological standard setting may provide another, less centralised opportunity for ecosystem formation from a technological perspective. Furthermore, despite the acknowledgement that standard setting in ecosystems may face challenges with regards to the different backgrounds of the ecosystem members, research scarcely explored the interdependencies between the lack of standards in an emerging ecosystem and the influence this has on the innovation strategies of firms in the ecosystem.

3.2. Ecosystem Strategies

The growing relevance of ecosystems for innovation influences firms' innovation strategies as they need to determine how to approach and behave in ecosystems as part of their business activities (Ganco, Kapoor and Lee, 2020) to benefit from the novel opportunities to access external resources (Amit and Han, 2017). Adner (2017) defines ecosystem strategy as "the way in which a focal firm approaches the alignment of partners and secures its role in a competitive ecosystem" (Adner, 2017, p.47).

The following sections explore the different aspects of ecosystem strategy. It starts with an evaluation of the roles and positions firms adopt in ecosystems and their implications for the ecosystem strategy in Section 3.2.1. Section 3.2.2 considers the importance of ecosystem dynamics in the analysis of ecosystem strategies. This is followed by a review of the literature on the foundations that enable a firm to implement their ecosystem strategy (Section 3.2.3).

3.2.1. Roles and positions in ecosystems

Extant research on ecosystems identified several different roles that firms can occupy within an ecosystem and explored how these roles are related to particular ecosystem strategies. The most discussed roles and respective strategies in ecosystems are the orchestrator role and the complementor role. While the former refers to firms that design and manage their own ecosystem, the latter refers to firms that become members of one or several ecosystems and create value through the provision of complementary products and services (Jacobides et al., 2018). Yet, despite the emphasis on these two roles, studies uncovered further ecosystem roles and strategies that shape an ecosystem's development (Dedehayir, Mäkinen and Roland Ortt, 2018). For example, the presence of an ecosystem dominator that is primarily interested in individual value capture may harm the overall ecosystem's health (Iansiti and Levien, 2004b) while an ecosystem integrator, aims to (technologically) connect other ecosystem members as some form of intermediary without necessarily pursuing an orchestration strategy (Bosch-Sijtsema and Bosch, 2015). Table 2 details the most common roles in ecosystems and summarises the related strategies and implications for the ecosystem.

Role	Description of strategy	References
Orchestrator Keystone Leader	Orchestrators seek to build an ecosystem by defining the ecosystem structure, i.e., the value proposition and alignment structure between the ecosystem members. They are also considered as being responsible for guiding the continuous development and adaptation of the ecosystem and thus for maintaining the ecosystem's health over time.	(Moore, 1993; Dedehayir et al., 2018; Jacobides et al., 2018; Jacobides, 2019b; Lingens et al., 2021b)
Comple-mentor	Complementors seek to benefit from the ecosystem by providing a product or service that is relevant for the ecosystem and can be integrated with and connected to the other products. Complementors can be exclusive members of a single ecosystem or provide their product/service to several ecosystems ('multi-homing'). They contribute to the ecosystem as their complementary products or services increase the value creation opportunities in the ecosystem.	(Moore, 1993; Dedehayir et al., 2018; Jacobides et al., 2018; Jacobides, 2019b)
Integrator	Integrators connect products or services of different ecosystem complementors thus opening further pathways for value creation. They often provide a technological foundation (platform) as the base for integration. While they decide about the conditions to integrate through their platform, they do not orchestrate the whole ecosystem	(Bosch-Sijtsema and Bosch, 2015)
Dominator	A firm that adopts the dominator role in an ecosystem strives to exert control over as many value creation and capture elements of the ecosystem as possible. The dominator executes their strategy through physical domination, seeking to physically absorb other ecosystem members in the attempt to maximise value capture for themselves. Accordingly, while this may benefit the dominator it harms the health of the ecosystem as other ecosystem members may be reluctant to engage in the ecosystem.	(Iansiti and Levien, 2004a)

Table 2: Overview of ecosystem roles

Due to the emphasis on roles and positions vis-à-vis other ecosystem members in the analysis of ecosystem strategies, (Visscher et al., 2021) they are often treated as being identical to the role a firm adopts in the ecosystem. This is reflected in the common use of terms such as orchestrator strategy and complementor strategy when referring to a firm's ecosystem strategy (Iansiti and Levien, 2004b; Jacobides, 2019b; Cenamor, 2021)

With regards to the orchestrator strategy a particular interest has been on exploring how firms can implement new ecosystems (Ansari et al., 2016; Dattee et al., 2018; Lingens et al., 2021b; Lingens and Huber, 2021), or strategically open up their existing product business to form the foundation for an ecosystem of complementary innovation (Subramaniam, 2020; Stonig et al., 2022). In these instances the platformitization of the existing product fosters open innovation through the provision of digital interfaces that enable the development of complementary products and services (Hilbolling et al., 2020; Stonig et al., 2022).

Hence, the adoption of an orchestrator strategy among incumbents requires firms to adjust their established innovation practices and adapt their internal organisation and activity system to lay the foundation for openness and collaboration (Stonig et al., 2022). Besides those internal adaptations, an orchestration strategy also requires the implementation of coordination processes to facilitate the innovativeness of the ecosystem through third party complementors (Hilbolling et al., 2020). Studying the orchestration strategy of Philips Hue, Hilbolling et al. (2020) found that coordination can thereby be achieved through the adoption of a dual strategy in which an orchestrator directly manages a dedicated number of partners, either collaboratively or at arm's length through standard interfaces, whilst at the same time becoming embedded within a broader ecosystem such as Apple HomeKit to further increase their reach in the ecosystem.

Despite the scholarly attention on orchestrator strategies, the ecosystem can only exist, if there are other firms operating as complementors or 'niche players' that contribute to the ecosystem (Jacobides et al., 2018; Iansiti and Levien, 2004b). Firms that adopt the role of a complementor are not responsible for the

development and resilience of the overall ecosystem. Instead their position allows them to leverage the resources and capabilities of other members of the ecosystem for their own benefit (Jacobides, 2019b; Selander, Henfridsson and Svahn, 2013). With regards to their strategy, complementors need to decide whether to invest all their resources exclusively into a single ecosystem or if they prefer to split their resources and multi-home if the barriers to join more than one ecosystem are low (Chen et al., 2022). Multi-homing allows complementors to spread their investment risk if a dominant ecosystem has not yet developed and further increases their access to other ecosystem members. Strategically, multi-homing may also be beneficial for complementors as it prevents the unfolding of winner-takes-all dynamics in which a single ecosystem survives which grants the respective orchestrator a powerful position to determine the value appropriation rules in the ecosystem in their favour (Jacobides et al., 2018).

Only a few scholars have explored in depth how complementors develop their strategy to leverage their ecosystem affiliation for their own benefit. Selander et al.'s (2013) study on Sony Ericsson's affiliation with different ecosystems illustrated how complementors can use their ecosystem membership to access external resources of other ecosystem members. In doing so, Sony Ericsson enhanced their own innovation capabilities which enabled them to develop their products and services towards new directions (Selander et al., 2013).

Irrespective of the particular role in the ecosystem, ecosystem strategies are considered to be co-opetitive as firms must define how they want to balance value creation and value capture in the ecosystem (Karhu and Ritala, 2021; John and Ross, 2022). In the context of a nascent ecosystem, Hannah and Eisenhardt (2018) identify three co-opetitive ecosystem strategies which a firm may adopt according to their position in the ecosystem:

(1) a component strategy in which firms provide one or very few selected components in an ecosystem and rely on other ecosystem members for the remaining components;

(2) a systems strategy, in which firms provide many components for the ecosystem themselves; and

(3) a bottleneck strategy, in which firms strategically occupy a critical ecosystem component that is important for the overall ecosystem growth.

They find that a component strategy is particularly viable in more collaborative ecosystem settings, whilst the systems strategy is more relevant in competitive ecosystems. Further, they suggest that the adoption of a bottleneck strategy is complex, as bottlenecks may shift so that firms pursuing this strategy must possess strong dynamic capabilities to be able to adapt their ecosystem position and continuously balance the competitive and collaborative tensions at the bottleneck position (Hannah and Eisenhardt, 2018). However, it is important to note that in the solar panel ecosystem which served as the context for this study, the interdependencies between the ecosystem members did not rely on digital technologies making the establishment of ties and connections more difficult. It also consisted of five clearly identifiable components and hence firms could accurately determine the implications of each strategy. Furthermore, the firms in the study were all new ventures and thus potentially more flexible in choosing the component they wanted to occupy. This may proof to be more difficult for incumbent firm which are faced with path-dependencies and need to align their ecosystem strategy with an existing core business.

Across these studies, the development of an ecosystem strategy is often presented as a linear process in which a firm identifies their desired role in an ecosystem and then undertakes the necessary steps to implement the respective strategy (Adner, 2017; Lingens and Huber, 2021). Change may only occur if other actors in the ecosystem challenge a firm's position. For example, orchestrators may have to defend their role over time or complementors could threatened to be made redundant or be replaced by other ecosystem members (Moore, 1993), or by the orchestrator's entrance into a complementor's domain (Foerderer et al., 2018).

To summarise, the debate on ecosystem strategies is largely characterised by the discussion of roles that firms adopt within an ecosystem and in relation to other ecosystem members (Visscher et al., 2021). A strong emphasis has also been on exploring the implications of value creation and value capture for the

development of an ecosystem strategy (John and Ross, 2022; Hannah and Eisenhardt, 2018). Yet, less research has focused on how firms develop their ecosystem strategy over time (Visscher et al., 2021) and how ecosystem strategies may be influenced by the co-evolutionary dynamics in an ecosystem (Hou and Shi, 2021).

3.2.2. Ecosystem dynamics

A frequent critique on extant research on ecosystem strategies and the emphasis on positions is that they are often approached as relatively static and scholars increasing call for a stronger emphasis on the dynamics that underpin ecosystem development and the strategies of its members (Rong et al., 2015; Philips and Ritala, 2019).

For example, the assumption that a firm adopts the role of a central orchestrator and is then in control of the development and design of the ecosystem proposed by the 'ecosystem blueprint' perspective, contrasts the understanding that ecosystems develop in response to and in accordance with growing interdependencies between a diverse group of actors (Aarikka-Stenroos and Ritala, 2017). In fact, these interdependent dynamics of ecosystem development have been described as 'co-evolutionary' to highlight the close entanglement of the actions of the different ecosystem members (Moore, 2006). By focusing on these co-evolutionary relations and interdependencies, Philips and Ritala (2019) highlight that an ecosystem's structure is not static and compare it to a complex adaptive system.

Yet, at this stage ecosystem dynamics have primarily been approached from the level of the ecosystem by exploring how the ecosystem evolves across different lifecycle stages (Moore, 1993; Thomas et al., 2022; Snihur et al., 2018). However, if ecosystems are by design dynamic structures that are characterised by the continuous evolution of its members, this implies that the strategies of ecosystem members also face constant adjustment by the respective firms (Philips and Ritala, 2019). This will in turn influence the shape of the ecosystem (Felin and Foss, 2023), suggesting interdependencies between the strategy on the firm level and the evolution on the ecosystem level.

One of the few exceptions that focuses on the firm level, is a study of industrial firms in the context of more decentralised, emergent ecosystems that shows how a firm's ecosystem strategy unfolds across two layers, namely an exploratory and exploitative layer. The findings indicate that firms engage with the ecosystem on both layers, which may be constituted differently, and thus illustrates how the firms adopt different positions and alignment structures on each of them. The study further suggests that ecosystem strategies can be clustered along different maturity grades depending on the engagement on each layer (Visscher et al., 2021). Similarly, Bosch-Sijtsema and Bosch (2015) suggest that firms may engage in different business ecosystems simultaneously and adopt different roles in each of them, depending on their goals and the respective affiliations with other ecosystem actors.

In conclusion, this shows that the dynamic evolution of an ecosystem is entangled with the members' individual expectations and the ecosystem goals they pursue in the ecosystem. Hence, a stronger emphasis on the dynamics at the firm level could help to better understand why and how ecosystems evolve over time (Felin and Foss, 2023).

3.2.3. Foundations of ecosystem strategy

In terms of ecosystem strategy foundations, research primarily unravelled the capabilities that underpin ecosystem strategies. There is a consensus among ecosystem scholars that firms that engage in ecosystems require particular capabilities that help them to survive and adjust to the dynamic and ambiguous ecosystem environment and enable the firm to execute the ecosystem strategy (Dedehayir et al., 2018). Consequently, several studies have been conducted with the aim to identify which capabilities firms develop in accordance with their ecosystem affiliation and how these capabilities contribute to the execution of the ecosystem strategy.

As with other aspects of ecosystem research, the key focus of studies exploring organisational capabilities in the context of ecosystems has been on investigating which capabilities firms require to successfully design and orchestrate an ecosystem (Linde et al., 2021; Helfat and Raubitschek, 2018; Altman, Nagle and

Tushman, 2022; Kindermann et al., 2022; Weill and Woerner, 2015). Furthermore, the majority of these studies adopted the dynamic capabilities framework (Teece, Pisano and Shuen, 1997) to understand how firms deliberately develop and deploy capabilities to address the requirements of an ecosystem (Linde et al., 2021; Lütjen et al., 2019; Kindermann et al., 2022; Helfat and Raubitschek, 2018).

Exploring how dynamic capabilities are relevant to develop and manage an ecosystem, a conceptual paper by Helfat and Raubitschek (2018) found that innovation, environmental sensing and seizing, and integrative capabilities are crucial for successful platform leadership and to ensure sustained competitive advantage (Helfat and Raubitschek, 2018). In this regard, the sensing capability enables the firm to detect changes in the business environment (e.g., new competitors, changing market needs) early on. Well-developed innovation and seizing capabilities then allow the firm to adapt the core product of the platform in response to these changes. Finally, integrative capabilities enable the platform leader to identify relevant partners and to build the governance and alignment structure of the platform to ensure that all elements of the platform are seamlessly integrated (Helfat and Raubitschek, 2018).

Building on the dynamic capabilities view, Kindermann et al. (2022) developed a conceptual framework of six routines that help orchestrators to resolve component and complement challenges resulting from interdependencies during ecosystem evolution. Components are thereby considered to be upstream and integrated by the focal firm whereas complements are downstream and integrated by the customer (Adner and Kapoor, 2010). Similarly, Foss, Schmidt and Teece (2023) explore how ecosystem leadership can be understood as a dynamic capability that enables firms to gradually establish a novel ecosystem through sensing and seizing and to manage the transformational requirements it may face over time (reconfiguring).

A study in the smart city ecosystem (Linde et al., 2021) showed how dynamic capabilities enable a firm to build and orchestrate a nascent ecosystem. It identified three sets of relevant dynamic capabilities structured along the

common triad of ecosystem sensing, ecosystem seizing and ecosystem reconfiguring. According to their findings, ecosystem sensing is the ability of firms to identify promising business opportunities and the respective partners while ecosystem seizing describes the definition of an appealing value proposition related to the business opportunity and the establishment of relationships with the prospective partners. Finally, ecosystem reconfiguring enables the orchestrator to adapt the structure and ecosystem offering to changing conditions i.e., from customers or members of the ecosystem (Linde et al., 2021).

What all these studies focusing on the underpinnings of ecosystem strategy have in common is their emphasis on dynamic capabilities and their respective contention, that an orchestrator needs to broadly address three aspects to implement their ecosystem strategy:

(1) the identification of business opportunities or market needs that can be addressed via an ecosystem (sensing);

(2) the identification of the relevant partners to address the market need (seizing) and:

(3) the ability to envision and maintain the relationships and alignment structure between the ecosystem members (reconfiguring).

Surprisingly, research only scarcely explored how firms adapt their existing capability base if they transition towards becoming more involved in ecosystem structures (Altman et al., 2022). A notable exception is the work of Stonig et al. (2022) which focused on a firm's underlying activity system and showed how firms must adapt their product-centric business to meet the requirements of an integrated value proposition and transition towards an ecosystem-oriented business.

To conclude, ecosystem research could benefit from more research beyond the focus on the ecosystem orchestrator to understand not only what kind of capabilities underpin an orchestration strategy, but more broadly explore the foundations of ecosystem strategies of different actors. Furthermore, the strong

emphasis on dynamic capabilities may fall short in exploring how firms develop their ecosystem strategy, as the deployment of dynamic capabilities implies the deliberate response to a changing environment (in this instance the ecosystem) (Teece et al., 1997) which is reflected in the strong emphasis on the purposeful adoption of the orchestration strategy. Hence, it may be fruitful to complement the dynamic capabilities perspective on ecosystem strategy and explore how firms may respond to the emergence of an ecosystem through the deployment of ordinary activities and processes (Salvato, 2009; Salvato and Rerup, 2011; Schriber and Löwstedt, 2020) and how these activities may contribute to the gradual development of an ecosystem strategy.

3.3. Literature Synopsis and Research Question

The following section provides a synopsis of the key insights derived from the literature review that indicate the research gap and more specifically the research question guiding this research.

The literature review began with a systematic analysis of extant research of ecosystem in business and management presented in Chapter 2. The analysis revealed that to date, research particularly focused on the study of established ecosystems and on ecosystems that are deliberately managed by a firm adopting the role of a central orchestrator or platform leader. Based on these insights, the systematic review enabled the identification of potential avenues for future research, one of them being the better understanding of ecosystem strategy development in the context of emerging ecosystems.

Against this background, the literature review engaged in depth with the extant literature on ecosystem emergence and ecosystem strategies. This revealed that research on ecosystem formation has predominantly paid attention to ecosystems that are created through the deliberate actions of a central orchestrator, and emergent ecosystems that evolve organically remain underexplored. With regards to strategies in ecosystems, a strong focus has been on the exploration of different roles and positions *that* firms can adopt in an ecosystem and the opportunities these offer for value creation and value capture. However, less research explored *how* firms develop their ecosystem strategies in

the first place. In accordance with these findings, the review highlighted that scholars have pre-dominantly approached ecosystem strategies as rather stable thereby neglecting temporality and the co-evolutionary dynamics stemming from other actors and the ecosystem environment. Finally, the review elicited that with regards to the foundations that underpin the execution of an ecosystem strategy particular attention has been paid to dynamic capabilities and the deliberate execution of orchestration strategies.

In conclusion, the literature review suggests that ecosystem research would benefit from a more in-depth and nuanced exploration of how ecosystems form in the absence of a central orchestrator that steers the formation process. Furthermore, in the context of emerging ecosystems, research lacks an understanding of how firms' ecosystem strategies evolve and how their development influences the emergence of the overall ecosystems. Finally, research would benefit from a stronger consideration of ecosystem dynamics and changes over time which could further outline the co-evolutionary interdependencies between ecosystem members as well as the firm- and ecosystem level of the ecosystem.

Figure 8 graphically illustrates the supporting literature, that of emerging ecosystems, of co-evolutionary dynamics in the ecosystem and the development of ecosystem strategies. In its centre, the figure presents the research gap that this study aims to address.

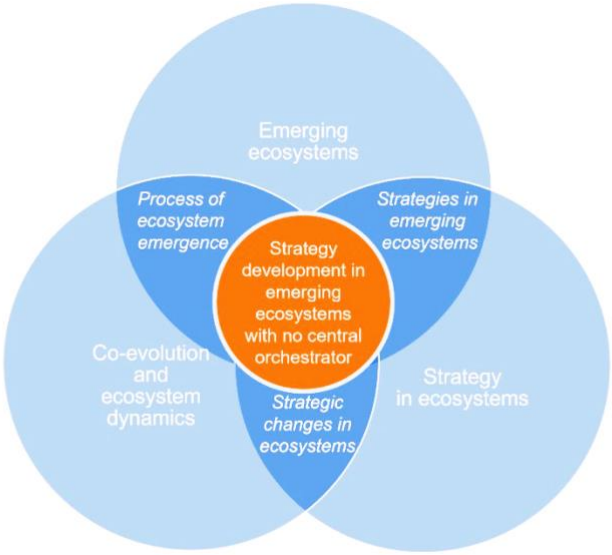

Figure 8: Research Gap

Based on the identified gaps in the literature an overarching research question is derived which builds on these gaps and guides the further development of this research project. The overarching research question is thereby posed as follows:

Why and how do firms develop their ecosystem strategy in the context of an emerging ecosystem with no central orchestrator?

This overarching research question is further divided into two sub-research questions which this study seeks to explore:

- **Sub-RQ1:** How does a firm's ecosystem strategy in an emerging ecosystem evolve over time?
- **Sub-RQ2:** Which processes do firms deploy to implement their ecosystem strategy and how are these processes developed?

The preceding chapters indicated that platform ecosystems are by default centralised, as they are structured around a platform. Hence, the focus of this study will be on innovation ecosystems. While both are oriented towards joint value creation, innovation ecosystems may also form around a shared technological standard and emerge in the absence of a central orchestrator (Autio, 2021). The use of the term 'ecosystem' in subsequent chapters therefore refers to an innovation ecosystem as illustrated in Chapter 2.5.1.

4. Research Design and Methodology

4.1. Philosophical assumptions

A study's research design is influenced by a set of philosophical assumptions the researcher either explicitly or implicitly makes about reality (ontology) and how acceptable knowledge about reality should be created (epistemology). Being aware of these assumptions is important for a researcher to develop an adequate research design to answer their research question (Easterby-Smith et al., 2021).

Ontological positions are differentiated with objectivism/realism at one end, and subjectivism or constructivism at the other end (Antwi and Hamza, 2015; Saunders, Lewis and Thornhill, 2019). Objectivism assumes that social phenomena exist independent or separatable from the behaviour and influence of social actors. They are predetermined and social actors can only react to their existence (Bryman and Bell, 2007). In contrast, constructivism suggests that social phenomena are 'constructed' through interaction between the social actors and therefore their state and existence are under constant change (Bryman and Bell, 2007). In between those two extremes lies the realist ontology. It suggests that there is an independent reality out there which the researcher cannot directly access and argues that reality therefore depends on the standpoint of the observer (Easterby-Smith et al., 2021).

A researcher's ontology as the perception of what constitutes reality is closely tied to their epistemological viewpoints which describes their understanding of how scholars should create knowledge about that reality. The epistemological underpinnings of a research design can be regarded as sitting alongside a continuum ranging from positivism to interpretivism. Researchers in the social sciences, who adopt a positivist standpoint, argue that similar principles as those applicable in the natural sciences should be applied to knowledge creation in social sciences. This means that they suggest that an observer can be neutrally separated from the observed and hence a positivist epistemology often links to an objectivist ontology (Easterby-Smith et al., 2021).

The opposite of positivism from an epistemological viewpoint is interpretivism, which suggests that knowledge creation in organisational research must consider differences in the perception of reality among social actors and therefore account for the meaning they assign to their environment. Accordingly, interpretivism generally rejects the idea that social science research should follow the same principles as natural sciences and emphasises the importance of understanding the subjectivist perspectives of the social actor that shape their reality (Bryman and Bell, 2007). It hence usually correlates with the ontological position of constructivism.

Between the two opposites sits critical realism. As the name suggests, critical realism refers to a realist ontology and argues that while an external reality exists irrespective of what is known about it, the access to that knowledge is socially mediated. Hence, what people perceive as knowledge about reality is only the researcher's depiction of it (Bryman and Bell, 2007). Critical realism and its approach towards knowledge about reality builds on three domains: (1) an empirical domain comprising the experiences and perceptions of actors; (2) an actual domain which entails events and actions that happen irrespective of whether they are observed or not; and (3) a real domain, which cannot be observed by the researcher, but which comprises causal powers and mechanisms that lead to actual consequences for social actors (Easterby-Smith et al., 2021).

Scholars subscribing to a critical realist tradition assume that "entities cannot be reduced to being something in themselves" (Frederiksen and Kringelum, 2021, p.23) and therefore argue that social actors, whether it is groups, masses, people, or organisations, cannot be individualised or separated as research objects. Instead, any object studied in the context of social sciences is influenced by its relations with other objects or social actors around them and research of a social phenomenon must account for those social relations (Bhaskar, 1978). Acknowledging the influence of social relations also leads to the recognition "that social structures, unlike natural structures, may be only relatively enduring" (Bhaskar, 1978, p.14), which allows critical realists to consider how social phenomena may change or evolve (Frederiksen and Kringelum, 2021).

This research projects adopts a critical realist position as this philosophy fits well with the researcher's assumption about the phenomenon under study, because innovation ecosystems emerge through social interactions between actors (firms, customers, stakeholders) and the firms' strategies influence which social relations they establish with other ecosystem actors. Furthermore, while an ecosystem emerges through the activities and behaviour of firms irrespective of the researchers' understanding of these activities, by investigating these activities researchers can generate theory about why and how firms develop ecosystem strategies and how these strategies and social interactions contribute to an ecosystem's emergence. Hence, the empirical setting of the innovation ecosystem and the underlying research questions support the adoption of critical realism as a suitable philosophical underpinning for this research project.

4.2. Research methodology

4.2.1. The case study methodology

In line with the philosophical standpoint and theoretical interest of this research, a case study approach was chosen as the appropriate methodology to answer the research question. A case study enables the researcher to investigate the phenomenon of interest in its real setting and allows for the consideration of influences by the phenomenon's environment. It is also particularly suitable if the researcher has no control over the environment (Yin, 2018).

The case study methodology allows the researcher to choose from and combine a range of different primary and secondary sources in the data collection process, such as the collection of archival data, the conduction of interviews or participant observation. Drawing on several data sources enables the researcher to achieve as much clarity as possible about the phenomenon under investigation and to ensure rigour in the case analysis (Eisenhardt and Graebner, 2007).

Case studies can either rely on a single case or be developed through the study of several cases, which enable the researcher to identify patterns and similarities and draw conclusions from these observations (Bryman and Bell, 2007) and the

selection of the particular case study design depends on the research question and the philosophical standpoint of the researcher.

There are two influential scholars and case study advocates in business and management research whose work has informed the development of the case study method in the field and who contributed methodological advice for the design of a case study: Robert Yin, who published a highly cited book on the case study methodology (Yin, 2018) and Kathleen Eisenhardt, who published several seminal papers on case studies as a method for theory building (Eisenhardt and Graebner, 2007; Eisenhardt, 1989). Both scholars are rooted in a rather positivist ontology and understand the case study methodology as a way to build theories and possibly also generalise from it, despite the adoption of mostly qualitative data collection methods (Yin, 2018; Eisenhardt, 1989). Yin even compares a case study to an experimental set-up in natural sciences, with each case representing one experiment (Yin, 2018). As a result, Yin and Eisenhardt prefer multiple case study designs as opposed to more context-dependent single case studies (Piekkari and Welch, 2018).

While multiple case study designs are closely linked to a positivist research philosophy, they are also well suited for critical realists if the interest of the research are "relatively clearly bounded, but complex, phenomena such as organisations, interorganisational relationships or nets of connected organisations" (Easton, 2010, p.123).

However, there are also advocates in the management discipline that emphasise the importance of single case studies and argue for a less positivist stance on the execution of case studies. Single case studies enable a researcher to uncover rich details and in-depth insights into a particular context rather than to make comparisons across a larger number of cases (Piekkari and Welch, 2018). A single case study is thus deemed particularly suitable for the in-depth, longitudinal analysis of a case. This is because it allows the researcher to generate deep insights or study a case representing an extreme or unusual example. In contrast, multiple case studies usually provide more comprehensive insights and allow the researcher to apply a replication logic in selecting cases (Yin, 2018).

4.2.2. The multiple case study design

This research project seeks to explore how different firms within an emerging ecosystem articulate their strategy in the ecosystem over time and understand the activities and processes they develop in support of it. Furthermore, the study seeks to investigate how the development of an ecosystem strategy relates to the emergence of the overall ecosystem. To understand the differences and similarities among firms within an ecosystem and explore their implications in the emerging ecosystem, a multiple case study approach is hence considered a suitable approach. Moreover, applying a multiple case study design, even if it is per se exploratory, allows the researcher to uncover patterns, explore relationships between constructs and identify similarities and differences across cases. These findings can provide inputs to develop theories, which can be tested in subsequent studies (Eisenhardt and Graebner, 2007).

Within a multiple case study design, it is essential to specify what the term 'case' in the study refers to and to be clear about the unit of analysis. The interest of this study is to examine the strategy process of individual firms within the ecosystem. It is assumed that the ecosystem itself influences the development process. Therefore, the firm is identified as the unit of analysis, and the ecosystem provides the study's context. Each firm in the study should thus be understood and treated as a separate case. Based on Yin's classification of different single and multiple case study strategies, the study therefore pursues a holistic multiple-case design (Yin, 2018).

Following the decision to adopt a holistic multiple case study design, the next step to develop the research design is the evaluation and identification of a suitable empirical research context (cf. Section 4.3.1 and Section 4.3.2). Furthermore, the rigorous execution of a multiple case study design relies on the careful and deliberate selection of cases to be investigated (cf. Section 4.3.3) and the purposeful choice of data collection methods to generate the necessary insights to answer the research question (cf. Section 4.4).

4.3. Research Context and Case Selection

4.3.1. The research context

In any empirical study, an important step in designing a research project is the careful selection of a suitable empirical setting. The current study is interested in exploring ecosystem strategies within an emerging ecosystem with no central orchestrator. An emerging ecosystem was considered to be an ecosystem in which the value proposition, the members, and the ties between the members are not yet fully defined, but where the ecosystem-typical interdependencies between the members are already observable. Therefore, the criteria which were applied to determine the research context were that the ecosystem's structures and value proposition were still evolving, that there was no apparent central orchestrator in the ecosystem and that there were firms from different backgrounds that jointly and interdependently engaged in value creation.

The researcher started by conducting desk research to explore potentially suitable empirical settings. This search identified three possible opportunities in the form of the health care ecosystem, the mobility ecosystem, or the smart home ecosystem. The empirical suitability of these options was further verified during the pilot study interviews conducted with experienced business consultants at the early stages of this research project. The researcher also engaged in a couple of informal interviews with industry representatives of these ecosystems to further explore the potential fit of the research context and narrow down the decision. This indicated that while all three contexts presented emerging ecosystems the healthcare ecosystem was at its infancy and might not yet yield sufficient data to answer the research question.

To get a sound understanding of the firms' strategies and overall ecosystem, it was also important to ensure that sufficient access to prospective firms in the ecosystem could be ensured. Considering this aspect in conjunction with the appropriate fit of the empirical context with the research aim, the smart home ecosystem was chosen as the research context for this study. First, it was at a suitable stage of emergence and populated by several different firms. Furthermore, due to the researcher's prior industry experience and professional

network, it promised the greatest chances to ensure access and gather relevant data.

A detailed description of the smart home ecosystem as the context for this study can be found in Section 4.3.2 and the detailed case selection process and introduction of the cases are provided in Section 4.3.3.

4.3.2. The smart home ecosystem

To understand how firms approached the development of their strategy it is necessary to first understand the smart home ecosystem context and its relevance for firms in the respective industries. The 'Smart Living Germany' initiative that is supported by the German Federal Ministry of Economic Affairs and Climate Change, provides a good starting point as it offers a definition of smart home and an approach to identify the components of the ecosystem. According to their definition smart home refers to the use of applications in private homes that address various needs of its residents. These needs can refer to security, assisted living, entertainment, comfort, or energy saving. Consequently, the smart home ecosystem is comprised by firms from diverse backgrounds such as consumer electronics, home applications, communication technology or building electronics (Smart Living Germany e. V., 2022). Recent market studies show that from a customer perspective, five key areas of overarching applications enabled through the convergence of actors and domains within the smart home ecosystem are considered to be of particular interest: Energy Management and Efficiency, Building Security, Home Automation/Comfort, Entertainment/Communication and Ambient Assisted Living/Health Care (Heimer, Pschorn and Waiblinger (Eds), 2022).

Figure 9 offers an overview of the ecosystem as it schematically depicts the converging industries and domains it is formed of. The figure also illustrates the inter-organisational interdependencies among the ecosystem members by indicating how cross-industry ties are forming across the different domains. Overall, it shows how the smart home ecosystem develops as the result of several converging connectivity efforts by different firms and across different domains.

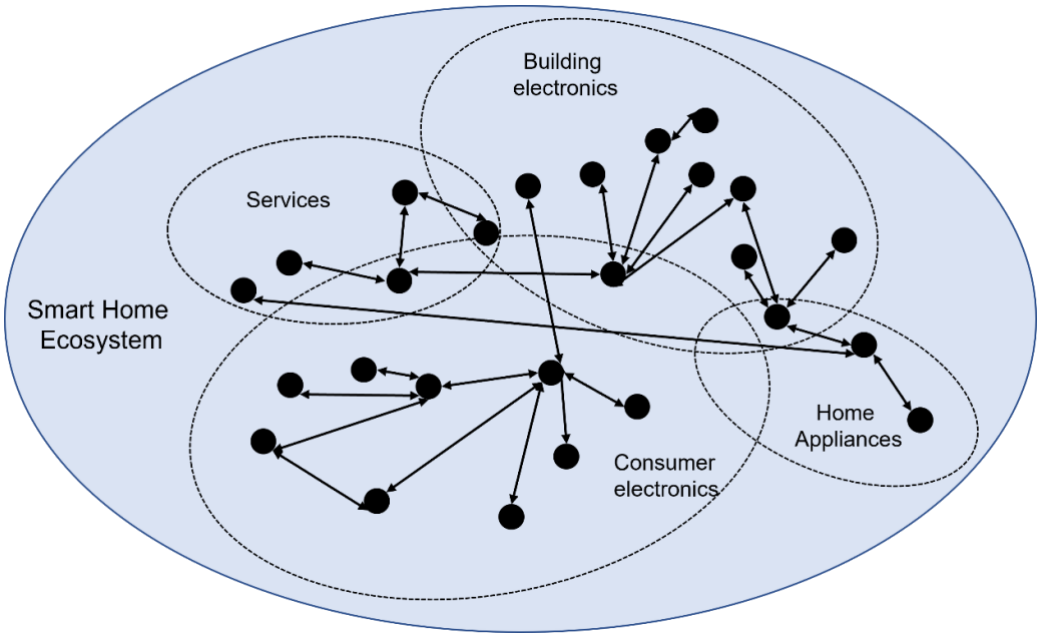

Figure 9: Schematic Illustration: Smart home ecosystem

The technological convergence of different firms into a joint ecosystem can be traced back to the start of this millennium, when several firms from the building electronics industry established a joint connectivity standard for their products (KNX Organisation, 2022). However, to date, no central orchestrator has taken charge of developing an industry-overarching smart home connectivity standard. Therefore, the devices are connected through a variety of parallelly existing technological standards that have been established in different industries to facilitate connectivity (Serrenho and Bertoldi, 2019). Consequently, the technological landscape within the smart home ecosystem remains fragmented (Berends, Deken and Hummel, 2018; Federal Ministry for Economic Affairs and Climate Action, 2016). Overall, the smart home ecosystem is still considered to be in a nascent state, partly because of the technological fragmentation, but also because no clear and overarching value proposition has yet emerged (Serrenho and Bertoldi, 2019).

Despite these challenges, market research foresees a significant growth potential. For example, the German Ministry for Economics and Climate Action expects revenues to grow from 2.3 bn Euro in 2015 to 19 billion Euro in 2025 and estimates a chance for German firms to participate from a 60% share of the value added. Yet there are also risks of international pressure and a potential for market failure (Federal Ministry for Economic Affairs and Climate Action, 2016).

In conclusion, the variety of firms of different sizes and backgrounds in the smart home ecosystem provides a rich empirical setting to study how the availability of digital technologies triggers the emergence of an ecosystem and how firms develop their strategy response to this situation. The introduction of the ecosystem further illustrates the opportunities for growth and novel value creation for firms already operating in the affected industries. It also indicates that there is a risk to lose market shares and customers to competitors entering from foreign markets. Especially because of the significant economic growth potential new entrants seek to engage in the smart home ecosystem to participate from the growth potential and seize the new value creation opportunities in the emerging ecosystem.

4.3.3. The case selection

Once the smart home ecosystem had been selected as the empirical context of this study, further rigour in the research design was applied in the identification of appropriate and comparable cases. It was essential to eliminate environmental influences to ensure differences related to the firm's strategy and were not caused by differences in the surrounding conditions, i.e., varying local legislation or different customer demands. Therefore, the case selection was limited to firms in the smart home ecosystem in Germany. This meant that to be considered as an eligible case for this study, a firm had to be active in the German smart home ecosystem. If firms were active globally, the focus should be on discussing the activities and strategies the firm applied in the German context.

In case study research, cases should be selected purposefully rather than randomly or opportunistically (Yin, 2018). The goal should be to select cases that can replicate, extend or purposefully contradict existing results or provide insights into settings that are not yet well understood (Goffin et al., 2019). Accordingly, case study research does not follow the same sampling logic as quantitative studies, and cases should be chosen to enable the researcher to develop, replicate or expand theory (Yin, 2018; Eisenhardt, 1989). In selecting the relevant cases from the overall population, researchers can adopt a literal replication approach which predicts to generate similar outcomes from each

case. Alternatively, they can use theoretical replication. This approach predicts different outcomes that are caused by foreseeable antecedents. If possible, a mix of both approaches should be adopted, i.e., theoretical clusters are built across cases that may yield different outcomes for determinable reasons. Within each cluster the researcher should seek to include a literal replication logic (Yin, 2018).

The present study followed the recommendation for a combination of theoretical and literal replication to provide sufficient room to study different types of firms in the smart home ecosystem. Initial desk research suggested three main clusters of firms in the smart home ecosystem: (1) incumbents from other industries that entered the smart home sector (e.g., utilities and telecommunication firms); (2) incumbents with a background in the home or building market (often manufacturers); and (3) new ventures. The study aimed to include firms from each cluster to provide a holistic picture of the actors in the ecosystem and their strategies.

Yin's recommendation is that a multiple case study design should ideally incorporate between 6 and 10 cases, as anything beyond this number may make data management and analysis difficult. Accordingly, the final number of ten cases included in this study is at the upper end of what is recommended. The ten cases were spread across the three groups identified above as follows: four cases were new ventures, five cases were incumbents with a background in the home or building market, and one case was an incumbent from another industry. Initially, the aim was to include a further incumbent from the energy industry to the group of cases 'incumbents from other industries'. However, the firm discontinued its smart home activities between the beginning of this research project and the beginning of the data collection period and access to the firm was no longer possible.

All case firms were identified through browsing context-relevant websites such as www.homeandsmart.de, reading publications or membership lists of smart home associations or government initiatives (e.g., Bitkom e.V. or Smart Living Germany) or by scanning newspaper articles about smart home in Germany. Furthermore, once different firms had been identified it was also possible to visit

the websites of their smart home initiatives to identify further involved companies.

After a list of potential firms for the research project had been compiled, it was narrowed down as the researcher aimed to select firms that had different backgrounds in terms of products lines, size, or age and to ensure that the selected cases fell into the different groups of ecosystem actors. Following the selection of firms that were considered suitable, possible interviewees within these firms were searched either by utilising the researcher's personal and professional network, but also by browsing professional networks such as 'LinkedIn' or the German equivalent 'Xing'. Prospective participants were contacted either by email or through a private message on the professional networks. The initial message, if the researcher did not know the person beforehand, introduced the researcher, and informed the recipient about the purpose of the study and why they had been contacted. The prospective interviewees were asked if they would be willing to participate in the study and respective information was provided. Although some efforts to reach out to people did not lead to the establishment of a research contact, the overall response rate was quite high, and the researcher could cover the different group of firms set out for the case selection.

If the responses by the prospective participants were positive, the interviewees were asked to recommend further potential interviewees in their firm, who could also speak on the research topic to ensure that each case relied on the viewpoint of more than one interviewee. At this stage it should also be acknowledged that the inability to visit the companies on site due to COVID-19 contingency measures implemented with regards to international travel but also within the firms, limited the collection of additional data, for instance through observations or informal chats with other people at the company. While this implies the establishment of less research contacts within the firms, the researcher made sure to mitigate this effect by maintaining regular contact with interviewees through e-mails or phone calls for further clarification. Moreover, where possible public data sources such as interviews in newspapers, industry magazines or

public smart home industry panels were leveraged to generate further insights. A detailed outline of the data collected for each case is presented in Chapter 4.4.

Not all of the ten case firms were included in the research from the beginning. Two of the four new ventures (SensorCo and TechCo) were added to the case selection once data collection and analysis for other cases had already commenced. The reason was that the researcher felt that data saturation for the new ventures had not been reached. Additional desk research was conducted to identify possible further cases that could increase the study's validity. The researcher identified and contacted three more new ventures which fit the selection criteria, of which two agreed to participate. Interviews with these two firms followed the same order and interview protocols as with the other cases. This ensured that the data collected for these two additional cases was not biased by ideas or interpretations that the researcher had already developed through the analysis of the other cases.

While it is desirable to disclose the names of firms and participants within a research project to increase its transparency (Gibbert, Ruigrok and Wicki, 2008), this is often not possible due to concerns on the companies' end. This was also the case for this research project, in which most companies were only willing to contribute to the study by sharing their firm's development and strategy in the smart home ecosystem if their firm's identity was pseudonymised so that the firm and they themselves were not easily identifiable. Consequently, it was decided to pseudonymise all cases to ensure consistency and potentially increase the openness of the interviewees, as they could be assured that their firm and personal identity would not be disclosed.

Table 3 introduces each of the ten case firms in more detail. It provides relevant background information on the firms; briefly introduces how they organised their ecosystem activities and summarises the key objectives they pursued with their strategy in the smart home ecosystem. This serves to increase the transparency with regards to the empirical origins of the data despite the pseudonyms used to describe the cases. The information also helps to contextualise the empirical findings of the study.

	HeatCo	ConnectCo	TelCo	MotorCo	SwitchCo	ElectronicsCo	ApplianceCo	HouseCo	SensorCo	TechCo
Background	• Incumbent family-owned manufacturer for products in the sanitary installation domain • ~ 4,500 employees • active in ~10 countries	• new venture founded in 2019 • ~ 10 employees • provider of techno-logical platform to connect smart products and services into new use cases	• European telecom-munication provider • Provider of IT services and infra-structure • Regularly scouting for new business opportunities • > 100,000 employees worldwide	• Incumbent, family-owned manufacturer of tubular motors for the control of shutters, awnings, blinds etc. • ~ 6,500 employees • ~ 125 branches worldwide	• Incumbent, family-owned premium manufacturer of building electronics • ~1,400 employees • ~100 branches worldwide	• Incumbent, family-owned premium manufacturer of building electronics • ~1,200 employees • branches in ~40 countries	• Incumbent home appliance manufacturer • among Top 10 global appliance manu-facturers (by revenue) • > 10,000 employees • 40 global production sites	• New venture founded in 2013 as spin-off from an electrician service firm • ~18 employees, 2/3 with IT roles • Provider of hard- and software to connect smart products	• New venture founded in 2017 • ~ 20 employees • Smart home device equipped with sensors to monitor the home and trigger actions with other devices	• New venture founded in 2012 as university spin-off • ~25 employees • Provision of platform infrastructure to combine manufacturers' devices into an integrated, smart solution
Structure of ecosystem activities	• activities spread across functions (Strategy/ Business Developm., Product Development , Marketing) • dedicated unit since 2019 to explore digital opportunities	• managed by two Co-Founders (CEO and CFO) and CPO • regular exchanges across all employees • adoption of lean & agile working principles to organise tasks	• ~80 employees work in dedicated Smart home unit • access to additional IT developer resources • adoption of lean & agile working principles to organise tasks	• dedicated smart home unit • formal exchanges between global and regional teams • informal exchanges among regional teams	• activities spread across business functions, • regular exchange between business functions and global branches	• dedicated ecosystem team dissolved 2018, activities embedded in business functions • regular exchange across business functions and branches	• project teams to explore ecosystem opportunities in 2015 • transfer of project activities into dedicated team in 2018 • team consists of global core and regional spokes	• managed by Founder and COO • organisation of teams around lean & agile working principles particularly in the development of the software solution	• managed by Co-Founders (CEO and CMO) and CTO • regular exchange among management team • tasks organised along agile working principles	• managed by CEO/CTO • 4 teams: technical development; product management, sales, marketing & services; business development • cross-team work use of agile methods

	HeatCo	ConnectCo	TelCo	MotorCo	SwitchCo	ElectronicsCo	ApplianceCo	HouseCo	SensorCo	TechCo
Ecosystem objectives	• ensure core business meets requirements of growing digitisation / connectivity • enhance core business	• seize new business opportunity • enable development of data-driven, integrated offers from connected devices	• seize new business opportunity • develop integration platform to connect smart hardware of other firms	• build ecosystem around product to expand business activities and generate competitive advantage	• ensure core business meets requirements of growing digitisation / connectivity • Enhance core business	• ensure core business meets requirements of growing digitisation / connectivity • enhance core business	• build ecosystem around product to enhance core business activities and ensure competitive advantage	• seize new business opportunity • enable development of data-driven, integrated offers from connected devices	• enhance applicability of device • enable further devices and services (‘brain of the home’)	• seize new business opportunity • develop integration platform to connect smart hardware • Enable manufacturers

Table 3: Overview of case firms

4.4. Data Collection

4.4.1. Ethical considerations

Before starting the data collection phase of the study, ethical approval for the planned research approach was granted by the University of York's Ethics Committee. The approval required a description of the research design and the creation of a participant information sheet and a participant consent form.

The participant information sheet provided the interviewees with all relevant information regarding the research project. This included the study's background and purpose, a description of how data would be collected, stored, and handled by the researcher, and information on whom the participants could approach in case of any questions or concerns. Since the research project recruited participants for a pilot and a main study, two versions of participant information sheets were prepared and approved, and they were shared with each interviewee before scheduling the interview.

The participant consent form complemented the information sheet and ensured that participants voluntarily and actively agreed to participate in the study and had the opportunity to ask and clarify any questions or concerns they may have. It also asked for permission or denial to audio-record the interview, to which all participants agreed. Due to the implications of the COVID-19 pandemic, the consent form was emailed to participants before the interview. The participants either returned a signed digital copy of the form (digital signature or a printed and scanned version) or confirmed their agreement via response to the researcher's email.

Both documents were prepared in English for the approval of the Ethics Committee. However, as the study was conducted in Germany, translations of the documents were prepared after they had been approved. The different language versions allowed the interviewees to choose whether they preferred to receive a German, English or both copies of the participant information sheet and consent form. Even though all but two interviews were held in German, all participants were happy with receiving the English documents.

In addition to the information provided in writing through the information sheet, the researcher personally explained the key points from the information sheet at the outset of each initial interview with a participant. In addition, to build rapport between the researcher and interviewee, the researcher introduced herself and her background and allowed the interviewee to ask questions they had. This way, the researcher and interviewee got to know each other better and could create a more comfortable interview situation despite the online setting (cf. Section 4.4.3). Also, the participants could use this opportunity to ask for clarification on the study or the interview procedure.

Even if the interviewees had previously agreed to being recorded, the researcher asked the interviewee again if they consented to recording the interview's audio for transcription purposes. In addition, the Zoom software, the main video conferencing software used to conduct the interviews, has an embedded consent function. This feature informs all participants that a recording is in place and ensures that interviewees grant permission to being recorded. All recordings were handled with high care by the researcher, storing them locally on the researcher's computer and using not only a password to access the computer but also a different password to protect the files from unauthorised access by others.

4.4.2. Qualitative research methods

4.4.2.1. Semi-structured interviews

Interviews are a powerful tool for data collection in qualitative studies as they allow the researcher to collect rich data from the participants and understand their viewpoints on the phenomenon under study. Hence they can be applied for different purposes in qualitative research (Langley and Meziani, 2020). Interviews can either be structured, semi-structured, or unstructured, with the latter two being of more relevance in qualitative research (Bryman and Bell, 2007). For the purpose of this study, semi-structured interviews with knowledgeable representatives of the case firms were chosen as the main form of primary data collection.

Semi-structured interviews follow a general interview guideline which defines the key questions to be discussed with each participant, while allowing room for the interviewer to enquire on additional aspects that emerge during the interview. As opposed to unstructured interviews, they allow for a better comparability of the answers across participants due to the underlying structure that is similar across all interviews (Easterby-Smith et al., 2021).

Before the interviews with the representatives of the case firms were held, the researcher conducted a pilot study that included interviews with six business consultants from five different consultancies. The aim of the pilot study was to gain a practitioner's perspective on why and how firms get involved in ecosystems and the challenges that firms face in the process. For the interviews, a semi-structured interview guide was developed based on the conceptual framework (cf Section 4.6.1), allowing the researcher not only to address aspects of the ecosystem strategy that emerged from the literature, but to also to react to any relevant points raised by the interviewee during the interview.

The interviewees had supported different firms in the development of their ecosystem activities and thus could speak of practical experience with regards to firms' ecosystem strategies. On average these interviews lasted 55 minutes. The pilot study thereby supported the development of the interview guidelines for the main study as well as the development of initial codes for data analysis to complement the conceptual framework (cf. Section 4.6.2). It also allowed the researcher to evaluate the applicability of the conceptual framework for the purpose of the study. The interview guide used for the pilot study can be found in Appendix 1 of the thesis.

Overall, the pilot interviews confirmed that the conceptual framework was a good starting point for the data collection process and highlighted the importance of also focusing on aspects such as the role of path-dependencies for incumbent firms or the approaches to relationship building among firms. The pilot interviews also supported the researcher to become familiar with corporate language used within an ecosystem context.

Once the main study's interview guideline had been developed based on the literature review and pilot interviews it was tested with two interviewees of the selected cases (HeatCo and ConnectCo). The researcher had prior professional relations with these two informants, which ensured a friendly and supportive atmosphere during the interviews. This allowed to test questions and gain feedback on the clarity, structure, and order of the questions after the interview. Through considering the feedback from the interviewees as well as personal notes taken by the researcher, the interview guideline was slightly adapted for later interviews (Rowley, 2012). However, as these changes to the interview protocol were only minor and because the informants had not been told beforehand that these were only test interviews and had provided consent to participate in the study, the researcher decided to keep these interviews in the data sample. The interview guideline for the first round of interviews is provided in Appendix 2 of the thesis.

The guideline for the follow-up interviews was developed in iteration with data analysis. It was based on items which the researcher required further clarification on as well as questions that further enquired on findings emerging from the data. Appendix 3 provides the interview guideline supporting the follow up -interviews.

The interviews and follow up interviews were conducted in iteration with data analysis from December 2020 to May 2022. During the initial round of interviews these lasted on average 84 minutes excluding any warm-up or wrap-up discussions. Interviews during the round of follow-up data collection lasted 67 minutes on average, again excluding any warm-up or wrap-up discussions. Across all 49 interviews, the average time per interview was 77 minutes. All interviews were recorded and subsequently transcribed verbatim by the researcher.

The participants were offered to be sent a copy of the transcript after the interview. While it might be argued that this can lead to methodological dilemmas such as interviewees wishing to delete or rephrase parts of the interview (Mero-Jaffe, 2011), the benefits were considered more important for the study. First, the

main aim was to build trust between the researcher and the participant, as the opportunities for personal interaction were limited due to the pandemic which made face to face meetings almost impossible. Also, the researcher told interviewees that first and foremost the transcript was shared for information purposes, but that they were free to comment or clarify on any issues that they identified as important. Second, the study was designed to be based on the initial interview as well as follow-up interviews at a later stage. Therefore, it was considered helpful if participants could re-read what they had said and discussed in the first interview. Finally, the sharing of the transcripts provided interviewees with a high degree of transparency on the research process.

4.4.2.2. Further data sources and triangulation

If data is collected through retrospective expert interviews, there is a risk of participant bias in the interviewees' responses (Langley and Meziani, 2020). Hence, to increase the validity of the collected data and to enrich the information collected through semi-structured interviews, further data on each of the cases was collected. Depending on the case and availability of certain forms of information, additional data included internal company presentations or documents shared by the participants, public company documents (e.g., annual reports), press releases or interviews in media outlets such as newspapers or industry magazines. Furthermore, for some cases the researcher had access to audio or video sources in the form of podcast interviews, presentations or expert talks the interviewees gave in other settings. In combination, this additional information allowed the research to better understand the cases, their ecosystem history and the rationale behind certain activities they conducted.

Table 4 provides an overview of the data collected for each case. It details the interviewees' roles and outlines how many interviews have been held with each interviewee. Each interviewee was assigned an ID to keep a clean track record without using their real names. The IDs, which will also be used to refer to respondents in the empirical chapters, are provided in parentheses. In subsequent sections the ID is followed by a number to indicate whether a quote is taken from the first or second interview. The table further illustrates the total

number of interviews conducted per case and at the bottom provides the overall number and length of the interviews. Finally, the table lists secondary data sources that were compiled for each case to develop the case narratives and facilitate triangulation.

ID	Company (Pseudonym)	Interviewees [Interviewee ID] (number of interviews)	Total number of interviews	Secondary data sources
01	HeatCo	Chief Strategy Officer [0101] (2) Director of Digital Products 0102] (2) Vice President Global Services & Consulting [0103] (1)	5	- company website - informal chats (phone) - follow up emails - press releases
02	ConnectCo	Co-Founder/CTO [0201] (1) Co-Founder/CEO [0202] (2) Chief Product Officer [0203] (1)	4	- company website - informal chats (phone) - follow up emails /documents - external interviews
03	TelCo	Marketing Manager [0301] (2) Chief Product Manager Smart Home [0302] (2) Head of Consumer IoT Hardware [0303] (2)	6	- company website - follow-up emails /documents - press releases
04	MotorCo	Head of Business Development Smart Home [0401] (2) Head of Strategic Product Marketing Smart Home [0402] (2) Head of Product Management Smart Home [0403] (2)	6	- company website - follow up emails /documents - press releases - external interviews
05	SwitchCo	Head of Product Management Building Electronics [0501 (2) Head of Product Management [0502] (1) Head of Marketing [0503] (2) Member of the Management Board [0504] (1) Head of Business Development [0505] (1)	7	- company website - follow up emails - press releases - external interviews

ID	Company (Pseudonym)	Interviewees [Interviewee ID] (number of interviews)	Total number of interviews	Secondary data sources
06	ElectronicsCo	Head of Application and Cooperation [0601] (2) Digital Business Development Manager [0602] (1) Head of Smart Home [0603] (2)	5	- company website - informal phone calls - press releases - external interviews
07	ApplianceCo	Head of Smart Home [0701] (1) Head of Ecosystem [0702] (2)	3	- company website - follow-up emails - press releases
08	HouseCo	Founder/CEO [0801] (2) Chief Operations Officer [0802] (2)	4	- company website - follow up emails - press releases - external interviews
09	SensorCo	Co-Founder/Chief Marketing Officer [0901] (2) CTO [0902] (1)	3	- company website - press releases - external interviews
10	TechCo	Business Development Manager [1001] (2) CTO [1002] (2) Managing Director [1003] (2)	6	- company website - press releases - external interviews
		# Number of Interviews	**49**	
		Total length [hours]	**63.9**	

Table 4: Overview of primary and secondary data

4.4.3. Collecting data during the COVID-19 pandemic

The beginning of the data collection period for this study collided with the global outbreak of the COVID-19 pandemic, which impacted the initial plan for how data should be collected. Due to the pandemic and related contingency measures the initial plan to hold the interviews on site had to be revisited to meet the 'work from home' and 'social distancing' measures that were implemented in the UK and Germany. Furthermore, most companies had their own COVID-19 related restrictions with regards to allowing visitors on their premises.

To account for these restrictions, it was decided to make use of video conferencing tools to continue with the study and conduct the necessary interviews. Video conferences were preferred over phone interviews because the researcher expected that the ability to see each other during the interview would support building rapport between herself and the interviewee. Accordingly, this would help to create a more comfortable setting and encourage the interviewees to get engaged in the interview and to provide rich information on the questions asked.

Comparisons of the interview quality of face-to-face and telephone interviews even before the pandemic showed no great difference in the quality of the interviews (Sturges and Hanrahan, 2004). Yet, further research during the COVID-19 pandemic identified several challenges of using video conferences instead of face-to-face interviews. These include interviewees being distracted by their environment or being uncomfortable with seeing themselves on the screen (Rahman et al., 2021). However, after careful reflection on the data collection process, these have not been found to apply the interviews conducted during this study. Most interviews took place in a quiet setting and interviewees were attentive during the exchange, with many of them silencing their phones. In the rare instances where an interview was interrupted by an incoming phone call this was not different from a similar situation occurring in face-to-face settings in which a phone rings or someone knocks the office door.

Hence, the researcher’s experiences in this regard positively differed from other scholars' experience of conducting interviews during the pandemic. This may be

because by the time the interviews in this research project took place, the pandemic's safety measures had been in place for several months and most interviewees at that time were largely familiar with the circumstances and requirements of online meetings in different business contexts. The only downside of video interviews instead of personal on-site visits, was that occasionally interviewees re-scheduled meeting on a short notice, for example because they had to attend to urgent business issues. Assumingly, these cancellations would have been less likely to occur during on-site visits in which the researcher had invested time and money to come to the interviewee's premises. Besides these occasional scheduling difficulties however, it can be said with relative certainty, that the switch from face-to-face to video-conference-based interviews caused no loss in the quality of the data collected from the interviews. The only disadvantage in terms of this study compared to the initial plan of on-site visits by the researcher was the loss of any potential field notes or informal conversations from a visit to the companies' facilities which was accounted for by the extensive collection of secondary data.

Once national Covid regulations in both the UK and Germany had been eased in Summer 2022, a few exceptions could be made to the approach of using video-conferencing tools for the interviews. This provided the chance to conduct some of the follow-up interviews face-to-face at the premises of the case firms. Therefore, in instances when the data collection schedule, the available (financial) resources and the availability of the interviewee fit, selected interviews were conducted personally. This led to on-site visits to ConnectCo and TechCo, which were both located in commutable distance to the researcher's location in Germany.

4.5. Ensuring rigour throughout the case study methodology

The business and management field has seen constant debates about the applicability of case studies as a methodology and the importance of the case study's design to achieve reliable results (Piekkari and Welch, 2018; Goffin et al., 2019). Triggered by the so called replication crisis in social psychology, the field of management furthermore faced a debate about research reliability and

transparency especially with regards to the adoption of qualitative research methods (Pratt, Kaplan and Whittington, 2020). In management research, case studies based on qualitative research methods are often used for theory building, which means they are of exploratory nature and aimed at achieving a better understanding of a new phenomenon. Hence, it is particularly important, that sufficient rigour is applied to ensure a robust foundation in the understanding of these phenomena (Gibbert et al., 2008; Goffin et al., 2019).

It should be acknowledged that the purpose of a case study is to investigate a phenomenon in its actual environment, which is dynamic and dependent on how the research subject approaches their environment and hence, conditions for the case study can usually not be replicated at a different point in time (Pratt et al., 2020). Accordingly, and in line with the critical realist view and the general understanding of qualitative research, replicability similar to scientific experiments or through means of quantitative methods is not the goal of this case study design.

Nevertheless, there are certain criteria and approaches that case study researchers should apply to ensure rigour in their research design and to increase the validity and reliability of their findings. The four main criteria refer to a case study's construct validity, internal validity, external validity, and reliability. However, it is important to note that depending on the purpose of the case study (exploratory, explanatory) and the ontological and epistemological standpoint of the researcher, not all criteria may be addressed equally (Easton, 1995; Scandura and Williams, 2000).

Construct validity "refers to the extent to which a study investigates what it claims to investigate" (Gibbert et al., 2008, p.1466). It serves to ensure that the researcher establishes adequate clarity about the concepts that they seek to investigate and how they seek to measure or operationalise those concepts (Yin, 2018).

Internal validity seeks to explore whether there is a causal relationship between two or more variables in the sense that A caused B and that there are no alternative or rival explanations that could have led to the event (Scandura and

Williams, 2000). It is particularly relevant in settings of explanatory case studies and relies on the correct inference of the data that is collected in the study, because it may not always be possible to observe the actual event and its cause in the same manner that is possible in lab-based experiments (Yin, 2018; Scandura and Williams, 2000).

External validity is used to determine whether a study's findings can be generalized towards a broader population (Gibbert et al., 2008). With regards to case studies, it is important to note that 'statistical generalisation' to a broad population as in more quantitative studies is not possible. However, a case study should seek for what Yin calls 'analytical generalisation', i.e., findings or theoretical propositions that can be applied beyond the specific cases (Yin, 2018). As Easton (2010, p.126) argues "generalisation come from identifying the deep processes at work under contingent conditions via particular mechanisms".

Reliability seeks to reduce bias and ensure that if a case study was repeated at another time or by another researcher under the same conditions, it would lead to the same findings (Miles and Huberman, 1994). A key determinant to achieve reliability is to develop a clear research question and ensure that the research design is appropriate to address the research question (Miles and Huberman, 1994). Arguably, in case study research it is highly unlikely that a study can be repeated under the same conditions. Therefore, it is important that the researcher applies careful measures of documentation throughout their research project. This can be achieved through a case study protocol that describes the steps undertaken by the researcher throughout the study, including for example case selection criteria, reasons for the adopted methods, interview protocols and the steps of data analysis. A case database helps to organise all available information on the cases throughout the project (Yin, 2018; Gibbert et al., 2008).

Table 5 provides an overview of the measures undertaken with regards to each criterion to achieve a high degree of rigour throughout the present research project.

Criterion	Measures applied in this project
Construct validity	• Development of a conceptual framework • Use of multiple data sources • Clear record of the chain of evidence • Discussion of draft findings with interviewees during follow-ups
Internal validity	• Cross case analysis • Use of visuals and tables to analyse and assess data from various viewpoints
External validity	• Cross case analysis • Replication logic
Reliability	• Development of a case study protocol • Interview protocol to be used in all interviews • Creation of a case study database

Table 5: Measures to ensure case study rigour [based on Yin (2018)]

Through a review of 818 case study-based papers published in leading innovation management journals in the last 20 years, Goffin et al. (2019) developed a quality assessment template (CASET). This template is more detailed than the four criteria outlined above and includes 10 evaluation criteria to assess the quality of a case study. To strengthen the quality and transparency of their research, scholars should describe how they addressed each of these criteria throughout their research project (Goffin et al., 2019).

Table 6 presents each of the 10 quality criteria and details how it has been addressed in this research project. If applicable, the table refers to a chapter or section in this thesis, where the respective procedure is outlined in more detail.

Evaluation criteria		Addressed	Where / How
Research Design	Theoretical foundation	Yes	Literature Review (cf. Chapters 2 and 3) Conceptual Framework (cf. Section 4.6.1)
	Pilot Study	Yes	Pilot Study with Consultants
	Theoretical sampling	Yes	cf. Section 4.3: Research Context
Data Collection	Triangulation	Yes	Multiple informants and rounds of data collection Triangulation of data through secondary sources cf. Section 4.4: Data Collection
	Review & validation of evidence	Yes	
	Transparency of data collection	Yes	
Data Analysis	Inter-coder Agreement	Yes	Evaluation and collection of feedbacks through supervisor feedback and conference presentations
	Case presentation	Yes	Case Overview (cf. Section 4.3.3) Findings (cf. Chapters 5 - 7)
	Case interpretation	Yes	Findings (cf. Chapters 5 - 7) Discussion (cf. Chapter 8)
Post-Hoc	Reflecting on validity and reliability	Yes	Ensuring rigour throughout the case study methodology (cf. Section 4.5)

Table 6: CASET quality evaluation [based on Goffin et al. (2019)]

4.6. Data Analysis

The data analysis process followed several steps informed by influential works on case study research (Eisenhardt and Graebner, 2007; Yin, 2018; Eisenhardt, 1989) as well as more general methodological advice on how to conduct rigorous qualitative research and data analysis (Miles and Huberman, 1994).

Multiple tools were utilised throughout the data analysis process to structure the large amount of raw data and make sense of it. This section briefly introduces the tools used along the different steps of data analysis. Subsequent sections describe the data analysis process in more detail.

The initial coding of the data was done using NVivo, which is a useful tool to organise large amounts of data. As the interview transcripts accumulated to more than 1,000 pages of written text, the researcher quickly found that it was important to have a concise summary for each case. These case summaries, which included case history tables, were created in Microsoft Word. To get a better understanding of the temporal unfolding of the firms' activities, MIRO was used to develop process visuals of each case. Cross-case analysis was conducted using the tables and graphs build in Microsoft Word and MIRO. Furthermore, codes were transferred to MindGenius to build connections and display orders between codes using mind-maps.

In line with the critical realist position, data collection and data analysis overlapped and unfolded in parallel, which allowed the researcher to clarify questions or test ideas with the interviewees (Easton, 2010). Figure 10 provides an overview of the data analysis steps adopted in this study.

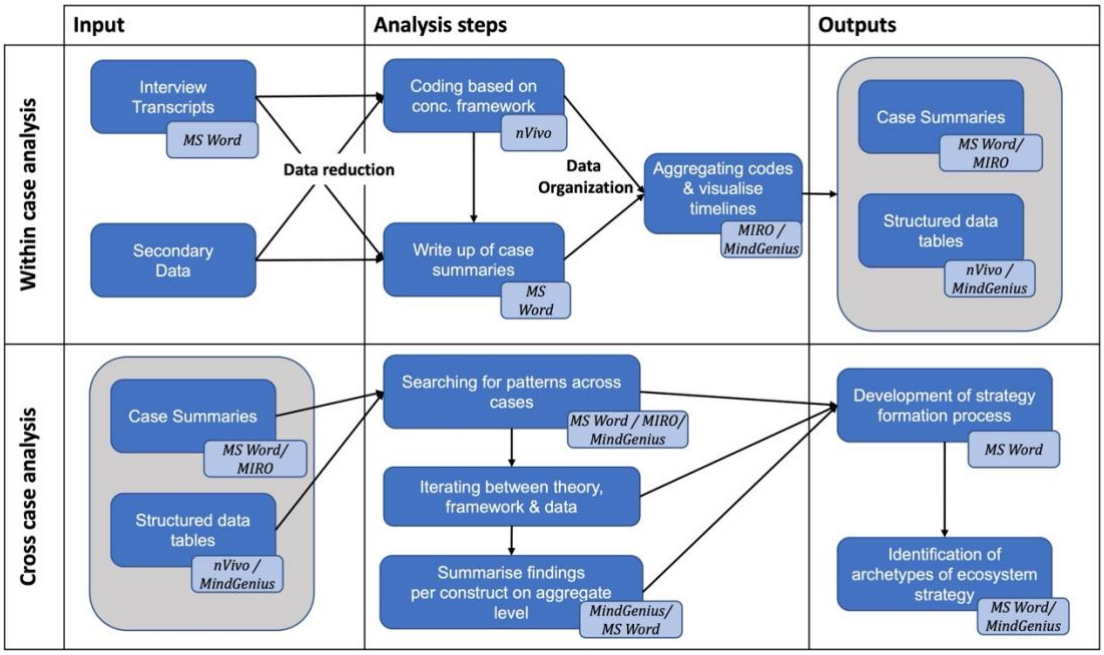

Figure 10: Data Analysis Process

4.6.1. Developing a conceptual framework

While it is possible to start qualitative research and data analysis from a 'clean slate' (Gioia, Corley and Hamilton, 2013), developing a conceptual framework can be useful to stay focused throughout the data analysis process. Especially if there are ideas from extant research that a study seeks to extend or build on, developing 'intellectual bins' based on a set categories derived from the existing literature provides a useful tool to organise collected data and can help the researcher to remain focused throughout the analysis process (Miles and Huberman, 1994). Therefore, the purpose of a conceptual framework is to develop a mental map of potentially relevant constructs that may have relevancy for answering the research question. In this project, it also supported the development of the interview guideline for the main study.

By outlining a set of potentially relevant constructs that are considered relevant to answer the research question, the framework supports the design of the research project (Eisenhardt, 1989) and guides the initial phases of data analysis (Miles and Huberman, 1994). Yet, it is important to consider the conceptual framework a starting point and remain open to unexpected findings from the data to prevent confirmatory bias in the analysis and only finding what the framework suggests (Miles and Huberman, 1994; Ketokivi and Choi, 2014). This is crucial to avoid bias in the data analysis process by seeking to confirm the previously established ideas from the conceptual framework (Eisenhardt, 1989).

The conceptual framework for this study was built from the insights developed in the literature review. Furthermore, it was complemented through the information gathered in the pilot interviews with business consultants. These helped the researcher to strengthen the potential relevance of these constructs and get a better understanding of how they may be reflected in a firm's ecosystem strategy.

The literature review indicated that in the early stages of ecosystem emergence, strategy formation in the ecosystem should not be perceived as a linear endeavour and instead is an evolving process including continuous adjustment to the direction of the ecosystem, its members and relations (Ansari et al., 2016;

Dattee et al., 2018; Lingens et al., 2021b). Furthermore, the literature review repeatedly stressed the need to consider how firms' ecosystem strategies unfolds over time (Philips and Ritala, 2019). These aspects are reflected in sub-research question 1. While scholars adopted a perspective of temporality on the ecosystem level through the development of a lifecycle perspective (Moore, 1993) or outlined different phases in the formation of the ecosystem from the orchestrator's perspective (Dattee et al., 2018) the literature did not yet offer a process perspective for the development of a firm's strategy in an emerging ecosystem. The conceptual framework thus draws on the strategic alliances literature (George and Farris, 1999) and proposes three stages of strategy formation. Furthermore, due to the previously mentioned dynamics in the formation of an ecosystem the conceptual framework assumes that these stages may not necessarily unfold in a linear path, but that firms may iterate between the stages.

As firms become increasingly embedded in ecosystems and face growing interdependencies with other firms, it is likely to assume that this effects how the firms approach their innovation strategies (Fuller, Jacobides and Reeves, 2019; Ganco et al., 2020). Relatedly, when investigating the development of a firm's ecosystem strategy it is important to perceive the ***ecosystem environment*** as an important influential element.

With regards to sub-research question 2, the conceptual framework outlines several building blocks that contribute to a firm's ecosystem strategy. For example, the literature review showed that an ecosystem strategy usually begins from the identification of a **value proposition** that binds ecosystem actors together and thus builds its foundation towards a common vision (Adner, 2017; Dattee et al., 2018; Lingens et al., 2021b). Research also highlighted the importance to identify and build relationships with firms in the ecosystem, which serve as **partners or complementors** for the focal firm to realize the value proposition and achieve its individual ecosystem objectives (Dyer and Singh, 1998; Selander et al., 2013; Lingens and Huber, 2021). The **role and position** a firm chooses to adopt in the ecosystem further influences its strategy and determines how it engages with other ecosystem members and how it creates

and captures value in the ecosystem (Iansiti and Levien, 2004b; Ritala et al., 2013; Hannah and Eisenhardt, 2018; Jacobides et al., 2018).

The ecosystem strategy requires the **alignment** of the ecosystem partners towards the shared value proposition (Adner, 2017; Lingens and Huber, 2021; Malherbe and Tellier, 2022) and for the purpose of this study, it is assumed that in the absence of a central orchestrator this task may be pursued by different ecosystem members. In the context of ecosystems enabled by digital technologies, firms should also ensure the **technological integration** of the different partner's products and service into a coherent value offering (Autio, 2021).

Figure 11 depicts a graphical summary of the elements that are considered relevant for the study. While some of these have previously been explored with regards to an ecosystem orchestrator, this study assumes that in an emergent ecosystem with no central orchestrator they may be equally relevant for firms.

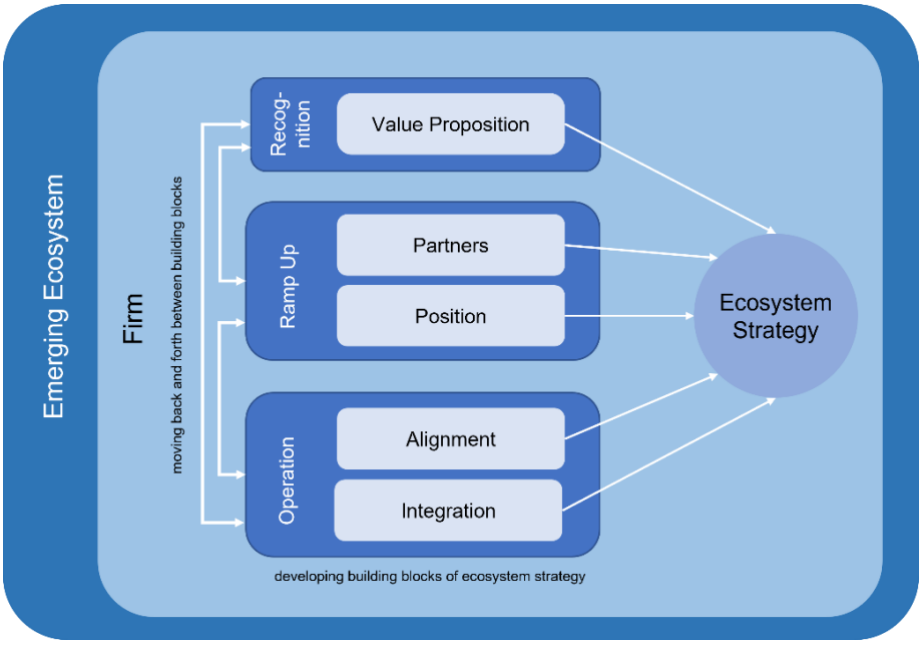

Figure 11: Conceptual Research Framework

In summary, the conceptual framework comprises a set of a priori defined constructs by aggregating the findings from the literature review and pilot study and linking them to the research questions set out in the previous chapter. This study built on the conceptual framework in the development of the research design and analysis process.

4.6.2. Applying the conceptual framework

As previously mentioned, the conceptual framework developed for this study was first used to develop the interview guideline for the initial round of interviews (cf. Section 4.4.2.1). In this regard the framework helped to identify potentially relevant lines of inquiry. Subsequently, it was also applied throughout the data analysis process.

Using a conceptual framework to start data analysis helps to remain focused on the research question and avoid 'information overload' from the large amount of qualitative data which may especially be an issue for novice researchers (Miles and Huberman, 1994). This was particularly useful due to the large amount of qualitative data collected throughout this study. Based on the conceptual framework the researcher hence developed an initial list of codes for the data analysis, which were validated through the pilot study. These are presented in Table 7. The table further details potentially relevant theoretical references with regards to these codes.

Subsequently, the conceptual framework and the respective references to the literature were also a useful to relate emerging findings back to the existing literature on ecosystems as they ensured a link between the data, emerging findings and the theoretical underpinnings of the codes.

Category	Provisional Codes	References
Back-ground	Ecosystem Understanding	n/a
	Firm Background	
	Interviewee Background	
Motivation	Ecosystem Objectives	n/a
	Internal Drivers	Yoo et al., (2012) Amit and Han (2017)
	novel resource configurations	
	competitive advantage	Dyer and Singh (1998)
	servitisation / new BM	Kohtamäki et al. (2019)
	External Drivers	Nambisan et al., (2017) Gawer (2021)
	Digital Innovation	
Phases	Recognition Phase	George and Farris (1999)
	Ramp Up Phase	
	Operation Phase	
	Changes in ecosystem strategy	Philips and Ritala (2019)
Ecosystem Foundations	Partnering	Dyer and Singh (1998) Selander et al., (2013)
	Partner search	
	Partner management	
	Alignment	Adner (2017) Dattee et al., (2018)
	Developing value proposition	
	Steering ecosystem members	
	Aligning priorities with partners	Adner (2017)
	Change mindset/internal processes	Altman et al., (2022)
	Selecting	Hannah and Eisenhardt (2018) Jacobides et al., (2018)
	Choosing an ecosystem	
	Determining ecosystem position	
	Integration	Yoo et al., (2010) Autio (2021) Gawer (2021)
	Connectivity approach	
	Modularized products	

Table 7: Initial Coding List

The study was interested in uncovering how the firms' ecosystem strategy evolved over time and how they developed the foundations of their ecosystem strategy. Hence, these elements, which were depicted in the conceptual framework, were used as higher-level categories when starting the data analysis. Throughout the immersion with the data and the evolution of the coding process

the researcher refined and expanded these categories for example by uncovering distinct activities, which underpinned the development of the strategy.

During the within-case analysis, each case's activities and development process could be mapped and compared against the framework thus providing empirical insights into the development of the ecosystem strategy and identifying additional aspects not reflected in the framework, which may be of importance. These additional aspects were further evaluated throughout the cross-case analysis by exploring if they had relevance across cases. During this this step the framework's elements were expanded, rejected, or merged in accordance with the data analysis and emergent findings. The deviations or refinements between the emerging findings and the conceptual framework also provided a starting point for the development of novel ideas with regards to ecosystem research.

The extension or adaptation of the original framework required the researcher to engage with additional literature to explore how these findings related to debates in extant research and explore the potential implications of the findings in the ecosystem context. For example, the findings uncovered activities directed more broadly at overcoming technological fragmentation rather than the bilateral integration of products. To interpret these findings, the researcher engaged with additional literature on the technological aspects of ecosystems and the role dominant designs and standards, thus exploring the relevance of standard-setting in emerging ecosystems.

Similarly, the analysis revealed that the firms did not start their ecosystem engagement from a distinct value proposition blueprint. Instead, it suggested several instances in which the firms conducted activities to engage customers in the refinement of the value proposition to meet their distinct customers' needs. Exploring the theoretical background of these findings the researcher referred to literature on marketing as well as on co-creation and user innovation.

Details of the analysis process within and across cases and the implications for the development of the framework are further elaborated in subsequent sections.

4.6.3. Within-case analysis

Within-case analysis followed the three steps proposed by Miles and Huberman (1994): (1) data reduction, (2) data display, and (3) conclusion drawing/ verification. The written transcripts of all 49 interviews from the case studies alone accumulated to more than 1,000 pages of text. This data was further supplemented by secondary data sources. To develop an accurate understanding of each of the cases it was inevitable to reduce data and structure it along the conceptual framework to get a better overview of each case individually and to later make comparisons across cases.

As explained before, the interview transcripts were coded using NVivo 12 to support the coding process. While the use of tools like NVivo still requires the researcher to conduct the actual analysis and come up with a data structure and codes, the utilisation of computer-aided tools simplifies the researcher's work as they offer supportive functions such as text search or the simple merge or separation of codes. They also allow the researcher to conduct queries on the raw and coded data. While most of the analysis was done using NVivo, at times coding was first done on printed versions of the transcripts, which allowed a deeper feeling of immersion and engagement with the data. However, to ensure a 'single source of truth' coding done on paper was transferred to NVivo.

The main purpose of the first round of coding within cases was to organise the data and get a clear understanding of each case to get an overview of how the case findings related to the categories identified in the conceptual framework. The first step was to code relevant contextual information on the company and interviewee background as well as the firm's understanding of ecosystems. Subsequently, the data analysis in the first round of coding focused on codes relating to the three elements of the research question and framework, (1) the reasons for firms to engage in the ecosystem; (2) the activities firms deployed in support of their ecosystem strategy; and (3) the development of and changes to the ecosystem strategy over time. This round of coding primarily built on of the initial interviews conducted with the informants of the case firms.

To achieve the analytical objectives, the researcher adopted provisional or initial coding methods, based on the literature review, the conceptual framework and the start list of codes presented before. However, as suggested with provisional coding, as the analysis progressed the categories and codes were merged, renamed, restructured, deleted or expanded inductively to remain open to any unexpected findings (Saldana, 2012). Hence, while the data was initially coded with the provisional codes in mind, data that could not be assigned to any of these codes, but was considered relevant to understand why or how firms engaged in the emerging ecosystem was coded using descriptive codes (Saldana, 2012). Examples include codes referring to 'matchmaking between firms', 'ensure interoperability' or 'joining smart home initiatives'. Notes were kept on these emerging codes, particularly if they were applied in more than one interview, to follow up on them in the second round of interviews. To cluster the emerging codes, they were provisionally aggregated into second-order codes such as 'co-development' or 'role of standards'.

At the beginning of the analysis process coding proved to be difficult, as occasionally a data extract could be assigned to several codes. Saldana aptly notices that "Coding is not a precise science; it is primarily an interpretive act" (Saldana, 2012, p.4). For example, the involvement of firms in overarching smart home initiatives could be seen as an activity to jointly develop the ecosystem or to increase the firm's visibility in the ecosystem. To ensure accurate representation of the firms' intentions and rationale behind certain activities, notes of such instances were made to seek clarification of why the firms conducted these activities in follow-up interviews.

The second round of within-case coding was conducted after the follow-up interviews. One aim was to explore, if the codes that provisionally emerged from the first round of coding were of relevance for the research question. The second aim was to further refine the researcher's understanding of the firms' development of the ecosystem strategy. Overall, the objective of the second round of coding was to refine and aggregate the fragmented codes that had evolved across cases to reach a higher level of abstraction. Through the additional data, codes were also further revised and refined. For example, the provisional code

'co-development' was divided into two codes: The code 'co-creating' was created to mark activities that referred to the involvement of users in the firm's ecosystem strategy development. The activities that referred to a firm's collaboration with other ecosystem members to support the development of the ecosystem and its value proposition were subsumed under the label 'developing the market'. The latter emerged through cycling between the data and theory and found that these findings could be linked to a recent stream in marketing literature dealing with firms' efforts to purposely create novel markets (Nenonen, Storbacka and Windahl, 2019). 'Developing the market' was later aggregated to a higher-order code labelled 'shaping' which also subsumed the code 'achieving standardisation'.

During the second round of coding, the researcher went through the coded and new data seeking to get a better understanding of how firms deployed activities in support of their ecosystem strategy and how these activities could be aggregated into processes that evolved over time. Thus, in the second coding round data was approached using process coding as the analytical coding strategy. Using gerunds to label the data hereby helped to achieve a stronger sense of activities and processes, i.e., a stronger emphasis on exploring *how* the case firms approached the development their ecosystem strategy (Saldana, 2012).

While coding was a useful starting point for data analysis because it facilitated data reduction into manageable units, it was difficult to display the temporal unfolding of the activities in NVivo. Thus, for each case summaries, which included structured case tables, were created. The case tables were ordered temporally and provided a concise summary of each case's activities outlining what firms had done, when they did it, how and why they had done it and how it contributed to their ecosystem strategy. The case tables were created simultaneously with the second round of coding and hence supported the refinement of the codes. Furthermore, they allowed to get a better understanding of the temporal dimension of strategy development.

Tables are considered a powerful tool in qualitative data analysis and data display as they help to bring structure into qualitative data. The tables created for each case resembled what Cloutier and Ravasi (2021) describe as event listing tables. While the timeline did not always reflect the exact dates for each event but instead referred to a timeframe (i.e., a month or quarter in a year), they allowed the researcher to get a general understanding of how the firms' strategies had evolved over time, which was the important aspect of the analysis. At a later stage in the analysis process the tables also provided a good starting point to make comparisons across cases.

In addition, process maps depicting the unfolding of the most relevant ecosystem activities for each of the cases were created and allowed visually and temporally organising the data to understand how the process of strategy development unfolded over time (Garud, Berends and Tuertscher, 2017). By using different shapes and colours, the visual process maps allowed a further perspective on the data and later supported the comparison of ecosystem strategy development across cases (Langley, 1999). For example, activities were colour-coded to indicate whether they were (more) technology-oriented or (more) market-oriented. This led to the recognition of a shift from a technological- to a market-emphasis in the activities of the case firms, a discovery that was less likely to be uncovered using only hierarchical coding strategies. Small post-it shapes were used to note which overarching process the activity could be assigned to. Arrows at the top were used to indicate the stages of strategy formation and illustrate when the data analysis suggested that at this point a change in the firm's ecosystem strategy could be observed. Figure 12 shows an example of a process visualisation developed for SwitchCo. The process visualisations of the other cases are presented in Appendix 4.

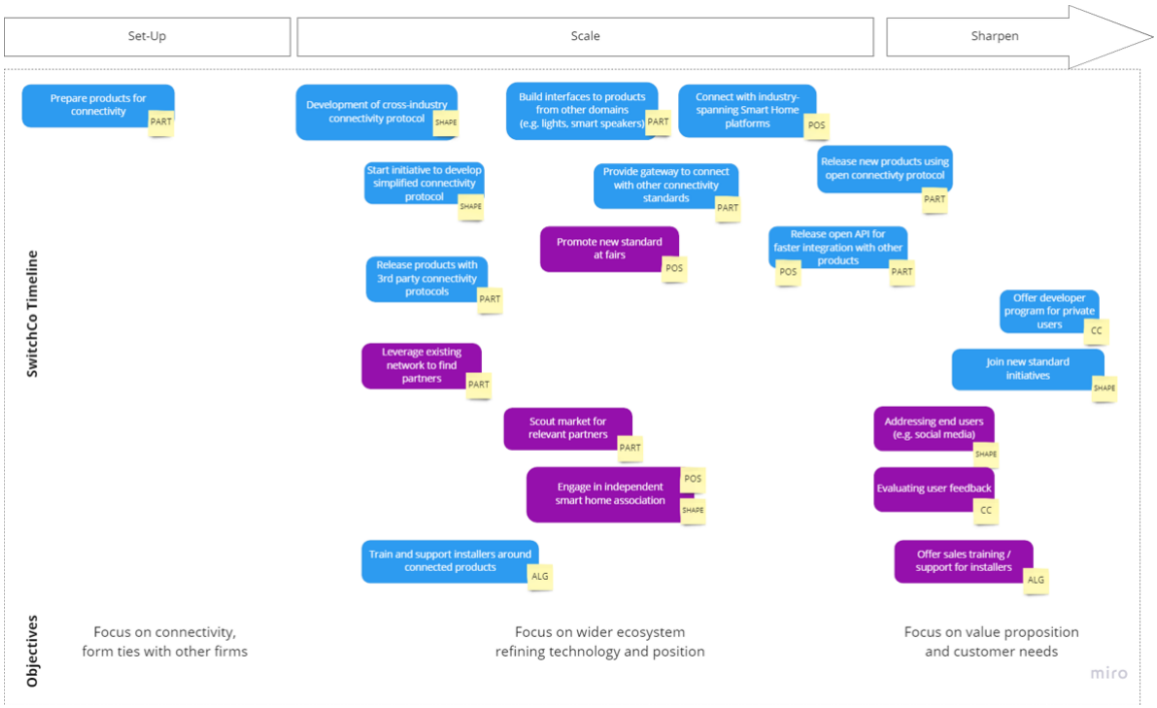

Figure 12: Process Visualisation SwitchCo

In summary, the development of a coding structure, data tables and process visuals helped to manage the large amount of data for each case and to keep a clear chain of evidence during the analysis process. Furthermore, it supported the analysis of the data from different perspectives to get a holistic overview of the firm's ecosystem strategies. It also ensured that rigour was applied in terms of how conclusions were reached in the analysis process (Goffin et al., 2019).

4.6.4. Cross-case analysis

Qualitative research per se does not strive for generalisability, yet research designs using multiple case studies can achieve some form of analytical generalisability through cross-case analysis to explore the applicability and relevance of the case findings beyond a single case (Yin, 2018). It thus seeks to understand, if or under which conditions the findings of the within-case analysis could apply to broader contexts beyond each individual case (Miles and Huberman, 1994). Another aim of cross-case analysis is to prevent premature conclusions based on a single case and instead look for patterns, similarities and differences between the cases and try to identify where their originate (Eisenhardt, 1989).

Throughout this research project, cross-case analysis commenced iteratively with the ongoing within-case analysis and the first round of data collection. This allowed the researcher to constantly review and refine emerging ideas and to evaluate them in the follow-up interviews with the case firms. However, cross-case analysis only started once the researcher was broadly familiar with each case individually. It then referred to the process visualisations and case tables to compare cases.

Through cross-case analysis, the motivations and activities deployed by the firms with regards to their ecosystem activities were clustered and aggregated across cases. This led to the identification of two motivational pattern: product-centric motivation and system-centric motivation. To illustrate these findings, Table 8 provides an overview of representative quotes for the two clusters and related codes that contributed to their development. Details on these findings are presented in Chapter 5.

Representative Quotes: Value Creation Motivations
Product-centric motivation:
Protecting the core business "We don't want that a customer chooses to create a connected home, and then the project planner or architect, or the construction company or whoever says: Well in this case these are the possible firms. And we are not part of it, that would be bad, so we must ensure that for the leading systems, we are a potential partner." (0102-02)
Enhancing the core business: "And also, what we are trying to do is also engaging, so really making use of their channels to reach out to new potential consumers and tell them, hey, look, what we can all do together, with their services. And just the huge potential that they have as a company is something that we try to gain as much as possible from". (0702-01)
System-centric motivation:
Enabling the ecosystem as a service "We provide extended applications for our partners if they join our initiative. We provide them with interoperability to other manufacturers, other domains, or new applications." (1001-03)
Enabling the ecosystem as a service "Many partners think, if they are connected, they automatically sell more. But that they need to do something, develop stories, so they can sell more, that last step they don't understand it. We often completely guide the partners through this step and help them achieve this." (0801-01).
Enabling data-driven value propositions "Based on the data from the smart devices you can derive information on the customers' needs and this allows you to develop novel services, tailored to particular customers" (0201-02)

Table 8: Coding – Value creation motivation

The comparison and aggregation of codes with regards to the activities deployed by the firms led to the identification of four interrelated, ecosystem-relevant processes across cases. These processes were underpinned by a range of activities that supported the development of these processes. As elaborated in the previous section, the initial building blocks of an ecosystem strategy were developed deductively based on the Conceptual Framework and Literature Review and throughout data analysis their relevance was supported. Yet, the analysis within and later across cases also led to adaptations of the building blocks. First of all, it was seen that the building blocks were not static but resembled dynamic processes that the firms deployed in support of their ecosystem strategy. Furthermore, refinements were made with regards to the building blocks. For example, the analysis suggested that discovering the value proposition and achieving technological integration were both concerned with developing the ecosystem foundations, thus they were subsumed into a joint category labelled as 'shaping' which resulted from the coding process (Saldana, 2012; Miles and Huberman, 1994).

The aggregation of the first and second order codes into ecosystem-relevant processes overall showed two different directions of the processes: *Partnering* and *positioning* were identified as core processes that directly contribute to the execution of the firms' individual ecosystem strategies, whereas *aligning* and shaping were considered enabling processes that contribute to the development of the overall ecosystem. Figure 13 shows how the codes describing lower-level activities were aggregated into overarching, ecosystem-relevant processes using mind-maps to organise the data.

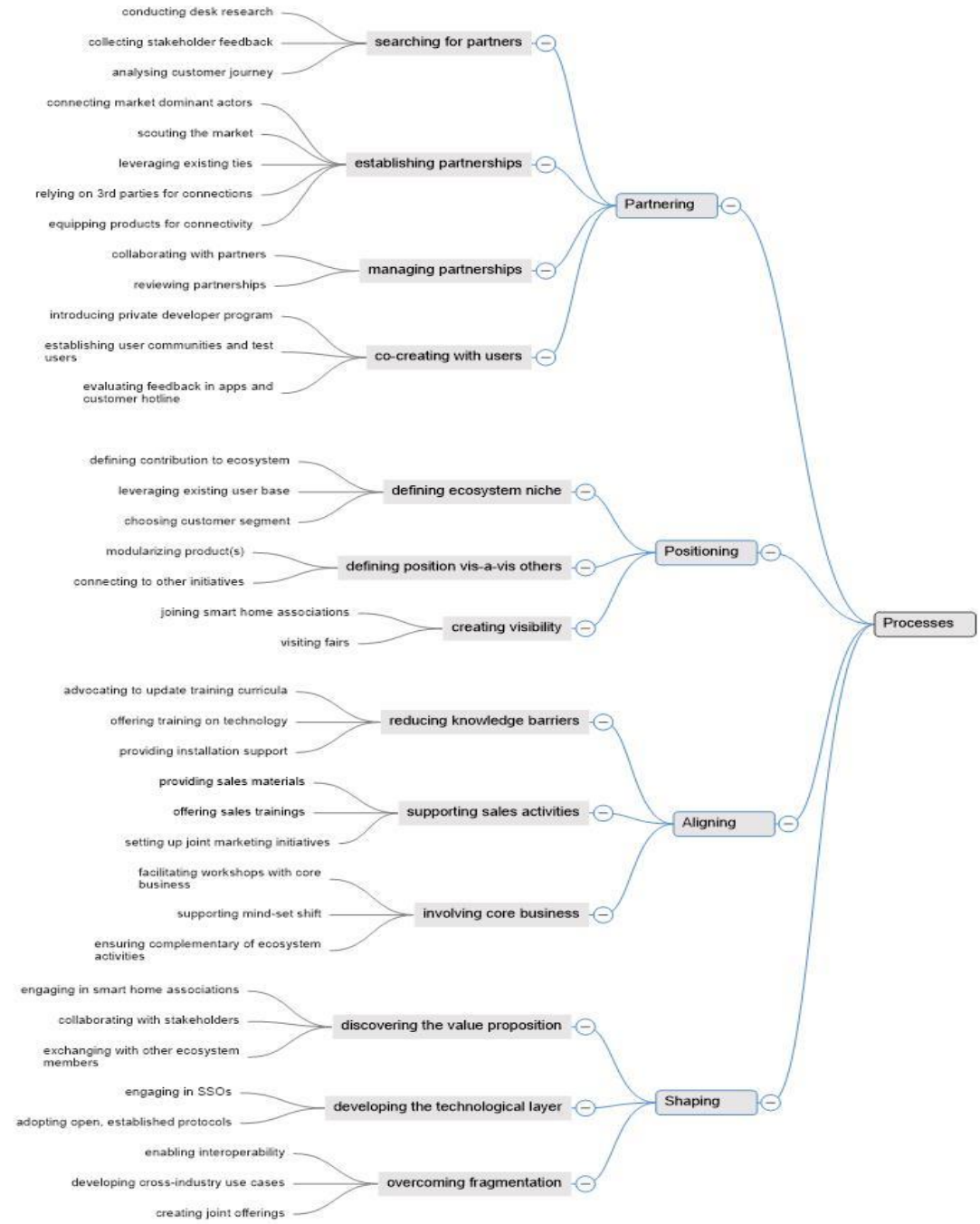

Figure 13: Coding Structure after aggregation of codes

Tables 9 presents representative quotes from the data that underpin the development of the ecosystem processes. They illustrate how data was coded with regards to the activities and overarching processes.

Representative Quotes: Activities and Processes

Partnering/Searching for partners: "We began by analysing the customer journey and identifying disruptions in the journey that we could fill with a partner." (0701-01)
Partnering/Establishing partnerships: "Many partners for example in lamp manufacturers, we approached them, through contacts or our network, one lamp manufacturer may know another. And then there are industry associations and other entities where we try and meet them." (0202-01)

Positioning/Achieving visibility: "Initially, we wanted to show that we do smart home now and are serious about it. We wanted to be visible (…) but also make contacts. Manufacturers attend the meetings, too. It was a good chance to speak to firms we knew and meet new ones." (0302-02)
Positioning/Defining ecosystem niche: "We don't go where they [big overarching initiatives] are. I think there are enough areas where we can offer a solution where they aren't. And we try to strengthen our position there. I mean the market is still so unbelievably big, there are so many households without a smart home. And we try to position our solution as one for experts, that will immediately understand the differences between what we do and what others do." (0901-02)

Aligning/Overcoming knowledge barriers: "There is a specialised group among the installers, the so-called system integrators, that are capable of bringing all these components together into one system so that it works seamlessly. And for us as a firm it was a massive effort to train people, so they are able to do this."(0603-01)
Aligning/Aligning core business: "There are only some limited budgets available for what the brands can do (…) Obviously, we are in competition with a lot of things. So, in some cases, the business is still very much on 'Well, I'm selling a dishwasher, and what does it do, well right it cleans my dishes, I am selling washing machine and it cleans my laundry, I'm selling an oven, it bakes, it cooks the best food etc.' And that is still very, very much in their mind, and where we still have to do a lot of convincing work, that you can add additional value by adding this." (0702-01)

Shaping/Brokering: "We orchestrate different technologies, different products and different manufacturers, providers in the building electronics domain. In our solution we bring all these together so that we can provide an integrated whole to the users, offer them additional value." (1002-01)

Representative Quotes: Activities and Processes
Shaping/Developing the market: "Many don't see the value if for example your light is connected to your door buzzer. If you explain it, half the people are not open to it, the other half understands it, but only a fragment is actually interested. The others can live without, because it is too complex, we need to find ways to transfer the value to users better." (0303-01) **Shaping/Supporting standardisation:** "[Connectivity protocol] is a highly successful protocol, it is an important element of our activities and we are part of the group, the association that develops the protocol. Not only a member, but an active driver in the working groups that keep developing the protocol." (0501-01)

Table 9: Coding – Ecosystem-related processes

Understanding the temporal dimension of the ecosystem strategy development was a further aim of data analysis. This was achieved by comparing the unfolding of activities over time based on the data tables and process visualisations as described in the within-case analysis. The goal was to understand whether the processes, which firms deployed, operated in isolation or relied on each other and to understand the dependencies of the processes across time. In exploring this aspect, it was also possible to explore how the ecosystem strategy itself unfolded over time and to identify the order of development.

Following the analytical approach of temporal bracketing (Langley, 1999), using the times and process visuals, notes were made and points in times where a shift in the strategic approach of the firm could be identified. By doing this across all cases, three consecutive phases of strategy formation in an emerging ecosystem could be identified as visualised in Figure 14. Interestingly, while the conceptual framework proposed a circular development, the analysis pointed to a more sequential development of the ecosystem strategy.

Figure 14: Strategy Development Stages

Table 10 provides illustrative codes which indicated shifts in how firms approached their ecosystem strategy over time. These were helpful in ordering the activities into three temporal stages.

Representative Quotes: Strategy Development Stages
Set-Up "We looked for the initial partners and brought them together. We screened the market and also, within our company, looked what connections we have, that we could leverage to establish partnerships." (0302-01) "Initially we had, I think, six partners, kind of the most relevant in each of the important domains, windows, garage doors, heating systems, etc., so this was like a small ecosystem already." (0403-01)
Scale "And then we tried to connect everything, make the whole home smart. And then we began building partnerships just to increase the offer. But we recognised it overwhelmed the users. They had heard about smart home, but they did not know what to do with it." (0402-01) "We asked anyone we met and didn't run fast enough to join. Thus, we had partnerships we later terminated as we realised it made no sense. Now we are more selective with partners, focusing on use cases that make sense to users." (0303-01)
Sharpen "But after a few years, we have gained a certain critical size of the partner of the ecosystem. And we now try to also look more for sustainable features that we think are going to last and create long term value and try not to acquire just a partner just to have another partner to mention." (0702-02) "Sometimes I still think our view is too technical, and it is essential for the success, that people understand what it can do. Most people don't understand the technology behind. So, you really have to create a problem, or a scenario and say, let's find a solution for it. The magic, the technology, then just happens." (0901-02)

Table 10: Coding – Strategy Development Stages

Details on the findings with regards to the four underlying ecosystem processes and the formation of the ecosystem strategy across the three stages are presented in Chapter 6.

In the final step of the cross-case analysis, the insights from these three aspects of the data analysis process were combined to compare the ecosystem strategies of the ten case firms. The aim was to identify commonalities and differences with regards to how firms approach their ecosystem strategies. To compare the strategies of the firms, the researcher relied on the coding structure, case summaries and process visualisations and relied on the findings generated throughout these steps of analysis. The evaluation of the (dis)similarities across the ten cases subsequently led to the development of a typology of strategic approaches that firms adopt in an emerging ecosystem. Chapter 7 presents these findings in detail.

5. Value Creation Motives in the Emerging Ecosystem

The purpose of this chapter is to elicit the case firm's value creation motives in the emerging smart home ecosystem, which determined how they engaged in the ecosystem. As the findings across this study reveal, understanding a firm's individual value creation motive is relevant as it influences how it develops its ecosystem strategy as well as how it contributes to the ecosystem and interacts with other ecosystem members (Dattee et al., 2018; Khanagha et al., 2020), which will be explored later in this thesis. This chapter thus provides relevant contextual information to understand the further development of the ecosystem strategy in subsequent chapters.

While there is a general acknowledgement that firms are motivated to become involved in ecosystems due to growing interdependencies between firms and the novel ways for value creation that ecosystems provide (Jacobides et al., 2018; Gawer, 2021), research has primarily focused on a single firm's explicit pursuit of an overarching value proposition as the motivation to create an ecosystem in the form of an orchestrator strategy (Adner, 2017; Stonig et al., 2022). Yet, it is important to acknowledge that each firm, not only the orchestrator, has its individual motives regarding how it wants to use the ecosystem to create value for itself, which influences the emergence of an ecosystem (Thomas et al., 2022).

The present findings outline the multitude of individual motivations that co-exist within the smart home ecosystem and influence the strategy development process of each firm. Hence, these findings extend research on value creation motives in emerging ecosystems by exploring them in a context in which the alignment of the different motives is not steered by a central orchestrator (Ansari et al., 2016; Dattee et al., 2018). Depicting the different motivations thus provides relevant insights to understand why and how ecosystems may emerge without an orchestrator's interference.

First, the chapter will introduce the findings with regards to the cluster of product-centric motives and discuss why and how firms pursued those. This will be followed by presenting the findings informing the cluster of system-centric

motives in the same form. The chapter concludes with a summary of the findings and their relation to the existing literature.

5.1. Product-centric value creation motives

The first cluster of value creation motives was informed by firms that entered the ecosystem with a particular product or portfolio of products around which their core business activities revolved and which determined their current value creation activities (HeatCo, MotorCo, SwitchCo, ElectronicsCo, ApplianceCo and SensorCo). Five of these firms, all except SensorCo, were incumbent firms in the home or building market, which considered the growing smart home ecosystem as a potential threat to the value creation from their core business. Accordingly, they wanted to address these threats, and which means, that their initial motivation to become engaged in the ecosystem was extrinsic. However, it could be seen that over time, these firms also displayed intrinsic motivation to engage in the ecosystem, recognising the opportunities it provided to enhance their core business. Still, the motivation of these firms to get involved in the ecosystem remained centred around a particular product (portfolio) of the firms' core business. Therefore, these motives are summarised as product-centric value creation motivation. The next sections will discuss the two underlying motives in more depth.

5.1.1. Protecting the core business

The five incumbent firms (HeatCo, MotorCo, SwitchCo, ElectronicsCo, ApplianceCo) highlighted how digitisation and the growing presence of digital technologies and connected devices played an important role in triggering their ecosystem involvement. The growing connectivity between hardware in the home sector required them to consider how they wanted to react to that development to address the requirements and expectations of the market and their customers. While the firms rarely reported the desire to build a new business model from the opportunities created by digitisation, the focus was on ensuring that they played a part in the development of the technology and to remain in control of the development to avoid negative consequences for the core business. Hence, the analysis revealed that the engagement in the ecosystem was

originally seen as an investment in the company's future, to protect the core business and potentially grow it in the future. A HeatCo representative summarised the company's motivation and highlighted the supporting role of the ecosystem activities:

"We want to enable others to participate in the digital building process, but not really as a purpose in and of itself, as a business model on its own. That is just a side effect, the purpose is to keep growing as a global market leader in our domain and to be seen as a valuable strategic partner (0103-01)

MotorCo similarly explained how the involvement in the smart home ecosystem served as an outlet to successfully transition the core business towards a more digitized and interconnected business environment:

„We are a market leader in manufacturing tubular motors that is where we make our margins. One could say I don't need it, for sure we can continue like this for another 10 years, but the question is: will we be replaced by someone that better transitioned into this new era? So, we decided to make the best of it and instead of waiting in the second row, we went to take a front seat and to drive the development." (0401-01)

Due to the growing interconnectedness enabled by digital technologies, the firms also reported that they feared to lose their position in the market or competitive advantage over other firms, if they did not react to the emerging ecosystem around them. Four of the incumbent firms, all except ApplianceCo, were active in the building industry, which is characterised by strong interdependencies between the domains. Hence, if the firms and their products were not compatible with other hardware around the home, they risked becoming ineligible for certain building projects. This could mean losing out to competitors, which are better embedded in the ecosystem and could hence negatively influence the core business through the loss of market shares. A MotorCo interviewee explained:

„In the end the ecosystem becomes a growing driver of our core business and there is a risk that my core business gets excluded at some point, because I don't fit into a certain ecosystem initiative or a use case" (0402-01)

Despite not being in an industry with such close interdependencies between domains, ApplianceCo faced a similar situation. Because of the growing presence of smart home systems offered by third parties, which enabled the integration of

devices across industries, ApplianceCo risked being rejected by customers if their appliances were not connectable with the smart home systems that the customers used.

Furthermore, ApplianceCo stressed that the ecosystem was seen as an important driver for competitive advantage, because the appliances of different manufacturers could become increasingly similar over time, as the products' basic features can hardly be differentiated. Thus, competition happened mostly based on price, brand reputation or incremental technological progress. However, the firm recognised that connected services and products could become a differentiating factor for their products in the future. The Head of Smart Home from ApplianceCo stressed how he expected that customers' buying decisions in the future would include considerations of relevant partners and interfaces, which made building an appealing ecosystem an important element of their business strategy:

„As a company, we decided this is where we will go, we will connect the majority of our appliances. And once they are connected, then the additional value that is created by our partners, will be an important driver for our customers' buying decisions." (0701-01)

Besides digitisation and growing connectivity, the competitive situation and the positioning in the industry hence played a major role in the development of ecosystem activities for these five firms.

5.1.2. Enhancing the core business

The previously mentioned motive for firms to engage in the ecosystem was rather defensive and highlighted aspects that did make engaging in the ecosystem a necessity rather than a deliberate choice. Yet, the analysis also revealed that with growing familiarity and experience in the smart home ecosystem, there was a shift towards recognising the chances the ecosystem provided and how it could contribute to the firms' value creation from the core business.

Hence, the second product-centric value creation motive was the possibility to enhance the products' features by combining it with products or services of other firms in the ecosystem, thereby creating new or improved value for users. This

motive was pursued by the five incumbent firms as well as SensorCo, a new venture with product-centric value creation motives. A SwitchCo representative aptly summarised the opportunities of the ecosystem:

"And another important aspect I want to mention is that, from my experience it [the smart home activities] is a lot about adding to our offer." (0501-01)

The ecosystem provided firms with the possibility to use the integration with the products or services of other firms to offer customers a holistic solution or add additional functionalities to the product without the need to develop, manufacture or sell these complementary products or services in-house. Instead, the firms relied on partners that had the core competencies to provide the complementary products and services. The SwitchCo representative continued to explain:

"I think it is important to focus on the core competencies. Many firms try to cover the whole home, smart smoke detectors, vacuum cleaners, and all this. None of this really works well and they buy all of this from some cheap third-party suppliers. I do not believe in this approach, because anyone can copy this." (0501-01)

Besides this aspect of enabling novel product features through the ecosystem, three firms (ApplianceCo, MotorCo, SensorCo) also recognised the opportunity to expand their market reach through relationships with other ecosystem members. The collaboration with partners provided access to new customer segments or sales channels and could increase the company's visibility. MotorCo's Business Development Manager stressed how the reciprocal relationships between partners could support sales and growth activities:

"The moment I have such a connection with [firm], they potentially also have an interest to call and say, look we have this customer, and we may be able to win them better together than each of us individually. So joint generation of leads, joint customer meetings." (0401-01)

Appliance Co's Head of Ecosystem similarly elaborated how the ecosystem was an opportunity to leverage partners' sales and marketing channels to win new customers for the core product:

"What we are trying to do is to make use of their channels to reach out to new potential customers and tell them, hey, look, what we can do together with them. And just the huge potential that they [the partners] have is something that we try to gain as much as possible from." (0701-01)

With regards to the five incumbents firms, this shows that the original extrinsic motivation to join the ecosystem to protect the core business was gradually expanded towards a deliberate use of the ecosystem to enhance the core business. SensorCo, as a new venture, was motivated by this, too as it helped them to accelerate their firm's growth by leveraging the partner's customer access, but also by enhancing their device's product features.

5.1.3. Summary: Product-centric value creation motives

To conclude, product-centric value creation motives were identified among firms that possessed products that worked independent of the ecosystem and their motives strongly evolved around these products. Surprisingly, it was found that initially, the motivation was not to create additional value, as firms also acknowledged the cost associated with the ecosystem engagement. Instead, the initial motivation was to prevent the products from losing their market position by not being compatible in the ecosystem and to avoid losing established value creation paths. However, once the firms gained more experience with the ecosystem there was a transition towards the pursuit of novel opportunities that could create further avenues for value creation, yet these remained closely related to the extant core business.

In accordance with the strong focus on the core business, there was no evidence, that the firms aimed to govern or control the overall smart home ecosystem or engage with ecosystem members, which had no direct relevancy for their product-centric value creation motives. The Head of Smart Home from ApplianceCo summarised, that they did not see themselves *"as the orchestrator for the whole house and we do not even have the ambition to become this, alarms, solar panels, all this stuff." (0701-01).* Instead, the firms aimed to find an ecosystem position and relevant partners that enabled them to manage a product-centric ecosystem initiative, which could create competitive advantage over other firms in their respective industries.

5.2. System-centric value creation motives

As illustrated in the Research Context (Section 4.3), market research identified significant growth potential in the smart home ecosystem and consequently it attracted new entrants. In this study's sample, four of the case firms (ConnectCo, TelCo, HouseCo and TechCo) were new entrants that entered the ecosystem either as an incumbent from another industry (TelCo) or as new ventures (ConnectCo, HouseCo, TechCo), but without a particular protect to contribute to the ecosystem. Instead, they perceived the ecosystem per se as an opportunity for value creation, in which they wanted to participate by acting as intermediaries and innovation enablers across the ecosystem's members. This means they relied on the presence of the product-centric firms and the realisation of their value creation motives depended on the ecosystem per se. Therefore, these motives are subsumed as 'system-centric value creation motivation These motives are explained in more depth in the subsequent sections.

5.2.1. Enabling the ecosystem as a service

The first value creation opportunity that motivated all four firms was to offer a technological infrastructure as a service for product-centric ecosystem members. The product-centric firms succeeded at connecting their individual products to other firms which led to a fragmented technology landscape of smart devices and related apps, but there was no overarching infrastructure which could enable cross-industry integration of the loosely emerging connectivity efforts. Furthermore, the product-centric firms often lacked the relevant knowledge and resources to build this form of technological infrastructure and to develop a complex net of ties with other ecosystem members. Others were not interested in pursuing this effort, as it did not fit with their overall business strategy and ecosystem motives. Hence, the four system-centric firms perceived an opportunity to create value for other ecosystem members and participate in the emerging ecosystem, by developing a technological interoperability infrastructure as a service for product-centric firms. Product-centric firms would benefit as they could extend their product features across industry- and connectivity-boundaries. Customers and end users were also considered as

beneficiaries of these efforts, as they benefitted from better integrated and more advanced cross-industry solutions. This was aptly summarised by the Business Development Manager of TechCo, when she described the company's inherent business model:

„Basically, we define our business model as 'PaaS', which stands for platform-as-a-service, which means we offer technology solutions for the building industry, manufacturers and building professionals, that can be used in all kinds of private housing, from detached houses to flats." (1001-01)

Accordingly, the four system-centric firms perceived themselves as enablers of the ecosystem activities of product-centric ecosystem members, positioning themselves as brokers or innovation intermediaries that aimed at connecting the different ecosystem activities across firms and industries. The four firms were not particularly interested in the provision of the underlying hardware devices, even if they could potentially acquire relevant hardware from manufacturers abroad. This was helpful to gain the trust of the product-centric firms, as they did not perceive the system-centric firms as potential competitors, but as partners which provided the relevant infrastructure to further facilitate connectivity between ecosystem members.

The system-centric firms also benefitted from the collaboration with the product-centric ecosystem members. They leveraged the deep product knowledge and market insights of their product partners to develop their 'ecosystem-as-a-service' solution and generate ideas for further value creating, cross-industry use cases. As the Chief Product Manager Smart Home of TelCo explained, they considered their value creation efforts as complementary to those of the product-centric firms and aimed to create a win-win situation for both sides:

"The partners have this deep product know how, what their device can and cannot do. Most of them spent years in their industries and developed user scenarios with smart devices for years. So, they have good insights, how their customers use the product and what for and what they would like to have on top, which is then where we come in." (0302-01)

5.2.2. Enabling data-driven value propositions

The second system-centric value creation motive aimed at leveraging the data generated by connected and smart devices to facilitate novel, data-driven value propositions. This motive was pursued by two of the system-centric firms (ConnectCo and HouseCo), but also by SensorCo, which considered this a complementary value creation opportunity beyond their product-centric motives.

In the context of digital innovation data has long been recognised as an important input in the innovation process, which supports new value propositions beyond the traditional notion of innovation through the (re)combination of resources (Alaimo, Kallinikos and Aaltonen, 2020). While the smart home ecosystem was initially driven by value propositions evolving around the combination of products into integrated value offerings, the three firms recognised a further value creation opportunity in the enhancement of the ecosystem towards data-driven value propositions. As Sensor Co's Chief Marketing Officer elaborated:

"The keyword for us are hardware-enabled services. How can we enable the service of an energy utility or an insurance through our IoT-based device so that they can build a future business model on it." (0901-01)

These data-driven value propositions were particularly oriented towards service firms (e.g., insurances, utilities, facility managers), which could use the data that was generated by smart products and prepared by the three firms to either customise existing or develop new services. The provision of these services relied on a constant inflow of data from customers' smart devices and offered an opportunity for service firms to create additional touchpoints with their customers, hence strengthening customer relationships. The CEO of ConnectCo elaborated:

„The service providers in particular – less so the manufacturers, they started understanding this – they do not see the disruption. They do not see that connected devices generate data and information about customers and offer user touchpoints. At some point this could enable pro-active risk management or alert me to buy detergent for my washing machine." (0201-02)

The motivation of the three firms was thereby to generate ideas for data-driven value propositions and provide the infrastructure to enable these. They then collaborated with ecosystem members from the hardware and service side to implement the respective value propositions and the created value was shared among the involved parties.

5.2.3. Summary: System-centric value creation motives

System-centric value creation motives were identified among new entrants to the smart home ecosystem, which did not have their own product (portfolio) that they wanted to position in the ecosystem. Instead, the firms which pursued system-centric value creation motives aimed to create new paths of value creation in the ecosystem by leveraging the extant products of other ecosystem members. Accordingly, their value discovery efforts were less restricted than those of the product-centric firms as they did not have to immediately contribute to an extant core business.

As the system-centric firms relied on the collaboration of product-centric firms to establish their value creation paths, their goal was to create value beyond what the product-centric firms could create on their own. Hence, they adopted the role of an intermediary or enabler for these firms by offering additional value propositions that benefitted the ecosystem members as well as the ecosystem's beneficiaries. For example, the provision of 'ecosystem-as-a-service' offered technological platforms to achieve interoperability of product-centric firms across industries and the creation of data-driven value propositions allowed service firms to profit from the ecosystems by extending or improving their services.

TechCo's CTO description of how they perceived their role in the ecosystem provided a suitable summary of these motives. He stated that *"we perceive ourselves as an enabler, which means enabling access, too. Simply put, it is about those win-win situations you can create, in the end everyone should have a benefit from it." (1002-01)*

5.3. Summary: Value creation motives in the ecosystem

Overall, the findings confirm that the identification and pursuit of individual value creation opportunities was the determining driver for firms to engage in the emerging smart home ecosystem. The majority of ecosystem research has focused on the desire to realise a complex, integrated value proposition as the motive for ecosystem engagement (Williamson and De Meyer, 2012; Adner, 2017; Ansari et al., 2016). Yet, this perspective emphasises the ecosystem-level and assumes the existence of a pre-determined value blueprint which underpins the ecosystem emergence (Adner, 2017; Lingens et al., 2021b).

Scholars who adopt a more collective perspective on ecosystem emergence argued, that it is crucial to look beyond the ecosystem's overarching value proposition and to define how each firm individually contributes to and benefits from the ecosystem through its value offerings (Dattee et al., 2018; Khanagha et al., 2020; Thomas et al., 2022). While these studies focused on how orchestrators can balance the value discovery process between the ecosystem's overarching value proposition and the firm's individual value offerings, the present study adds to this by exploring the entanglement of firm's value creation motives in the context of a self-emerging ecosystem. In doing so, it shows how the different motives are complementary and thus contribute to the formation of the ecosystem, as they encourage collaboration and convergence among the ecosystem members.

By analysing and clustering the different paths of value creation the firms pursued, the findings thereby uncovered two distinct but complementary motivational patterns among the ecosystem members (product-centric and system-centric motives). The analysis further revealed how the firms derived their value offerings based on their individual competences and how the firms' background contributed to different paths for value creation (Kopalle et al., 2020).

Neither of the two motivational clusters is entirely novel in the context of ecosystems and digital innovation: Product-centric motivations have previously been identified in the context of incumbent firms, which transition from a product

business to a platform business by using their existing product as the basis for an ecosystem's value proposition (Subramaniam, 2020; Stonig et al., 2022). Similarly, the system-centric value creation motives resemble what prior studies identified in the context of new ventures, which seek to establish complex new value propositions for which they rely on contributions by other, oftentimes incumbent, firms (Ansari et al., 2016; Lingens et al., 2021a).

Extant research usually studied these motivations in isolation, and it has not yet been sufficiently explored how the entanglement of different motivations within a single ecosystem influences strategy development and ecosystem emergence across firms, particularly in the absence of a central orchestrator. By exploring different value creation motives among firms in the same ecosystem, the study thus complements prior research in which incumbents felt threatened by the ecosystem efforts and value creation motives of new entrants, because they feared losses in their core business, leading to difficulties in the ecosystem's emergence (Ansari et al., 2016). In contrast, the present study shows how incumbents and new entrants considered the value creation efforts of other ecosystem members as complementary, which resulted in greater openness towards collaboration for both value discovery and value creation among the ecosystem members.

These findings therefore relate and contribute to studies which argued that the pursuit of distinct value propositions across ecosystem initiatives supports collaboration and mutual interaction between ecosystem members (Khanagha et al., 2020). In the present study reciprocity did not origin from the pursuit of distinct value propositions, but from the desire to establish the foundations for joint value creation. Consequently, it is also likely that this mutual understanding contributes to the emergence of the overall smart home ecosystem.

Chapter 7 will build on the insights about the value creation motives introduced in this chapter by combining them with the findings on strategy formation presented in Chapter 6 to derive a typology of four distinct strategic approaches in emerging, decentralised ecosystems.

6. Formation of an Ecosystem Strategy

The previous chapter discussed the reasons for firms to engage in the emerging smart home ecosystem. Following this, the current chapter focuses on exploring how the firms developed their respective ecosystem strategies.

By adopting a capability lens the analysis focused on uncovering the activities the firms deployed in support of their ecosystem strategy and which eventually formed into more stable processes (Salvato, 2009). The aggregation and comparison of the activities conducted across the ten case studies led to the identification of four processes: partnering, positioning, aligning, and shaping. Each of the processes enabled the firms to engage with the ecosystem from a technological and market perspective. Across the four processes, two processes (partnering, positioning) are considered core processes, because they directly contributed to the enactment of the ecosystem strategy. The two further processes (aligning, shaping) are considered enabling processes and they enable the firm to mitigate the contextual factors surrounding the ecosystem strategy. Figure 15 provides an overview of the four ecosystem-related processes and illustrates the underlying activities.

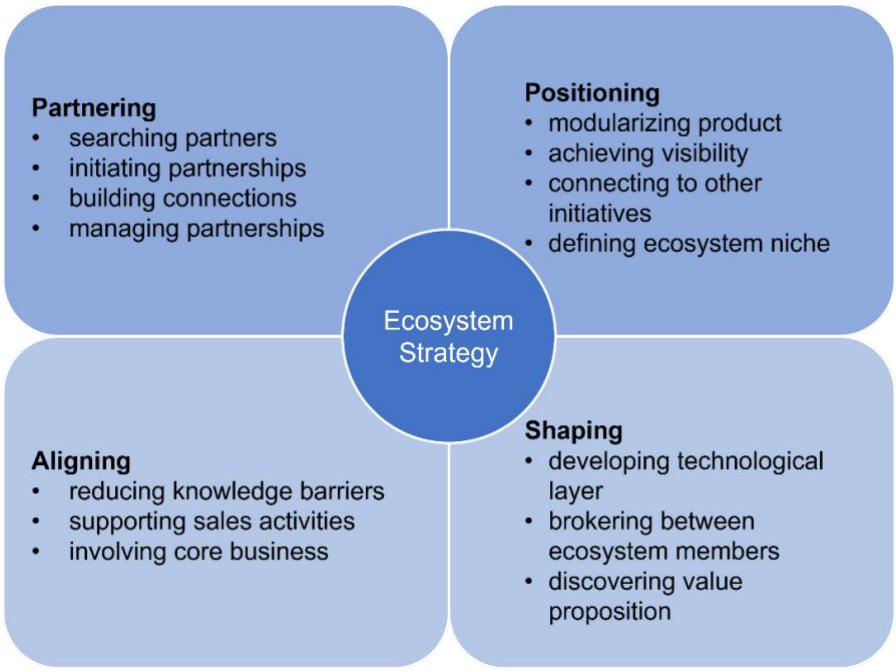

Figure 15: Processes underpinning the Ecosystem Strategy

The capability perspective is complemented by a temporally oriented process view to evaluate the change in the activities and strategy over time. Through the application of temporal bracketing techniques (Langley, 1999) in the analysis of each firm's ecosystem strategy and comparison across cases, the findings revealed that the development of the ecosystem strategy could be broken down into three distinct stages: Set-Up, Scale and Sharpen. This development was accompanied by a shift from a technological to a more market-oriented perspective of the ecosystem and by changes in the activities underpinning the four ecosystem-relevant processes.

Figure 16 depicts the findings presented in this chapter by providing an illustration of the linkages between the strategy development stages, the processes and activities underpinning strategy formation and the shift from the technological to the market layer throughout the process.

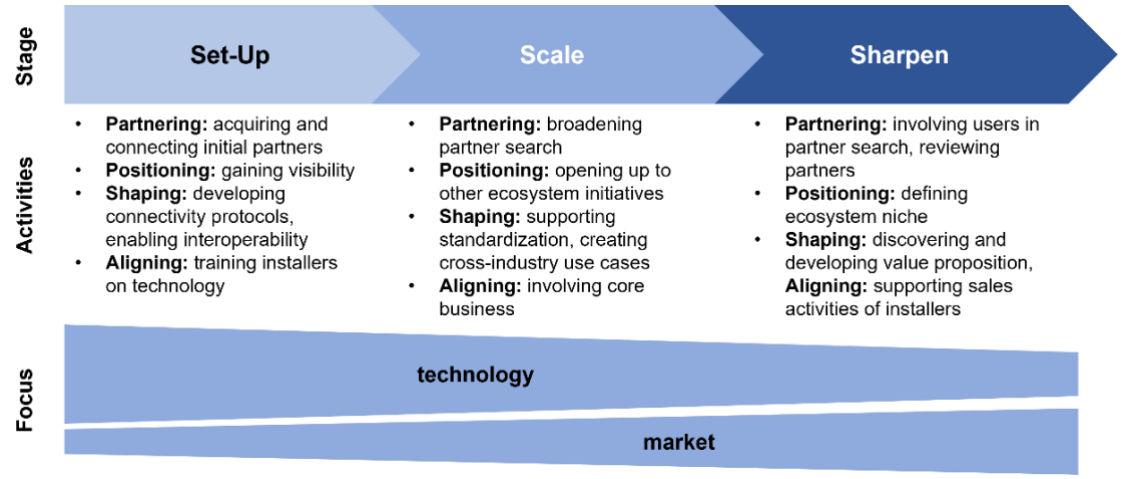

Figure 16: Ecosystem Development Process

The following sections unravel how a firm's ecosystem strategy unfolds in an emerging ecosystem. The sections are organised along the three development stages and four ecosystem-related processes.

6.1. Stage I: Set-Up

The conceptual framework suggested that based on research on strategic alliances the initial strategy formation stage could be considered 'recognition'. In line with this assumption, the findings showed that the first stage of strategy development in an ecosystem is determined by a firm's growing awareness, that the emerging ecosystem has relevance for its business activity and the respective desire to engage in it. Consequently, firms gradually become involved in the ecosystem through the provision of a connectable product, which builds the foundation of their ecosystem activities. Product in this instance can either refer to an actual hardware device, as in the case of the product-centric firms (HeatCo, MotorCo, SwitchCo, ElectronicsCo, ApplianceCo and SensorCo), or the provision of a technological platform to connect hardware devices and to manage them through a software, as in the case of the system-centric firms (ConnectCo, TelCo, HouseCo and TechCo).

Compared to strategic alliances the first development stage of an ecosystem strategy is less clear in terms of determining the potential benefit for the firm. Further, since ecosystem partnerships are less formally structured than in alliances and lack a pre-determined common goal, recognition was not followed by a long preparation phase (research) and systematic search for partners (relationship building) (George and Farris, 1999). Instead, the firms quickly launched their ecosystem strategies by beginning to set up the foundations for their ecosystem activities. Hence, the first stage is labelled 'Set-Up'. The subsequent sections explore how the firms deployed the four processes to develop their ecosystem strategy in this stage.

6.1.1. Set Up: Partnering

The pre-dominant idea of how firms find partners in an ecosystem is driven by the orchestrator-centric view, in which a firm strives to build an ecosystem and then searches for relevant partners and initiates the alignment structure between them (Lingens and Huber, 2021; Dattee et al., 2018). In this perspective, non-orchestrators are treated as passive entities, who. hardly pursue their own strategic partnering activities (Selander et al., 2013).

This study revealed that in the case of the smart home ecosystem no orchestrator firm was needed, because firms individually acquired partners for their ecosystem activities. However, at this early stage, partnering focused on building technological connections with other firms to complement or expand the features of the modularized product. Market-oriented aspects at this stage were largely neglected. As the Chief Strategy Officer of HeatCo aptly summarised:

"I don't say there is no logic yet, but it's technical. Which interfaces do we know and can integrate easily, simply, because there's knowledge about it. But it lacks marketing reasons and the evaluation of long-term collaboration benefits." (0101-02)

Furthermore, all case firms reported on adopting local search for the acquisition of their initial partners, leveraging existing business ties or networks. Given the relative newness of the ecosystem and the lack of experience the firms had with it, such local search meant that there was a certain pre-existing degree of trust between the firms. This contributed to the willingness to jointly explore the value creation potential of these connections and reduced the uncertainty surrounding a newly forming ecosystem (Dattee et al., 2018). A SwitchCo interviewee explained:

"We started speaking to several manufacturers, many of which we already knew well, where there was an existing relationship. We did find some partners that were probably looking for something similar and felt that our image fit and that trying this was worthwhile." (0501-01)

For the system-centric firms, which were new to the home and building industry, such local search patterns provided the opportunity to overcome the chicken-and-egg dilemma, as they could not present an established product yet. Except for TelCo, which built on the reputation of their core brand, the firms did also not have a reputation in the market. The Managing Director of TechCo vividly recalled the experience of finding the company's initial partners through local search, stating that:

"My dad owns an installation company. So, I approached his suppliers, the salespeople. With our prototype I drove around cold calling them and probably from 100 attempts, I got 95 rejections, but I kept going and then I had the first three, five, six partners. Then it became easier." (1003-01).

This approach to start from an existing business network was confirmed by TelCo's smart home unit, which leveraged the mother company's business networks to find and convince initial partners to join their ecosystem initiative.

"We screened the market, but of course we also searched using our company's ties. Other divisions provided IT services to some big companies and had a strong network, so of course we leveraged this to approach them." (0302-01).

Following the acquisition of initial partners, technical connections between the firms were achieved through two distinct patterns: Some firms developed a shared connectivity protocol with their partners which enabled their products to communicate (cf. Section 6.1.4). In instances where such a shared protocol was not an option, individual integrations between the products were realised through the creation of respective interfaces. However, both approaches were resource intensive, limiting the speed at which partners could be acquired and slowing the growth of the ecosystem activities. MotorCo's Product Manager Smart Home remembered how the approach of a shared protocol presented difficulties in working with relevant partners:

"Our partners… one firm was very active, (…) but others, they needed a long time to bring products to the market which hampered our growth as well." (0403-01).

A similar experience was shared by ApplianceCo, which initially integrated each partner's products into their technological infrastructure. Appliance Co's Head of Smart Home recalled the difficulties this presented in terms of increasing partnerships by explaining that after they acquired the initial three partners this was when *"(…) it began that we said, ok we have seen what a huge effort it is to do this integration ourselves." (0701-01)*

For the system-centric firms, the speed at which partnerships could be established was similarly slow, as they initially had to build and adapt their technological platforms to ensure that it could connect partners' products. Hence, it required upfront investments by the system-centric firms to build the respective interfaces.

Overall, partnering at this stage was about acquiring partners and establishing dyadic connections between firms. At this stage, partnerships mostly remained

at the level of a technological connection and lacked intense collaboration, or an evaluation of how partners could contribute to the enablement of new product features or be used from a marketing perspective to create additional value.

6.1.2. Set-Up: Positioning

Positioning refers to a firms process of determining the role it takes within the wider ecosystem, thus presenting an important element of its ecosystem strategy. The dominant view in ecosystem research is that ecosystems are actively designed by firms, and positioning in the birth phase of an ecosystem has evolved around the question of whether firms take an orchestrator position or complementary position (Iansiti and Levien, 2004b). This study's findings reveal that in an emerging, decentralised ecosystem (Aarikka-Stenroos and Ritala, 2017) where a large number of co-existent ecosystem initiatives remain autonomous and only loosely connected (Baldwin, 2020b), positioning starts much earlier by achieving visibility, and by making the ecosystem involvement known to other ecosystem members and customers. This allows the firms to extend their reach beyond the immediate partners and to introduce their ecosystem efforts to customers.

One activity conducted by all firms to achieve visibility was to visit fairs to present their ecosystem activities. For the system-centric firms the aim of these fair visits was to meet and introduce their initiative to potential partners. All four system-centric firms reported on visiting or presenting at fairs in the domains that they wanted to attract partners from. In contrast, the product-centric firms saw the ecosystem activities as a leverage for their core business and consequently they presented them as part of their core business' exhibitions. For them the emphasis was on acquiring partners, but also on making their ecosystem activities known to other stakeholders (e.g., construction and real estate companies, project planners, architects) and customers.

Smart home associations provided a further opportunity for the firms to meet other ecosystem members and make their ecosystem efforts known to others. This aspect was particularly relevant for the system-centric firms as all four were new entrants into the home and building market and had no industry-relevant

existing reputation among the incumbent firms in the industry. Hence, these firms reported on the importance, particularly at the early stages of their ecosystem activities, to engage in smart home associations to increase their visibility and highlight the legitimacy of their ecosystem activities. A TelCo representative explained:

"Initially, we wanted to show that we do smart home now and are serious about it. We wanted to be visible (…) but also create contacts. Manufacturers attended these meetings, too. It was a good chance to speak to firms we knew and meet new ones." (0302-02)

Besides the system-centric firms, this aspect was also relevant for other new entrants as could be seen in the case of SensorCo. The Chief Marketing Officer of SensorCo, a product-centric firm but also a new entrant, stressed the importance of these associations for new ventures launching their ecosystem activities:

"It enables networking, attention and visibility, people search for firms in these associations. As a start-up it is important to be listed, as you need visibility. You also look what other firms are there; if one might be a good partner, you get in touch. (…) You must be a member to be listed, to be found and approached." (0901-01)

While this aspect of gaining legitimacy and establishing new contacts was less relevant to the five product-centric incumbents, they still reported to engaging in these smart home associations at this stage, mainly referring to the aspect of visibility by sharing that it was a lot about "*seeing and being seen"* (0503-02).

6.1.3. Set-Up: Aligning

Aligning at the early stage of ecosystem activities was particularly relevant for six of the case firms, which relied on professional installers to install their smart products in homes, i.e., four product-centric firms (HeatCo, MotorCo, SwitchCo and ElectronicsCo), as well as two system-centric firms (HouseCo and TechCo). All six firms considered their close affiliation with installers as a competitive advantage, as installers were often consulted by customers in the selection of smart home products. Further, the four incumbents reported on the high loyalty and long-standing relationships with their installers, which they perceived as a core capability that differentiated their ecosystem activities from those of other

ecosystem members entering from external industries. However, if the installers could not be convinced of the ecosystem's benefits, there was a risk that these core capabilities became core rigidities in the ecosystem context (Leonard-Barton, 1992).

The installation of smart products often required the use of software to implement the connections among the products, something that many installers were reluctant to adopt as it was not normally within their job profile and their reluctance meant that they would not recommend these products to customers. Consequently, the six firms that depended on professional installers, developed, and offered various training formats to reduce the installers knowledge gaps with regards to the technological requirements of smart products. The aim was to support installers, so they felt confident in their ability to work with the products and to ensure that they were installed correctly and integrated seamlessly. ElectronicsCo's Head of Smart Home recalled the efforts the firm undertook to train installers at the beginning of their ecosystem engagement:

"For us this was a massive effort, because we first needed to enable these people [the installers]so they were capable of doing this [set up the system]." (0703-01).

However, all six firms acknowledged that not addressing and actively resolving these knowledge gaps among installers would mean installers would be hesitant towards their ecosystem activities. Hence, installers' support and approval represented a crucial barrier that had to be overcome to ensure the pervasiveness of the six firms' ecosystem activities. Supporting installers to achieve their adoption of the smart products was therefore a critical activity for the set-up of their ecosystem strategy.

6.1.4. Set-Up: Shaping

The shaping process evolved through the data analysis and the growing recognition, that the firms conducted a range of activities in the emerging ecosystem and in the absence of a central orchestrator, that, in conjunction with the activities of other ecosystem members, contributed to the ecosystem's

development. Thus, 'shaping' refers to activities the firms deployed to build the technological foundation of the ecosystem and to create the market around it.

Within an orchestrator-centric ecosystem the orchestrator is initially responsible for developing the technological layer of the ecosystem. Often this is via a platform or the definition of standards that determine how complementary products and services can connect, allowing for the formation of the characteristic interdependencies between ecosystem members (Autio, 2021). The findings revealed that in the absence of an orchestrator, developing the technological infrastructure was a decentralised effort with several ecosystem members working on the development of connectivity protocols (product-centric firms), or offering technological platforms to facilitate interoperability across these protocols (systems-centric firms).

At the beginning of their ecosystem activities, three of the product-centric firms (MotorCo, SwitchCo and ElectronicsCo) collaborated with other firms, usually from adjacent domains, to develop connectivity protocols. The firms sought to create a connectivity protocol that distinctively met the requirements of their products. All three firms began with proprietary connectivity efforts but opened the development and use of the protocol by inviting other manufacturers to join their efforts. To overcome the chicken-and-egg dilemma of finding partners that were willing to invest resources in the development a novel technology and equip products, which was a challenging endeavour, the three firms initially approached firms they had existing relationships with. MotorCo's Head of Smart Home remembered:

"Initially we wanted to be able to control the full home and felt we should develop a shared protocol. Our first development partner was a close partner before. We included a few more but didn't want 100 members to not become static." (0403-01).

The firms quickly realised the difficulties of developing and introducing a connectivity protocol based on a proprietary technology: Since there was no existing product portfolio that already supported the protocol and no existing customer base using it, other firms were reluctant to commit resources towards the development of the technology which hampered the development and

consequently the coverage and relevancy of the protocol. One interviewee from SwitchCo reflected:

"If you start this [a smart home ecosystem] with a new proprietary technology you begin with just your portfolio and you compete with other protocols in the market." (0501-01).

MotorCo shared a similar experience by sharing the difficulty of establishing a new connectivity protocol:

"We wanted to establish our protocol in the housing industry but had to realise other sectors already used other protocols and so we struggled a lot. (0402-01).

This eventually led to a change in the firms' shaping efforts, which is represented by MotorCo's realisation that "*it wasn't the right strategy to establish our own protocol on the market – we had to open up to others" (0403-01).* The consequences of this recognition will be presented in Section 6.2.4.

For the four system-centric firms, due to their lack of a product portfolio to begin with, introducing a proprietary protocol to the ecosystem was not an option. Accordingly, shaping at this stage was about the enablement of interoperability across the existing connectivity protocols, adopted by product-centric firms from different industries. Through their technological platforms they wanted to achieve interoperability and shape the ecosystem by overcoming the growing fragmentation between the different ecosystem efforts of product-centric firms. The CEO of HouseCo elaborated:

"There will be devices with network interfaces, which deliver data. Then you need a platform, which ensures interoperability, where the devices can connect and share information (…)." (0801-01)

Overall, shaping at this stage of the ecosystem referred to the firms' contribution to the development of the ecosystem's technological underpinnings. As the findings show, the firms each conducted their individual yet mutually complementary activities to contribute to the development of the technological foundation of the ecosystem.

6.1.5. Set-Up Stage: Summary

Throughout the Set-Up Stage, the case firms began to experiment with ecosystem activities, exploring the opportunities it provided and how to navigate the emerging smart home ecosystem. Towards the end of this stage, each firm had developed a set of bilateral connections with other ecosystem members. Yet, partners were often acquired because they were easily accessible due to pre-existing ties or knowledge about the respective interfaces. Consequently, partnerships often remained superficial and loosely connected. The technological emphasis in the strategy development process is also illustrated in the focus on technology in the shaping process and the aligning process.

In the context of extant research on ecosystems, these findings are interesting, as they contradict the dominant assumption in the ecosystem literature, that firms start their ecosystem activities from the pursuit of a common value proposition (Adner, 2017). While this value proposition may be subject to change through interactions among the ecosystem members (Ansari et al., 2016; Dattee et al., 2018) it still provides the direction towards which an orchestrator steers the ecosystem development and guides each members' strategy. Furthermore, it ensures that the ecosystem members, from the start, pursue a shared objective.

In contrast, the findings presented in this section corroborate research that suggests that if an ecosystem forms as the result of growing digitisation, the emergence is decentralised and characterised by many parallel and non-streamlined activities (Yoo et al., 2010; Baldwin, 2020b). More particularly the findings show that at this stage, the firms' major concern was to achieve a common ground for connectivity and to ensure that other firms knew and supported their ecosystem activities.

From an ecosystem-level perspective, when most firms were still in the Set-Up Stage of their strategy development, the smart home ecosystem itself consisted of several separate or only loosely connected firms that pursued isolated ecosystem initiatives. The technological landscape of the ecosystem was highly fragmented due to the development and co-existence of different connectivity protocols. Furthermore, the ecosystem initiatives were often focused on single

industries and not compatible among each other so that there was no integrated, cross-industry ecosystem. Moreover, the ecosystem did not have an overarching value proposition yet, so that it mainly existed from a technological viewpoint.

6.2. Stage II: Scale

The second stage of strategy development is marked by the firms' expansion of the ecosystem activities. As illustrated in the previous section, in the Set-Up stage firms built the technological foundation for their ecosystem strategy and explored the opportunities it could provide. Subsequently, in the Scale stage, the firms aimed to grow their ecosystem activities and create ties with additional and more distant ecosystem members.

The findings revealed that there were two approaches in the Scale Stage: some of the firms approached it by seeking to extend their direct partnerships with other ecosystem members, while other firms did not necessarily engage in extensive partnering. Instead, they relied on positioning and shaping to expand their reach across industries. For the incumbent product-centric firms the Scale stage also required a stronger alignment not only of external stakeholders, but also of the core business to generate stronger support for the ecosystem activities. The following sections will present the findings for the Scale stage in detail.

6.2.1. Scale: Partnering

For the system-centric firms the success of their ecosystem activities depended on the development of an appealing ecosystem initiative that attracted both, further partners as well as further customers. For three system-centric firms (TelCo, HouseCo and TechCo) this was a time when they extensively grew their partner network. Yet, partnering at this stage was often not driven by a systematic evaluation of partners, but the desire to quickly increase the number of connections, as a growing number of partners promised further visibility and legitimacy towards other prospective partners and potentially higher relevancy for customers. This attempt of growing an ecosystem initiative was closely in line with the network effect often discussed for platform ecosystems (Cusumano, Gawer and Yoffie, 2019; Gawer, 2021). TelCo's Head of Consumer IoT explained

how they continued their strategy development once they had set up their ecosystem initiative with their pilot partners:

"In that phase, we visited a lot of fairs and, figuratively speaking, we approached anyone who didn't run fast enough to join us, to join our idea." (0303-01)

The COO of HouseCo reported a similar approach in their Scale stage by recalling how connecting partners became the determining factor irrespective of whether a partner provided value to the ecosystem initiative or not:

"Anything the market considered useful was connected, Sonos speakers, Philips Hue light. They were one of the first in the market who offered an open API that any developer could take and connect. Next were sockets, switches… Whatever came, we connected it while the resource needs kept growing." (0802-01)

Similar to TelCo, HouseCo and TechCo, three of the product centric-firms also reported on the active search of partners beyond adjacent domains in the Scale stage, in an attempt to build a product-centric ecosystem initiative around their product portfolio. However, the emphasis, too, was on growing the partner network and building more connections and partnering lacked a market-oriented evaluation of the partners. As MotorCo's Head of Strategic Product Marketing, who was responsible for partnerships, described:

"And then we tried to connect everything, make the whole home smart. We began building partnerships just to increase the offer." (0402-01)

ElectronicsCo's Head of Cooperation and Alliances, who at the time was responsible for the establishment of further connections, reiterated how this approach helped them to grow their ecosystem initiative, but also how this contributed to how other ecosystem members perceived the firm. He reiterated:

"We had a team called Applications and Cooperation as we noticed others approached us. We developed this solution that expanded our ecosystem, and they could connect to us even if they used another protocol. (…) We gained many partners, with some we worked closely and others more superficially. (…) But we had the opportunity. At a fair we had a corner where we presented all the partners and that brought us forward a lot." (0601-01)

Overall, it can be noted, that partnering at the Scale stage mainly focused on growing the number of technical connections. Market-relevant considerations and an evaluation of partners against this background remained scarce.

6.2.2. Scale: Positioning

Positioning at the Scale stage also served the growth of the firms' ecosystem activities. It involved defining the firms' technological position in the ecosystem, i.e., which connectivity protocols to support and, due to the co-existence of a range of ecosystem initiatives, to determine how the firms wanted to position themselves vis-a-vis other ecosystem initiatives. This included the decision how to potentially become affiliated with other ecosystem members without necessarily engaging in further direct, dyadic partnerships. The analysis revealed different patterns for firms to establish their position from a technological perspective.

The six product-centric firms had to decide how to modularize their product(s). The growing number of connectivity protocols in the smart home ecosystem meant that firms had to evaluate which connectivity protocols they wanted to support and how. To remain eligible for connections with a broad selection of other ecosystem members, five of the product-centric firms (all except ApplianceCo) reported on supporting different connectivity protocols so that their products would not be discarded by customers due to a lack of compatibility with other products. The Director Digital Products of HeatCo elaborated on their technological positioning decision-making process:

"We want to support as many established standards as possible. We rely on other manufacturers and look what standards they support. The challenge is to choose which standard to focus on (…) Sometimes the discussion arises, if we really must support multiple standards, but we must follow the trend, because we supply components that must fit with the other products." (0102-02)

The approach to equip products with more than one connectivity protocol was costly and increased the complexity in the product portfolio, which prevented economies of scale. Thus, the firms developed further, more efficient approaches to ensure compatibility across the ecosystem. The dominant approach was the

release of gateways and open APIs which could act as 'translators' between different connectivity protocols. The gateways allowed the firms to realise connectivity across other domains more easily and achieve interoperability. MotorCo's Product Manager for Smart Home elaborated:

"Our competitors always argued that we use our own protocol and don't support others. Like 'Careful, they try to lock you in, and you'll never get out'. (…) We had to show we aren't closed, and we don't want to lock anyone in. Customers who don't rely on installers' advice and search for the ideal solution have this fear of choosing a system and 3 years later finding it's not the right one. (…) We wanted to address that and show, there's no problem. You can buy our products, but we support other ecosystem initiatives, like Apple, Amazon, Google, IFFFT and others. The open API shows transparency, we're not hiding anything." (0403-02)

Furthermore, the open APIs meant that other ecosystem members could access them, to connect the firms' products into their ecosystem initiative. Particularly, the product-centric firms aimed for connectivity with the broader ecosystem initiatives of the system-centric firms, as this would allow them to expand their reach beyond their adjacent domains and become embedded in the wider smart home ecosystem. Hence, the six product-centric firms could increase their reach in the ecosystem without the need to manage direct but distant partnerships. The Head of Marketing from SwitchCo explained:

"For example, we now connect to these overarching systems, because as soon as we look towards IoT, we don't want to know how a vacuum robot works or a fridge or freezer. It is logical I guess that we enable the connection this way, because no manufacturer can cover this on their own." (0503-02)

Positioning at the Scale stage for product-centric firms therefore meant that they chose which protocols to support or how to establish connections with other ecosystem members to become embedded in the wider ecosystem. Ideally, without the need to maintain an increasingly broad and complex set of partnerships.

For the system-centric firms in the Scale stage, positioning meant to determine which protocols to support, as this influenced their ecosystem position and possible further partnerships they could establish. The different connectivity protocols had their roots in particular domains or industries in the ecosystem. Accordingly, the selection of a protocol was usually closely affiliated with a

domain or industry and supporting more than one protocol meant a more holistic solution could be created. Supporting different protocols thus also increased the number of prospective partners as it lowered barriers for collaboration, because the hardware partner did not have to make large investments into the establishment of a connection. Hence, supporting various protocols supported scalability and the growth of the ecosystem initiative potentially helping the firms to achieve a more relevant ecosystem position. The Head of Consumer IoT from TelCo summarised:

"When we defined our ecosystem initiative, we said we support open, established protocols for anything in the customer relevant domains. We made a few exceptions, for example if influential manufacturers had a proprietary protocol, but they were relevant. Else we said, it must be an established protocol. Why? Because if we want to play a part in the ecosystem we must scale." (0303-01)

At the same time, supporting more protocols within the ecosystem initiative led to an increased complexity in terms of ensuring the interoperability and maintenance of interfaces on the technological platform. The firms adopted different approaches towards maintaining this complexity. For example, TelCo tried to avoid supporting protocols that did not have a wide reach and relevancy and focused on established protocols. In contrast, for TechCo the support of connectivity protocols was closely linked to their partnering activities, and they chose the protocols they supported based on their (new) partners' requirements, but also shared the incurred development cost with them. Their CTO elaborated:

"The need is there when a partner says, I need this protocol for this or that reason. Because at this point the partner or we will ask around the partners if anyone else needs this and based on this we determine how to finance this idea, the integration and all this." (1003-02)

6.2.3. Scale: Aligning

For several of the firms in the Scale stage aligning became relevant to indirectly facilitate their connectivity with other members of the ecosystem. Particularly HeatCo and SwitchCo, but to some extent also ElectronicsCo, elaborated how they did not engage in active partner search but instead relied on third parties (i.e., installers) to establish these connections. While one approach was to position the ecosystem activities as part of a broader ecosystem initiative, as explained in the

prior section, a further approach these three firms reported on was to support established, open standard protocols so that installers could create customised connections. HeatCo's Head of Consulting Services explained how the extensive partnering was not a key element of their ecosystem strategy:

"We do not unconditionally search for complementary products to create the best buildings. That is an effort no one will pay us for. We just need to make sure that we understand the bigger picture." (0103-01)

Consequently, aligning the support of installers as illustrated in the Set-Up stage became even more relevant, as installers took responsibility for selecting complementary products and creating integrated solutions. This meant they needed to be qualified well and understand the requirements of the products. At the same time, they also obtained a gatekeeping role towards customers. SwitchCo's Head of Marketing shared HeatCo's view that finding partners was not necessarily at the core of the ecosystem strategy and was partly transferred to installers:

"In the first instance, we try to do what we are good at and do well. And then the professional installers, based on customer requirements, select the complements. So, we have these system integrators, system partners for it." (0503-01).

Moreover, in the Scale stage aligning for the five product-centric incumbents (HeatCo, MotorCo SwitchCo, ElectronicsCo and ApplianceCo) extended to the involvement of another stakeholder group: the firms' core business. At the Set-Up stage the ecosystem activities were often developed relatively independent of the core business, as they were exploratory and limited to only a few connections. However, with the growing adoption of the ecosystem activities and increasing complexity, it was necessary to achieve a closer alignment with internal stakeholders to ensure a seamless experience for customers.

Internal stakeholders referred to those responsible for the core business' product development such as R&D managers or product managers and those responsible for the ecosystem strategy of the firms sought to achieve alignment between themselves and those core business representatives. This was relevant, because when the core business developed or changed features of the products, they had

to consider the implications this could have for the features that were enabled through the ecosystem. SwitchCo's Product Manager stressed that:

"This mindset, you have a device, which you can touch, it is complete, packaging, instructions, all developed jointly, they [the core business] take responsibility for all of it. But when the product needs software for something to happen, they say well, this device is what you wanted, and it is not my problem it doesn't work. We must improve this, so they accept the responsibility and potentially get in touch with other manufacturers or developers." (0501-01)

All five firms agreed that the realisation of new ecosystem-related features oftentimes required the support of the core business to adjust some of the products' underlying settings as a prerequisite to make an ecosystem feature work. However, there was often a strong resistance among the core business in terms of opening the products for other companies which slowed down the scalability and development of new ecosystem features. As the Head of Smart Home of ApplianceCo remembered:

"Sometimes it is not just scepticism, it is outright resistance. They say we must ensure the quality of the appliance. It is important to involve them, communicate and outline the benefits and relevance for the core business. Show them our competitors do it, customers want it. I also made good experiences by showing them the features the ecosystem enables, make it tangible for them." (0701-01)

Overall, accomplishing the support of the core business was important for successful execution of the ecosystem strategy in the Scale stage. If the core business was not aware of or hostile towards the ecosystem activities, they could implement changes in the products that caused disruptions in the functioning of ecosystem features. These disruptions had negative impacts on the perception of the ecosystem activities among customers and strained the relationships with ecosystem partners that may also be affected. Thus, aligning internal stakeholders ensured that the core business and ecosystem activities were coordinated so that the ecosystem strategy could serve as an enabler for core business growth.

6.2.4. Scale: Shaping

The data suggests the existence of technological shaping activities to enable connectivity between products from different industries and to increase the opportunities of new resource combinations across the ecosystem. Shaping on the technological layer supported the growth of the firms' ecosystem activities, as the technological fragmentation was considered a barrier for the ecosystem to reach a higher acceptance among customers. Not only did the fragmentation hamper the possible combination of products, but it also carried the risk, especially for end users, that products were not compatible, which caused their reluctance to adopt smart products. The findings showed that in the absence of a central orchestrator, several firms approached technological shaping by supporting the development of standard connectivity protocols to reduce these barriers. ElectronicsCo's Head of Smart Home explained:

"There are many proprietary ecosystem initiatives. (…) You're stuck in this island; the system only works in itself. (…). You won't get far with it, because if a customer chooses this system, they choose a manufacturer. When the manufacturer stops supplying products, you may have a working system, but once they close the server you have rubbish. (…) Hence, the current trend is to use standards, some are really gaining traction." (0602-01)

The analysis uncovered differences in the extent to which firms engaged in standard-setting. HeatCo, MotorCo, SwitchCo, ElectronicsCo and ApplianceCo were all involved in one or more standard-setting organisations as the specifications of these protocols had direct implications for the features they could realise with their products in the ecosystem. For example, the Head of Strategic Product Marketing from MotorCo elaborated on the motivation to join the newly formed matter initiative:

"This standard is driven by US companies. They don't even have shutters or shading products there. They likely won't be aware of all the specifics; the protocol won't cover them. But we assume the protocol could become relevant in Europe and then we'll face problems as some features won't be covered and require the standard to be adapted." (0402-02)

SensorCo were in agreement with respect to the relevance of standard setting, but they did not actively engage in any organisations as they considered their company size and influence to be too small.

The four system-centric case firms were also supportive of standardisation efforts within the smart home ecosystem but took more of an observer role because the protocols' specifications did not have direct implications for their ecosystem strategy. Due to their dependency on the product-centric firms, they adopted the protocols supported by their hardware partners. While a reduction of protocols was considered beneficial to lower complexity in maintaining the underlying technological platform, they acknowledged that this relied on the adoption of such standards by their partners:

"In the first step something like a new connectivity protocol must be adopted by the industry, before we include it in our platform. Hence, we observe these developments intensely and then we speak to our partners to see if a protocol is relevant for them, then we implement it." (1002-02)

TelCo was the only system-centric firm that was actively involved in a standard-setting organisation but stressed that their involvement was mainly to be informed about the latest developments early on. Still, they recognised that their membership also provided them a chance to influence the development, if found useful with regards to their ecosystem activities.

"We were members in an SSO before and are now also members in the new matter alliance. The motivation is to know what is happening, so we can consider it for our roadmap early on. But also, as far as possible, to have influence. There are different memberships, bronze, silver, gold. (…) We don't have the highest but can submit requests and join the discussions." (0302-02)

In addition to standard setting efforts, three of the system-centric firms (TelCo, HouseCo, TechCo) conducted brokering activities aimed at shaping the technological layer of the ecosystem. These efforts were designed to overcome the fragmentation caused by co-existing connectivity protocols. The technological platform infrastructures they built facilitated communication of devices across connectivity protocols and enabled interoperability and the exchange of information and data across devices. As the CEO of HouseCo elaborated:

"There will be devices with network interfaces, which deliver data. And then you need a platform, which ensures interoperability, where the devices can connect and provide user information (…)." (0801-01)

TechCo's Managing Director similarly described how their software and server facilitated interoperability between products in the building industry and how this contributed to the development of an integrated smart home ecosystem:

„If I look at the value chain in a digital building, whether it is a home or commercial space, there are many different aspects, product development, manufacturing, installation… TechCo contributes a small but significant part to it, the provision of interoperability and connected applications within the building." (1003-01).

Accordingly, the three firms' technological brokering contributed to the growth of the ecosystem by supporting the convergence of its members across protocols.

6.2.5. Scale Stage: Summary

In the Scale stage firms acknowledged the growing complexity and variety of members in the smart home ecosystem and conducted activities to extend their ecosystem reach. This formation stage in the ecosystem strategy was characterised by an effort to achieve connectivity across the fragmented technological layer. While partnering remained crucial to grow the number of direct connections with other ecosystem members, firms also increasingly engaged in shaping activities, either through standard-setting or brokering activities towards interoperability. The shaping efforts contributed to convergence on the technological layer and made partnering with other ecosystem members easier. Furthermore, product-centric firms began to seek affiliation with more system-centric ecosystem members to increase their ties with distant ecosystem members without the need to build further direct partnerships. Still, the ecosystem strategy of firms at this stage emphasised technology, and market considerations for example through a stronger involvement of customers remained rare.

In terms of aligning, the findings revealed further efforts to align installers, as they were seen as a leverage to achieve connectivity with firms adopting the same connectivity protocol. The five incumbent product-centric firms also had to

increasingly work on aligning their core business towards their ecosystem activities. This was relevant to increase the acceptance of the ecosystem activities and contain the 'not-invented-here-syndrome' towards other ecosystem members (Hannen et al., 2019). If the core business was not properly aligned and there was no mutual understanding, there was a high risk that the lack of support would hamper the further expansion of the ecosystem activities which depended on the respective products.

On the ecosystem-level, the activities conducted throughout the Scale stage of the strategy development process, contributed the development of the overall smart home ecosystem towards a nested structure of ecosystem initiatives. Several specialised product-centric ecosystem initiatives converged and connected around broader, more holistic ecosystem initiatives managed by the system-centric firms. Consequently, the findings suggest that the individual ecosystem strategies of the firms contributed to the further emergence of the ecosystem. The increasing connections between ecosystem members and collaborative efforts to overcome the technological fragmentation led to the smart home ecosystem forming as an 'ecosystem of ecosystems' (Hilbolling et al., 2020).

6.3. Stage III: Sharpen

The third stage of strategy formation was marked by a stronger focus on the market layer with firms focusing on the value proposition and the creation of demand around the ecosystem. With regards to the ecosystem development, the firms jointly engaged in shaping processes to discover potentially overarching value propositions for the ecosystem which are attractive to its beneficiaries. Further, through aligning both external and internal stakeholders who mitigate customer and market access, the respective firms hoped to further develop the market demand around the ecosystem.

In line with these developments in the enabling processes (aligning, shaping), firms in the Sharpen stage displayed a stronger consideration of the needs from business customers and end users which was reflected in their partnering and positioning processes. This led to a general refinement of the firms' ecosystem strategy as firms began to review their partner structure against the potential

value propositions. They also identified a distinctive ecosystem niche they wanted to position themselves in. Hence, the third stage of ecosystem strategy formation is labelled 'Sharpen'.

6.3.1. Sharpen: Partnering

Relationships with stakeholders beyond the dyadic customer-firm relationship have long been considered an important strategic element of firms' marketing activities (Gummesson, 1999). The ecosystem required firms to consider relationships beyond customers and stakeholders (Payne and Frow, 2017) by identifying ecosystem members that could contribute to the materialisation of their strategic objectives.

It became evident that over time all firms developed a more nuanced view of their partnerships, broadly clustering partners in two groups: collaboration partners and market-dominant actors. Firms such as Philips Hue, Amazon Alexa or Sonos were frequently mentioned with regards to market-dominant actors. These companies had such a strong presence in the ecosystem that the case firms were required to connect to them due to customer expectations, irrespective of their ecosystem strategy. Therefore, all case firms agreed that these partnerships were necessary, but did not help them to differentiate their ecosystem activities from competitors. Moreover, these partnerships resembled commercial arrangements and lacked collaboration and exchange.

"If we think of Hue, they are a very important partner. Thousands of their products are connected to our ecosystem. (…) but I wouldn't say that we're close partners similar to others where we engage in many workshops to co-develop our solution." (0403-02).

In contrast, collaboration partners were ecosystem members that the firms built and maintained continuous relationships with. With collaboration partners, the firms engaged in shared sales promotions to advertise jointly created use cases. A use case is a pre-determined application scenario that customers could implement in the smart home ecosystem, and which is realised through the combination of resources from ecosystem members. The findings revealed that partner search for collaboration partners in the Sharpen stage became a

systematic, strategic activity that started from the identification of gaps in the current partner structure. The partner search then relied on three distinct activities: (1) desk research; (2) the evaluation of stakeholder feedback; and (3) the internal analysis of the customer journey.

Desk research was primarily used by the system-centric firms. The reasons were twofold: These firms did not have a particular product as a starting point for their partner search and in addition, they lacked business relationships with relevant stakeholders such as installers or construction companies, that could provide input. Desk research and market analysis therefore helped these firms to identify further domains that were of interest to customers and easy to promote. The Chief Product Manager Smart Home of TelCo remembered:

"We began to collect and analyse anything we found. From that we identified four domains: light, heating, energy efficiency and comfort." (0302-01).

In contrast, the product-centric firms started their partner search from the product. For example, ApplianceCo and MotorCo described how they assessed the customer journey to identify interruptions in the product's use that could be addressed through complementary products. Product managers from the core business often served as important informants as they held deep product knowledge, but the dedicated business units responsible for the ecosystem activities guided the process to ensure the adoption of an ecosystem perspective. A MotorCo representative explained:

"Sometimes I need to widen the perspective of the core business colleagues. To them everything is about shutters, and I ask them, but if we look at it with more distance, what other possibilities do we have?" (0403-01).

The evaluation of feedback from stakeholders was the third activity to identify relevant domains. It was particularly conducted by incumbents with close ties to stakeholders in the construction industry (HeatCo, SwitchCo, ElectronicsCo and MotorCo). It relied on the active involvement of stakeholders, specifically professional installers, construction companies or architects. The firms used workshops or other interaction with these stakeholders to identify which domains they missed in their ecosystem activities. This supported the firms in

building further partnerships that met the stakeholders' expectations and allowed them to strengthen their ties with these stakeholders.

The next step was to identify firms in the domains to establish partnerships with, either by scanning the existing business network or analysing and scouting the market. Firms now had a stronger awareness of the need to create a compelling value proposition for their ecosystem activities and to focus on customer needs. Therefore, the search for firms included a strategic evaluation of the potential relationship to determine how, beyond the establishment of a further technological connection, a partnership could contribute to the firms' objectives and motives in the ecosystem from a market-oriented perspective. The partnerships were considered to provide strategic marketing assets that could open new sales channels, provide access to additional customer groups, or increase market presence of the case firms. The Head of Ecosystem from ApplianceCo referred to this when explaining what made a good partnership:

"Committing to marketing activities in their channels. Obviously, there it is give and take. We do marketing on our end, but the partner commits and engages in it, too. That's also one of the big benefits we have in the ecosystem that we reach out to new customers in the marketing channels of our partners." (0702-01)

Furthermore, the firms evaluated on whether potential partners enabled them to better meet customer demands in the ecosystem by contributing to the realisation of new use case that created additional value. Therefore, partnering at this stage was closely linked to the shaping activities and the discovery of joint value propositions (cf. Section 8.4.4).

Due to the focus on the market and customers at this stage of the strategy formation process, the firms began to regularly review their existing partnerships. They aimed to establish a clear link between the desired value proposition of the ecosystem activities and the engagement in partnerships, which implied reviewing partnerships to evaluate whether they contributed to the firm's ecosystem objectives and underlying value proposition. If partnerships were simply accumulated by building more connections, irrespective of the benefits for the involved firms and customers, it became difficult to define a

direction and determine a position in the ecosystem. MotorCo's Head of Strategic Product Marketing explained:

„Currently we are at this point, where we need to refine [the initiative] (…) Otherwise it does not work, then it is really just a collection of features, of use cases, that are all in there somehow, but it is not an ecosystem." (0402-01)

The view was also shared by TelCo's Head of Consumer IoT, who remembered:

"Initially, we asked anyone we met and didn't run fast enough to join. Thus, we had partnerships we later terminated because we realised it made no sense. Now we are more selective with partners, focusing on use cases that make sense to users." (0303-01)

Examining existing partnerships was also relevant as each connection that a firm developed, irrespective of the technology, required resource efforts to maintain the connections and interfaces. Thus, only if the benefit created through the partnership exceeded these efforts, it contributed to a continuous success of a firm's ecosystem strategy. If this was not the case and either partner was not willing to contribute, the partnership was dissolved. As an ElectronicsCo representative explained:

„With some manufacturers the collaboration was great, we went to fairs together, all good. Then we said, look this requires high effort on our end, we have a team just for the development and maintenance [of the connections], it is expensive. We must do this together. Suddenly the partner says, actually, it is not that important to us. If you want us to pay for it, let's not do it." (0603-02)

The data also showed how in the Sharpen stage several firms implemented measures to involve end users in their partner search and the refinement of the partner structure. This included activities to continuously collect users' feedback, for example the provision of online user forums in which users could discuss ideas with the firms (TechCo, TelCo, SensorCo), the implementation of beta users that could test new features ahead of their release (TelCo, SensorCo), regular user surveys (ConnectCo, SensorCo, TelCo) or user workshops (SensorCo). Furthermore, all ten case firms systematically reviewed the feedback provided by users in app stores or on publicly available online forums.

Three firms (ApplianceCo, MotorCo, ElectronicsCo) even initiated developer programs which included the release of the interface documentation to private developers, who could use the interface to build customised connections and applications around the product and share these among the developer community. Where possible, the firms supported the growing developer communities through further information, promoting particularly good developments, or inviting developers to learn from their experiences. Consequently, the developer programs provided an opportunity to facilitate co-creation and specifically user innovation as they allowed users to tailor the ecosystem towards their individual requirements.

6.3.2. Sharpen: Positioning

With the growth of the overall ecosystem and with the entrance of diverse members from different industries and backgrounds, a range of value creation opportunities were opened. This meant there were several possible niches, for example assisted living, sustainability, or entertainment, and related customer groups that the ecosystem addressed. For the firms to manage their ecosystem strategy and to have a clear direction, it became increasingly important, to define their ecosystem niche, i.e., their contribution and targeted customer segment, and to position themselves in the ecosystem accordingly.

Due to this variety of customer segments and niches in the ecosystem, the firms usually perceived other ecosystem initiatives as complementary rather than competitively. The Head of Product Management from SwitchCo suggested that:

"We occupy another segment, which as opposed to these mass market smart home systems, is not as crowded yet. And we know we probably don't have this mass market capacity, because we explicitly rely on installers as our multipliers." (0503-01)

At this stage, the positioning of a firm within the smart home ecosystem was strongly entangled with its partnering efforts, since ideally the partners operated in a similar niche of the ecosystem, highlighting the interrelatedness of the ecosystem processes. The CMO of SensorCo explained how their customer

research led to a refinement of the targeted ecosystem position and subsequently influenced their partner search:

"When we developed the new version of the device, we engaged in an intense customer discovery process. We had this idea of multi-sensors and held informal exchanges with users and B2B stakeholders asking what ideas they had. To our surprise many people suggested the device could work in elderly care and assisted living. (…) This was when we realised it could be a good niche for us. To date, it influences whom we work with and the features we develop." (0901-02)

ApplianceCo and MotorCo both aimed to position their ecosystem activities as distinct product-centric initiatives in the smart home ecosystem, which evolve as inter-organisational ecosystems around their product portfolios (i.e., 'shutters' or 'appliances'). This required them to continuously search and manage further partners. As the Head of Smart Home from ApplianceCo elaborated:

"For the kitchen, or more specifically for the areas of culinary and home care, we see ourselves as a key player who holds together and orchestrates this sub-ecosystem and who creates the necessary connections to create additional value. That is where we see our right to exist." (0701-01)

The other four product-centric firms at this stage did not strive to position a distinct sub-ecosystem and only selectively formed collaborative ties with other firms in the ecosystem to enhance their products' features. Beyond these partnerships, the firms sought to achieve affiliation and interoperability with other ecosystem members through the involvement in broader ecosystem initiatives managed by other firms. As a SwitchCo representative explained:

"Some houses have elevators which must be connected to the flat's door panel. Partners like the [firm] have the interfaces for this. In negotiations the construction companies know what they want, and we can't offer that alone. I think being in such a community will be vital in the future." (0501-02)

Similarly, the system-centric firms needed to define how they wanted to position their ecosystem initiative, to determine which partners and customers to approach. For example, based on their existing customer base from their core business, TelCo aimed to develop a mass-market oriented ecosystem initiative that customers could mostly install themselves. TechCo and HouseCo on the other hand found that the increasing density in the mass-market segment coupled with the necessity of maintaining an increasingly broad set of partners from all kinds

of different industries was difficult to manage for new ventures. Since they already had the ties to installers, they thus decided to build a smart home for professionals, i.e., a smart home that is set-up by professional installers during construction or renovation. Consequently, they could limit their partners to firms in the building electronics industry, such as heating, building electronics, lighting, or ventilation, and only selectively expanded into the consumer electronics industry, for example with regards to market-dominant actors. Thus, similar to the product-centric firms, the evaluation of where to position the ecosystem initiative had direct implications for partnering.

Overall, defining an ecosystem niche depended on influences from the existing core business, i.e., the product or existing customer base, as well as market research, customer surveys and the objectives a firm pursued in the ecosystem. All these activities supported the case firms in carving out their niche in the emerging ecosystem.

6.3.3. Sharpen: Aligning

Supporting installers as the link between the firm and end users during the Sharpen stage extended to the market layer. Besides the training on the technological requirements of smart products, the six firms that relied on installers aimed to assist installers with regards to their sales activities. This support began by training internal sales staff about the benefits of selling an integrated, customer-centric value proposition, rather than stand-alone products. As the sales staff was the firms' connection to the external stakeholders including the installers, this was important for the knowledge transfer and to convince the installers of the commercial benefits of smart products. For example, firms showed the installers how they could present smart home to customers, but also highlighted how it did not only benefit the firm, but also the installers, as it allowed them to build a continuous business relationship with their customers.

"We make them understand, that in the past you installed shutters and did not hear from the customer for 20 or more years. If you install a smart home and leave a brochure, the customers can look at the use cases, find something they like. Maybe it's too expensive now, but one day they want connected smoke detectors, and you can also recommend connected lights or cameras." (0403-01).

Two of the firms (MotorCo and ElectronicsCo) also provided direct marketing support to help installers in the communication with end users. MotorCo provided installers with sales materials such as leaflets and brochures that the installers could give to customers. ElectronicsCo took a different approach, setting up a marketing initiative with further manufacturers as well as selected installers. Within the marketing initiative, the members developed a range of marketable use cases to present in showrooms. Installers that were members of the marketing initiative were then listed as professional partners to install the presented solutions. This visibility in the smart home marketing initiative thus helped installers to access further customers and grow their own business.

With regards to the internal stakeholders, the five incumbent, product-centric firms also engaged with the core business to further include the features the ecosystem enabled into their marketing efforts. The aim was to create greater awareness among customers by leveraging the market presence of the core business. When asked what he expected of the core business to further strengthen the ecosystem activities, the Head of Ecosystem of ApplianceCo replied:

"A higher priority in terms of marketing the stories and putting in more priority and focus and budget on telling this to our customers, what you can do with connectivity, I think that is something that would make it in the perception of the user much clearer." (0702-02)

6.3.4. Sharpen: Shaping

One important element in the birth stage of an ecosystem is the discovery of a compelling value proposition (Thomas et al., 2022) which is usually assumed to happen at the start of the ecosystem's formation. However, in the case of the emerging smart home ecosystem the firms only focused on discovering the value proposition during the Sharpen stage. It was a collective effort supported by market-oriented shaping activities of the case firms, albeit to different degrees,

so that value discovery only gained a prominent role at this later stage of ecosystem strategy development. The findings highlight that the discovery of one or several value propositions to which the firms could contribute happened after the firms had already converged their dyadic connections into multilateral ties forming the basis of an ecosystem. At this point, the firms recognised that the absence of a clear value proposition hindered the ecosystem's growth and the execution of their individual ecosystem strategies.

All firms acknowledged that the generic value proposition of 'connecting devices across the home' which implicitly underpinned the smart home ecosystem, was too unspecific and did not clearly meet customers' needs. Representative for this mind-set shift, the Chief Product Manager Smart Home of TelCo elaborated on how the company reassessed the ecosystem initiatives' value proposition:

"This is when we said, if we want take customers on this journey with us, we need to do more. We want to help people to create a home that cares about the people living there, but also include the devices that are already in the home, like the alarm. Just generally peace of mind in all aspects." (0302-02)

Yet, defining the value proposition was difficult, as the backgrounds of ecosystem members were diverse and the offerings that the technology could enable were wide-ranging. Further, there was no pre-existing market to analyse so that a top-down approach was difficult to execute (Autio, 2021). Therefore, the firms relied on their prior experiences in the ecosystem or feedback collected from users to gradually discover potential value propositions.

All firms explained how they focused on use cases as their approach to articulate the value of the ecosystem to customers. Jointly with the evaluation of customer feedback, the adoption of use cases informed the firms about what customers deemed valuable and hence supported the discovery of a potential value proposition. The Head of Marketing explained their rational for approaching the development of use cases:

"It is about creating demand, because there is no demand. No one has a problem. I never heard of anyone not being able to live in their home because it is not smart (…). So, it's about coming up with ideas that address the customers' emotion that match their needs, so they want this, it is hardly a rational decision." (0503-01)

The firms developed and advertised use cases and actively promoted them to customers through their marketing channels. Even the firms that did not directly sell to end users (HeatCo, MotorCo, ElectronicsCo and SwitchCo) expanded their marketing activities to involve end users via social media or other means to create demand and collect feedback. Furthermore, these firms worked closely with their business customers, such as construction companies or architects, to better understand their requirements and incorporate these in the value discovery efforts. By developing a compelling value proposition for these customer groups, the firms wanted to further grow the demand for smart products among them, irrespective of the adoption of installers. HeatCo's Chief Strategy Officer elaborated:

"We need to find a good approach and that is via architects and construction companies. The product needs to have such a high value to them, that they request it from the installers. That's the key." (0101-02)

Beyond these individual activities, collective efforts among the ecosystem members further supported the discovery of a value proposition and increase of market demand in the absence of a central orchestrator. Independent smart home associations provided an opportunity for firms to exchange their own insights with the experiences of other ecosystem members. The associations offered regular meetings and organised working groups in which ecosystem members met to jointly discuss ideas and challenges. Through these exchanges, the firms sharpened potential overarching value propositions and explored future value creation opportunities. An ElectronicsCo representative elaborated on the importance of collaboration for the development of the ecosystem market:

"We see that the ecosystem fosters collaboration. There are a lot of competitors, 60 manufacturers overall, but in the association, we agree that our goal is to jointly bring this topic to the market, and in the end the user decide which specific system they prefer." (0601-01)".

This idea of jointly engaging in the development of the market was shared by other firms such as TelCo, which pointed out they were

"(…) actually, happy for any other big player in the market and don't see them as competitors, because the main challenge at the moment is to get the idea into people's minds, so they feel a need for a smart home." (0303-01).

For the case firms becoming involved in the discovery of the ecosystem's value proposition or potentially a set of value propositions was important to build the market around the ecosystem. This was strategically relevant, as it contributed to the growth of the ecosystem which then increased the opportunities for further value creation and eventually value appropriation.

6.3.5. Sharpen Stage: Summary

In the Sharpen stage, the firms shifted their attention from the technology towards a stronger consideration of customers and the market. Extant research treated customers as rather passive value recipients (Autio and Thomas, 2020; Jacobides et al., 2018) assuming that firms on the supply-side of the ecosystem are capable of developing an appealing value proposition (Dattee et al., 2018; Lingens et al., 2021b).

The present findings propose that to develop a market for their ecosystem and the rather novel value proposition (Autio, 2021) firms need to actively engage with customers and include them in the strategy development process. Through recognising the relevance to develop a value proposition that can be conveyed to customers, the firms increasingly worked with smaller use cases as explainable scenarios for their customers and reviewed their partnerships with regards to their contribution to these use cases. Moreover, the firms evaluated their ecosystem position by searching for a niche in which they could create the most value in relation to their ecosystem strategy, which had further implications for their partnerships. The firms involved users in these processes by collecting feedback or offering opportunities for user innovation to gain greater clarity on customers' expectations and continue the discovery of a value proposition in a market that was not fully established.

The findings resonate with the growing stream of literature on market shaping, which suggests that firms can actively build new markets (Nenonen et al., 2019; Nenonen and Storbacka, 2020). Particularly, the findings corroborate prior research suggesting that shaping unfolds as a collaborative, systemic effort that does not necessarily depend on a central orchestrator and can instead be

facilitated through intermediaries such as the smart home associations (Randhawa, Wilden and Akaka, 2022).

On the ecosystem-level, the findings show how at this stage, the ecosystem evolved towards the presence of an ecosystem-level offering in the form of one or several commonly agreed value propositions. Therefore, the findings provide a new perspective on ecosystem formation which has pre-dominantly assumed that the value proposition either exists ex ante or is developed early on through a guided processes controlled by a central orchestrator engaging in complex, multilateral exchanges with prospective ecosystem members (Adner, 2017; Lingens et al., 2021b; Ansari et al., 2016; Dattee et al., 2018). In contrast, the findings show how the ecosystem initially emerged as a community of independent firms with the interdependences stemming from the establishment of digital connections and the underlying technical system (Baldwin, 2012) and how the value propositions subsequently developed as a collective discovery process among these firms.

6.4. Summary: Developing an ecosystem strategy

The findings presented in this chapter provide a detailed empirical account showing how firms deployed processes that supported the development and execution of their ecosystem strategy and how these processes and the overall formation of the ecosystem strategy unfolded over time. It thus provides novel insights into strategy development and ecosystem emergence in the absence of a central orchestrator that steers the ecosystem's emergence.

The findings provide a capability perspective on ecosystem strategies, by focusing on the distinct activities that relevant actors in the firms deployed. These activities contributed to the development of four interrelated ecosystem-relevant processes (partnering, positioning, aligning, and shaping) that supported the development and execution of a firm's ecosystem strategy. This extends the capability perspective on ecosystem strategy beyond the dominant perspective of dynamics capabilities as collective units of analysis that underpin an ecosystem strategy (Linde et al., 2021; Kindermann et al., 2022; Helfat and Raubitschek, 2018) and that firms readily deploy when they start their ecosystem endeavour.

Hence, by showing that in the context of an emerging ecosystem firms tend to develop their ecosystem processes bottom-up through the deployment of ecosystem-oriented activities and by gradually exploring the relevance of these activities, the findings offer a further perspective on the foundations of ecosystem strategies.

Developing a distinct capability to navigate the particularities of engaging in an inter-organisational setting with other firms has previously been studied in the context of strategic alliances. Similar to the present findings, these studies found that through the accumulation of experiences, firms developed an alliance capability which helped them to increase their success in alliances (Kale and Singh, 2007). However, in alliances, experience measurement was often based on the number of alliances firms had been involved in (Kale, Dyer and Singh, 2002), while in this case the ecosystem remains the same and the firms' experience is developed over time through 'learning-by-doing' and the related insights about other ecosystem members, customer expectations, and the ecosystem per se. Overall, it could be assumed that gradually, the four interrelated processes may convergence into some form of 'ecosystem-management capability'.

The results further show that the development of the respective processes addressed two layers of the ecosystem strategy: First, the processes addressed the technological layer, which determined how products or ecosystem initiatives can be connected. It built the foundation to establish connections and enabled the ecosystem's emergence. Secondly, the processes supported the market layer of the ecosystem strategy, which addressed the market development and the design of a value proposition that is appealing to customers and fulfils their needs through novel resource combinations in the ecosystem. By showing how the initial focus of the firms' ecosystem strategy laid on the technological layer the study corroborates research in the field of information systems that highlights how ecosystems can emerge as the result of growing convergence in a technical system (Baldwin, 2012, 2020b), but extends this view towards a stronger consideration of marketing-related aspects.

The next chapter will combine the empirical insights on ecosystem value creation motivations introduced in Chapter 5 and the commonalities and differences in the activities underpinning the development of the ecosystem strategy introduced in this chapter. In doing so, it develops a nuanced typology of ecosystem strategies in the context of an emerging ecosystem. It also highlights the relations between these strategies.

7. Typology of Ecosystem Strategies

The previous chapters outlined the ecosystem value creation motivations (Chapter 5) and process of strategy formation in the ecosystem (Chapter 6). By combining both aspects and evaluating them in terms of differences and commonalities across the ten case firms, it was possible to develop a typology of four distinct strategic approaches that existed in the emerging smart home ecosystem. This typology of ecosystem strategies relies on the differentiation of approaches along two dimensions:

The first dimension refers to the value creation motivation outlined in Chapter 5. The chapter outlined two broad directions of motivation for firms to engage in the smart home ecosystem: a product-centric motivation, as pursued by HeatCo, MotorCo, SwitchCo, ElectronicsCo, ApplianceCo and SensorCo, and a system-centric motivation, as displayed by ConnectCo, TelCo, HouseCo and TechCo.

Comparing how firms developed the foundation of their ecosystem strategy (cf. Chapter 6) facilitated the identification of the second key dimension to differentiate ecosystem strategies: the relational approach of firms. Relational approach hereby refers to how and to what extent firms established ties with other ecosystem members. Chapter 6 showed that relationships could either be built directly through partnering or indirectly through positioning in the ecosystem. Due to the interdependencies and value creation opportunities stemming from these relationships, partnering and affiliation with other ecosystem members had strong implications for a firm's ecosystem strategy. The comparison across cases showed that several firms only selectively engaged in direct partnerships, either due to their ecosystem motivation or because of limited resources and relied on positioning to increase their affiliation with other ecosystem members ('selective approach'). Other firms built a larger set of direct partnerships with other firms, which required higher efforts in partner search and maintenance ('extensive approach').

Combining the two dimensions resulted the identification of two overarching strategies based on the value creation motivation (product-centric and system-centric strategies), which were further refined along the relational approach. This led to a typology of four strategic approaches in the emerging smart home ecosystems. These are illustrated in Figure 17.

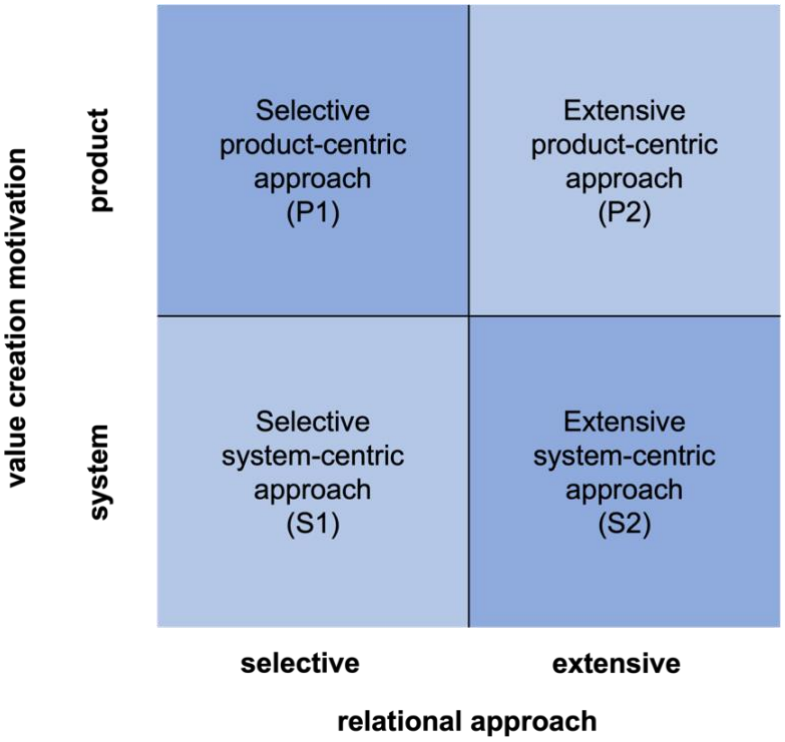

Figure 17: Ecosystem Strategy Typologies

Nine of the ten case firms could be assigned to either of these strategic approaches. The only case that did not clearly fit into one of the quadrants shown above was SensorCo, as their approach could be described as laying somewhere between the selective product-centric and selective system-centric approach. However, this finding is in line with the analysis of SensorCo's value creation motive, which revealed that while the firm's primary interest was to enhance the device's features, the company also considered their device a potential enabler for data-driven value propositions of other firms.

Moreover, it is important to note that due to the dynamic evolution of the ecosystem strategy across the three development stages, the firms' strategic approaches were subject to change over time. Hence, some firms initially experimented with one approach but made changes during the strategy

formation process, so they pursued a different approach by the end of this study. The firms have been assigned based on the strategic approach they displayed at the final stage of their strategy development process, i.e., in the Sharpen Stage. However, if relevant, subsequent sections will also point to instances when a case firm initially pursued another strategic approach. The following sections will detail which cases have been assigned to which typology and introduce each of the four strategic approaches in detail.

The chapter concludes with a summary and an evaluation of the interdependencies between the strategies. This section will also assess how the strategic approaches relate and jointly contribute to the emergence of an ecosystem without a central orchestrator.

7.1. Product-centric strategy

Five of the case firms (MotorCo, ApplianceCo, HeatCo, SwitchCo and ElectronicsCo) adopted product-centric strategies in accordance with their product-centric value creation motivation. As illustrated in Chapter 5 these firms engaged in the smart home ecosystem to promote an existing product (portfolio) and thereby protect or expand their core business.

Accordingly, analysing the development of the ecosystem strategy showed that the activities of these firms were influenced by considerations of the core business and existing product portfolio. The ecosystem activities focused on reaching an ecosystem position that supported the core business activities and finding partners that complemented their products' features. Overall, the emphasis in the strategy development process was to make sure that the ecosystem activities were closely aligned with the requirements of the core business.

Between the five firms that adopted a product-centric strategy, two strategic approaches could be differentiated: Two of the firms (MotorCo and ApplianceCo) sought to actively build and manage a product-centric ecosystem initiative around their product portfolio as part of their innovation strategy. This required them to partner with other ecosystem members extensively and directly. The

remaining three firms (HeatCo, SwitchCo, ElectronicsCo) primarily engaged in the ecosystem to support their core business and leverage the opportunities it provided for their products. However, they only selectively pursued direct, dyadic partnerships with other ecosystem members. Besides those partnerships, they used positioning to ensure affiliation with further ecosystem members. The following sections present both strategic approaches in more detail.

7.1.1. Selective product-centric approach

The selective product-centric approach (P1) builds on the strategic actions of HeatCo, SwitchCo and ElectronicsCo, although it is important to note that during the Scale stage, ElectronicsCo showed evidence for activities that resembled the extensive product-centric approach. However, the changes made over time resulted in the adoption of strategic approach P1 in the Sharpen stage.

The firms that pursued this approach perceived the ecosystem as a lever to protect and grow their core business activities. They recognised the strategic relevance of the ecosystem and its relevance because of increasing connectivity and interdependency and as part of their innovation strategy aimed to carve out a position that allowed them to participate in the ecosystem. At the same time, these firms only had limited resources to develop and execute their ecosystem activities, which is reflected in how they deployed the four ecosystem-relevant processes introduced in Chapter 6.

The three firms were not interested in developing and managing a complex set of direct relationships with other ecosystem members and only selectively established direct partnerships with other firms. Their partnering process emphasised the development of technical connections with market-dominant actors to ensure technical and commercial relevance of their products. Beyond these connections, the firms focused on a limited number of collaborative partnerships which were evaluated from a marketing perspective and had to contribute to a market-relevant use case or provide new commercial opportunities. A SwitchCo representative explained why they prioritised selective collaborative, marketing-oriented partnerships:

"In the future we need to emphasise customer expectations, support, and features. The mere connection becomes increasingly simple and maybe in the future we won't even notice that we have been connected somewhere, because we now have this open interface." (0501-02)

This viewpoint was shared by ElectronicsCo's Head of Smart Home, who explained that collaborative partnerships had to fulfil certain criteria:

"Many manufacturers have interfaces to our products we don't know of. If a local colleague calls and says, there is this product they'd like to connect, we evaluate it, to see if we want to engage in more market-oriented activities with them. We have some partners that are relevant for our product communication or support a certain marketing message. If we find we do not see how a partnership supports our use cases or there is little market relevance for us, but the other firm still wants to connect, they can use the open interface." (0603-02)

Based on their core business all three firms had established themselves as premium manufacturers in their industries. Therefore, the ecosystem partnerships were assessed carefully to prevent any negative influence that may damage the reputation of the core business. Because of the ambiguity of the ecosystem and absence of a formal hierarchy or contractual agreements collaborative partnerships normally relied on social fit with regards to the partners' brand image, values, and mutual trust. In summary, for the three firms building ecosystem relationships was about *"reliability, sustainability, and a lot about trust. I think that our kind of firm values these a lot" (0601-01).*

Despite the lack of resources to maintain a complex set of direct partnerships, the firms acknowledged the importance of being embedded in the wider smart home ecosystem to protect their core business and to remain relevant in an increasingly connected business environment. To account for these requirements, the firms positioned themselves as members of broader, system-centric ecosystem initiatives to strategically access ecosystem members from more distant industries. However, these affiliations remained technical and indirect, enabled either through the broader ecosystem initiatives, the provision of an open API or simply because the firms supported the same connectivity protocol. As a SwitchCo representative elaborated:

"If a product is part of the wider IoT we connect to it through broader initiatives because we do not want to wonder how a vacuuming robot or smart refrigerator works. But we want to offer an opportunity for connectivity. I think it's only logical that barely any manufacturer can do this on their own." (0503-02)

Because these firms had limited resources to establish technical connections on a firm-by-firm basis, shaping the technological landscape was of strategic relevance for them. This was reflected in their active engagement in standard setting organisations and industry associations to shape the development of connectivity protocols as well as norms and regulations around connected homes and buildings. Furthermore, firms in approach P1 deployed market-oriented shaping activities particular towards existing business customers such as architects and construction companies as their closest stakeholders. They also gradually engaged in end user marketing activities to create a pull effect from homeowners or tenants.

7.1.2. Extensive product-centric approach

The extensive product-centric approach (P2) is largely informed by the strategic behaviour of ApplianceCo and MotorCo. However, as mentioned in the previous section, ElectronicsCo during the Scale stage also experimented with some of the activities that underpin this approach but later changed their strategic direction. This further helped to elicit the differences between the approaches P1 and P2.

MotorCo and ApplianceCo perceived the ecosystem not only as relevant to protect the core business, but also as an opportunity to create competitive advantage by building a comprehensive set of partners around their products. The aim was to develop appealing partner portfolios and leverage those to differentiate their products from those of competitors to strengthen their market position and access further customers and sales channels. Accordingly, firms in approach P2 actively developed an ecosystem initiative around their product portfolio, which they wanted to position as the leading sub ecosystem initiative in their domains. Compared to the firms in P1, which managed their ecosystem activities within their existing organisational structures, the firms in P2 had distinct business units that were responsible for the development and execution of the ecosystem strategy.

In line with their goals, the firms in approach P2 actively engaged in establishing partnerships, searching for partners across industries and maintaining regular interaction with partners through dedicated ecosystem partner managers. Compared to firms in P1, the partnering efforts of these firms were extensive, yet the partner search focused on products or services which had a clear contribution to the firm's product portfolio. Therefore, their ecosystem initiatives remained focused on specific areas around the house, which were derived from their core business and then transferred into broader application areas. For example, ApplianceCo focused on one area labelled 'Kitchen and Culinary', while MotorCo's effort was directed towards 'Shading and Access'. As MotorCo's Head of Strategic Marketing elaborated:

"Otherwise, it is too blurry, there are too many things, and someone starts looking for something they don't find, the needs are too different. There must be a clear target audience, so there is a focus and the effect that suitable partners join. (…) If not, it doesn't really gather momentum, there is no drive. It needs to be sharp and adjusted accordingly." (0402-01)

Where possible, the aim was to identify globally relevant partners to maintain a manageable number of partnerships and ensure high relevancy of the partners. However, the firms also installed local partner managers, who were responsible for scouting their markets for regional specifics that had be considered in building the product-centric ecosystem initiative. To support scalability and to reduce efforts of establishing technical connections with partners and increase the opportunities for interoperability across connectivity protocols, open APIs were used to facilitate partnering on the technological layer.

Despite the desire to build a product-centric ecosystem initiative, the two firms were not interested in building holistic ecosystem initiatives. Accordingly, they perceived broader ecosystem initiatives operated by system-centric firms as complementary to their efforts. Similar to the firms in P1, they used affiliation with these broader ecosystem initiatives to establish connections with more distant domains in the home and to ensure interoperability and compatibility with broader home applications. The two representatives of ApplianceCo explained why both sides, the product- and system-centric firms, benefitted from these affiliations, hence highlighting the reciprocal understanding of each other's

ecosystems efforts. First, the Head of Ecosystem outlined the benefits for the product-centric firm:

"Once I have enough devices, and say, I would like to organise them. I start looking for relevant smart home systems and see which one fits to the products I have. Then I decide for this system and build on it. At one point the kitchen must be renewed. And I say, well, how does it fit into my system. If customers find we do not fit in their system, we have a problem, because they may decide for a competitor that fits." (0702-01)

However, the Head of Smart Home stressed that the partnership was also beneficial for the system-centric firms "*because having more products makes their offer more appealing, as they can cover more areas.*" (0701-01)

He continued to elaborate why overall the broad ecosystem initiatives were not considered a threat but instead seen as a complementary offer for customers:

"We, the smart home unit of ApplianceCo, see ourselves as experts for household appliances. But we don't see us as the orchestrator of the whole house, that's not our expectation, to manage alarm systems, solar panels, all this stuff." (0701-01)

The firms in P2 deployed the shaping process on the market- and technological layer. Market shaping was considered particularly relevant to further grow demand and ensure that customers recognised the value the ecosystem activities added to the existing product portfolio. With regards to shaping the technological layer, similar to the firms in P1, the definition of connectivity standards had implications for the features of products in the ecosystem, so the firms wanted to ensure that their requirements were reflected in the development of connectivity protocols. Moreover, whilst the firms recognised the risk that a standard connectivity protocol makes it easier for customers to replace smart products with those of competitors, they also saw the growth opportunities it provided for the ecosystem and accordingly for their individual ecosystem offer. Especially because further standardisation reduced the resource requirements to establish connections with other ecosystem members and could hence contribute to scaling the number of partnerships.

Even though firms in strategic approach P2 organised their ecosystem activities in a separate teams or business units, aligning the core business remained

important. Whilst the ecosystem teams collected customer feedback and generated ideas to expand the ecosystem initiative in novel directions, the necessary change requirements had to be agreed on by the core business. Therefore, aligning was crucial to align priorities and to resolve potential bottlenecks. ApplianceCo's Head of Ecosystem elaborated on the influence of the interdependencies between novel use cases planned for the firm's ecosystem and the limitations instilled by products' technical features:

"We have many ideas around energy management, but currently we cannot, provide all the consumption data through the API, which limits some potentially very nice and valuable use cases. I think that if you want to put it down to challenges, it is that we cannot realise all the ideas we'd like to. Sometimes we must park them and discuss them with the product team." (0702-01)

Overall, firms pursuing approach P2 perceived their ecosystem activities not only as an extension of their core business, but also as an opportunity to expand their business activities towards new value creation paths. This was particularly reflected in the set-up of dedicated business units responsible for managing the ecosystem strategy.

7.2. System-centric strategy

The development of the system-centric strategic approaches was informed by the analysis of four cases: Three of these cases, ConnectCo, TechCo and House, are new ventures and TelCo is a large established firm but new to the home and building industry. As outlined in Chapter 5, the firms in this group had no specific product(s) they wanted to promote in the ecosystem. Their ecosystem activities focused on exploiting new value creation opportunities they identified in the emerging smart home ecosystem. The Chief Product Manager Smart Home of TelCo recalled the company's main motivation to engage in the smart home ecosystem as being closely linked to the expansion of their existing commodity business by pursuing new opportunities:

"We try to differentiate ourselves as a premium provider by offering additional services. We continuously seek new topics to achieve this. We try to defend our space in the living room considering that we are already there." (0302-01)

The execution of a system-centric strategy relied on the presence of product-centric firms in the ecosystem and their contribution to the system-centric ecosystem initiatives. Therefore, building relationships with other ecosystem members was critical for a system-centric strategy. With regards to the relational approach, there were two paths:

(1) The selective system-centric approach (S1) pursued by ConnectCo, HouseCo and TechCo, which aimed to develop an ecosystem initiative in a specific niche within the overall ecosystem. They focused on building close collaborative ties with a selected number of partners and often the partners were small and medium sized manufacturers relatively new to the smart home ecosystem. The three case firms supported them in developing their ecosystem strategy.
(2) The extensive system-centric approach (S2) pursued by TelCo aimed to develop a comprehensive ecosystem oriented towards the mass market. Relatedly, this approach required more extensive partnering to cover different domains and industries as well as different quality and price ranges of products. While partnerships may be less intense compared to approach S1, there was still marketing-oriented collaboration to jointly promote the ecosystem activities to the market.

The subsequent sections detail the two strategic approaches that refer to a system-centric ecosystem strategy.

7.2.1. Selective system-centric approach

The development of approach S1 builds on the strategic behaviour of ConnectCo, TechCo and HouseCo. The three cases displayed commonalities in their organisational set-up (new venture, between 10-30 employees, no product in the ecosystem and focus on software development) and consistencies in the strategy they pursued in the ecosystem.

All three firms recognised that a barrier for the growth of the smart home ecosystem was the reluctance of many small and medium sized manufacturers to build their own ecosystem initiatives, often due to resource constraints and a lack

of experience in digitisation and the development of complex technological infrastructure. TechCo's Managing Director elaborated why this was an opportunity for new entrants to become involved the ecosystem:

"They [manufacturers] have three options: 1. build something, which is expensive and risky, it must be developed and accepted, and they need to be experts in the domains they include. Many technological aspects must be considered. 2. join an external, third-party platform. Maybe they sell more products but rely on the platform's rules. 3. do nothing, the worst option. TechCo is between 1 and 2, partners can influence the development and keep full control of their devices, a mix of make-or-buy." (1003-01)

Therefore, the firms in this strategic approach focused their collaborative partnering on small and medium sized manufacturers, which they wanted to support to become part of their ecosystem initiative. As new entrants in the ecosystem with no reputation, initial partnering efforts were difficult and required convincing to achieve legitimacy. Once an initial set of partners had been acquired, the three firms collaborated with their partners to present their ecosystem initiative on business fairs. The aim was to strengthen their position in the ecosystem and benefit from the acknowledgement and endorsement of their partners.

Yet, despite the system-centric perspective on the ecosystem and the desire to build cross-company use cases, the firms only selectively partnered with other firms, focusing on distinct areas in the smart home ecosystem (e.g., building technology) as their size and limited resources did not allow them to manage an unrestricted number of collaboration partners simultaneously. To still develop an appealing ecosystem initiative for customers, they expanded their partner portfolio by enabling purely technical connections to market-dominant ecosystem members. HouseCo's COO explained the importance of finding a balance between a broad number of technical connections and a selected number of collaboration partners:

"The simple partnerships, the easy connections are very common and there is a huge number. It is important to focus on key partners to create additional value, engage in sales activities, and develop use cases. As a small firm like ours, you can only have a limited number of those. It requires maintenance, intense collaboration, and management, but these are the partnerships that contribute to reaching your goal." (0802-02)

Since HouseCo and TechCo particularly focused on collaboration partners from the building electronics industry, which had strong links to professional installers, they deployed aligning activities for example by providing trainings for installers. They considered conducting the alignment activities as critical to position their ecosystem initiative and ensure the acceptance among manufacturers and installers. It further supported a seamless set-up of their solution, strengthened their market reputation, and prevented disruptions in the customer experience. As the CEO of HouseCo summarised:

"Some firms only offer a small element of the value chain, they hope that installers will just like it and voluntarily use it, but they don't and that makes it difficult. You need to take people by the hand, you need to have the product portfolio but also people that can set it up." (0801-02)

All three firms contributed to the shaping of the ecosystem by acting as brokers that bring partners together in the form of cross-company solutions. HouseCo and TechCo supported brokering on the technological layer by providing technological platforms that facilitated interoperability and data exchange across different connectivity protocols used by manufacturers. Additionally, all three firms conducted brokering activities on the market layer by developing and implementing cross-company use cases that combined the product features of different manufacturers. Where possible they involved their product partners in the development of these use cases to generate ideas and learn about customer needs. By extracting and aggregating the data from the smart devices, the firms further expanded the ecosystem towards service providers (e.g., insurances, utilities) which could use the data to develop further data-driven use cases and value propositions hence paving further paths for value creation.

Addressing the lack of market growth around the ecosystem, the firms also engaged in shaping on the market-layer by supporting partners with the development of marketing and sales activities. Highlighting that simply connecting products was not sufficient to convince customers of the ecosystem's value and that the benefits had to be outlined clearly, TechCo's Business Development Manager explained how they used their experience to support new and existing partners in developing their market-oriented ecosystem activities:

"We help our partner to position the technology in the market. We discuss with them, what marketing materials they need, a video, a social media account, a brochure, a website? What fits their customers? We do it individually for each partner." (1001-01)

Overall, the firms pursuing approach S1 positioned themselves as enablers of their partners' ecosystem activities. Their aim was to support other firms to benefit from the ecosystem, for example by facilitating their connectivity efforts, enabling cross-company interoperability, or fostering data-driven services on top of smart devices. At the same time, the support of these firms contributed to their own ecosystem initiative as it fostered further partnerships.

7.2.2. Extensive system-centric approach

The extensive system-centric approach (S2) mainly relies on the ecosystem activities of TelCo. However, both HouseCo and TechCo briefly experimented with this approach in their Set-Up (TechCo) and Scale (HouseCo) stage, before fully pursuing approach S1. Desk-research conducted by the researcher on further ecosystem members mentioned by case firms that were not included in the research project, suggested evidence of further firms in the ecosystem that pursued approach S2, which additionally contributed to its empirical credibility.

Similar to approach S1, firms pursuing strategic approach S2 did not have their own hardware portfolio and relied on hardware provided by partners. While the partner search of firms in approach S1 was focused on specific industries or areas around the home, the aim of strategic approach S2 was to build a comprehensive ecosystem initiative. This required a broad set of collaborative and technical partnerships. Consequently, this approach needed high resources for the establishment and management of a diverse and extensive partner structure and was thus pre-dominantly pursued by large incumbents like TelCo, entering the smart home ecosystem.

The ecosystem initiative was positioned towards the mass market and to reach a large customer base, customers were offered a broad selection of products which provided them with a high flexibility of choosing hardware. To win customers the focus was on partnering with well-known manufacturers in areas that customers

perceived as important in a smart home. The Head of Consumer IoT of TelCo summarised the partnering approach:

"Our ecosystem initiative relies on the relevant domains with the popular brands in each category. The customers usually know the brands from the traditional world not the smart world and trust them with their light or with their home appliances. None of this is TelCo. We are the connecting element in the middle, we do not represent any of the product categories, so the ecosystem perspective is crucial." (0303-01)

The role of the firm was to integrate these products into a single, technological platform, so that the products could be combined into cross-company and cross-industry use cases which product-centric firms could not or did not want to create themselves. Strategic approach S2 was therefore complementary to the product-centric strategies and the aim of S2 was neither to replace the product-centric ecosystem initiatives of firms pursuing P2 nor to compete with or replace the products of firms pursing P1. While the product-centric initiatives enabled specific product features and required deep product and industry knowledge, approach S2 strove to expand this offer through features enabled by the combination of previously unrelated industries. As the Chief Product Manager Smart Home of TelCo elaborated:

"We will never be able to create a single product solution as good, as the manufacturer unless they did not do their job well. But for example, Hue has so many lighting features or Sonos as so many music-specific use cases, that we would be busy just trying to copy this. So, we want to enable the basic settings, but beyond this we focus on cross-industry use cases." (0302-01)

Firms in strategic approach S2 collaborated with several partners to generate ideas and discover opportunities for novel use cases. They further engaged in joint sales activities with their partners. Arguably, the collaboration was less intense compared to the exchange between the firms in approach S1 and their partners, which arguably also related to the fact, that the partners of firms in approach S2 were already established in the smart home ecosystem, so that they required less support to develop their ecosystem activities.

Because strategic approach S2 was particularly adopted by incumbent firms, they leveraged their firms' reputation to shape the market around the ecosystem and

create greater pull effects from customers to grow demand for their ecosystem initiative. Thereby they also contributed to a greater awareness for the ecosystem overall. Furthermore, the analysis of TelCo's ecosystem strategy highlighted, that TelCo conducted market shaping by reducing entry barriers for end users. For example, the firm included the smart home control unit in the internet routers, so that customers did not have to buy an additional device. Further, TelCo supported products in the lower-price segment, which were often the first touchpoint customers had with smart devices as they required less investment. The Chief Product Manager Smart Home explained the importance of integrating these products, not only to shape the market in general, but also to position their ecosystem initiative as an entry point for non-technologically proficient customers in the mass market.

"We observe that stores in the lower price segments, Ikea but also Aldi or Lidl, occasionally offer smart devices. And that is a driver for us, because it further opens the mass market. We make sure we support these devices, because we say if several people, while shopping at Aldi, just take one or two of these devices, we need to make sure we support them, too." (0302-01)

By integrating these products as well as more proficient devices into their ecosystem initiative, firms pursuing S2 acted as a broker across firms and industries. Brokering happened technologically by providing a platform that combined products supporting different connectivity protocols and ensuring interoperability, but also on the market-layer through the development and promotion of integrative use cases that were offered to customers and encompassed several partners.

Overall, the main objective of strategic approach S2 in the smart home ecosystem was to offer a technological platform which combined existing products of other established ecosystem members, particularly manufacturers, into a single ecosystem initiative. It fostered cross-industry convergence of the ecosystem and complemented the product-centric strategies in the ecosystem. Still, the firms in strategic approach S2 were not considered traditional platform leaders as discussed in the ecosystem literature, as they did not have the influence to define the technological prepositions or overall value proposition of the ecosystem. Instead, they had to develop their ecosystem initiative in accordance with the

requirements and expectations of prospective partners and support connectivity protocols and interfaces that were considered relevant by their hardware partners to ensure their willingness to participate in the ecosystem initiative.

7.3. Summary: Typology of Ecosystem Strategies

The analysis and comparison of strategic patterns across cases revealed the co-existence of four strategic approaches in the emerging smart home ecosystem. As the presentation of each strategic approach showed, they could be differentiated along two dimensions: The value creation motivation in the ecosystem (product vs. system) presented in Chapter 5, and the relational approach (extensive vs. selective) derived from the strategy development process, particularly with regards to partnering and positioning, in Chapter 6.

Extant research which explored different strategies of firms in the context of nascent ecosystems, emphasised value creation and capture and studied entrepreneurial firms which were relatively flexible in the strategies they adopted (Hannah and Eisenhardt, 2018). In contrast, the present study extends these findings in two ways: First, it shows how firms develop strategies in ecosystems that are populated by industry incumbents and new entrants alike. The incumbent product-centric firms in the smart home ecosystem faced path-dependencies from their core business, which had strong implications on how they developed their ecosystem strategy. The presence of these incumbents also influenced how new entrants positioned themselves in the emerging ecosystem. Second, it was found that the strategic approaches of all firms were oriented towards value discovery and increasing the opportunities for value creation. The firms considered the presence of other ecosystem members as beneficial and their ecosystem efforts as complementary. Consequently, the study introduces four novel and complementary strategic approaches in an emerging ecosystem, in which boundaries are not yet determined and which is characterised by a dynamic and decentralised evolution.

The findings revealed how the firms collaborated with others to advance their own ecosystem strategy and simultaneously nurture the growth of the overall ecosystem. For example, firms in strategic approaches P1 and P2 collaborated

with firms in strategic approaches S1 and S2 to achieve interoperability with other connectivity protocols and to establish affiliations with a wider number of ecosystem members without the need to engage in dyadic partnerships. Arguably, even strategic approaches S1 and S2 – while there was no evidence that these case firms established relationships among each other– were compatible to some extent. Strategic approach S1 was niche oriented, while approach S2 was less specialised and aimed to develop a holistic, mass-market oriented smart home solution.

Even though it may be assumed that competition was fierce between firms pursuing a similar strategy, particularly among firms adopting a system-centric strategy, which did not only compete for customers, but also for partners, the findings could not confirm this. First, this may be due to the multi-homing of the product-centric firms, which often joined more than one ecosystem initiative to not put all eggs in one basket. The Director Digital Products of HeatCo explained:

"It is difficult to comprehend the full market. Smart Home has so many different initiatives. It is very fragmented, so it is difficult to decide exclusively where to join." (0102-01)

Second, the firms found that other ecosystem efforts, particularly those of well-known firms contributed to the growing presence of the ecosystem, thus fostering a greater awareness of its benefits among customers. This was seen as beneficial as it indirectly supported the ecosystem activities of others as well. The Chief Product Manager Smart Home of TelCo elaborated on the balance between competition and collaboration among ecosystem members pursuing a similar strategy:

"They [the other firms] drive the market of course. Since Apple for example released HomeKit and increasingly presents it, more and more people acknowledge it and recognise controlling it [smart home] can be simple. So, after all they contribute to educating customers, and we are happy about this." (0302-01)

Hence, at this stage of the ecosystem's emergence the emphasis on the strategic approaches of firms was to jointly contribute to the development of the ecosystem following a mutual understanding that at this stage the growth

potential was so large, that all firms would profit from collaborative value discovery and value creation efforts to jointly bake the "ecosystem cake", rather than focusing on slicing the cake before it was fully prepared. One interviewee from ElectronicsCo aptly summarised:

"At this point, we are a unit, we want to bring this topic forward jointly and neutrally towards the market and customers. We want to offer guidance. In the end, the customers decide which option they choose (…)." (0601-02)

It remains to be seen, how this collaborative and reciprocal understanding among ecosystem members evolves further and whether at some point it shifts to a more competitive approach similar to what Khanagha et al. (2020) observed in the context of newly forming platforms as extensions of existing platforms

.

8. Discussion

This chapter discusses the findings of this research in conjunction with the research questions identified earlier in the thesis. In doing so, it elucidates how the study contributes to the literature on ecosystems in strategic management and innovation research.

The chapter is structured as follows: First, the research objectives and related research question that guided the empirical investigation of this study are revisited. The subsequent section presents an update of the initial conceptual framework introduced in Section 4.6.1. This is followed by a detailed discussion of the three underlying contributions that underpin the empirical framework, i.e., the three stages of strategy development, the four ecosystem-related processes and the typology of four strategic approaches in the emerging ecosystem. Each of these aspects is further unravelled in terms of its implications for the ecosystem literature in strategic management and innovation.

8.1. Revisiting the research objectives

The research project set out to address three main gaps in the literature which are briefly summarised below:

First, as the analysis of the papers in the systematic literature view (cf. Chapter 2) indicated, ecosystem research has been dominated by the study of established ecosystems and strategic management and innovation scholars only recently shifted their attention to understanding how ecosystems come into being (Autio and Thomas, 2021; Pushpananthan and Elmquist, 2022). Yet, with the increasing importance of ecosystems for innovation, it is important to understand the trajectories of how ecosystems emerge in the first place.

Second, within the growing body of research on the emerging phase of ecosystems, particular attention has been given to the ecosystem as the unit of analysis (Thomas et al., 2022; Murthy and Madhok, 2021; Thomas and Ritala, 2021), largely neglecting the firm-level perspective. While research that explores the firm-level by depicting strategies throughout the emergence of ecosystems

remains scarce, this perspective is of relevance as arguably the formation of an ecosystem relies on the actions of individual firms that influence the direction of the ecosystem's development and growth (Felin and Foss, 2023).

Third, in the rare instances where scholars focused their attention to the firm-level within an emerging ecosystem, the emphasis has been on strategies for the creation and management of ecosystems (Lingens et al., 2022; Stonig et al., 2022; Dattee et al., 2018; Ansari et al., 2016). To date, there is a scarcity of firm-level research that explores strategies in the context of emerging ecosystems that do not have a central orchestrator. Yet, due to the growing pervasiveness of digital technologies that foster the convergence of industries through novel product and service combinations (Nambisan et al., 2017; Wang, 2021) it is likely that ecosystems will increasingly emerge without the interference of a focal firm that connects actors. This calls for a better understanding of the strategies firms pursue in ecosystems without a central orchestrator.

Taken together, the three gaps point to a lack of understanding of how firms develop their ecosystem strategy in the context of emerging ecosystems, particularly emerging ecosystems with no central orchestrator. The present research project shed light on the gaps presented above by answering the following research question:

Why and how do firms develop their ecosystem strategy in an emerging ecosystem with no central orchestrator?

The subsequent sections discuss the contributions of the study with regards to the research question and in relation with the extant literature. Section 8.2 presents a refined process-oriented framework based on the empirical findings from the case studies. The three subsequent sections discuss the different elements of the framework and their implications for ecosystem research in more depth: Section 8.3 discusses the implications of the stage-based development of an ecosystem strategy which is followed by the discussion of the four processes that underpin strategy development across these stages in Section 8.4. Section 8.5 addresses the implications of the typology of four strategic approaches that this study identified in the emerging ecosystem.

8.2. Revisiting and revising the conceptual framework

The process-oriented framework which is developed in this section integrates the findings presented across all three empirical chapters to offer a holistic process perspective on strategy development as the first, overarching contribution of this study. At its core, the framework illustrates how the ecosystem strategy in an emerging ecosystem unfolds across three sequential stages and two strategic layers. Furthermore, it shows how the development of the strategy rests upon the deployment of four interrelated ecosystem-relevant processes.

Figure 18 shows the original framework which was developed in Section 4.6.1 and served as a starting point for this research project. Based on this original framework the present section discusses why and how the new insights generated through the data analysis shaped the refinement and adaption of the original framework's elements leading to the development of an adapted framework that is presented in Figure 19.

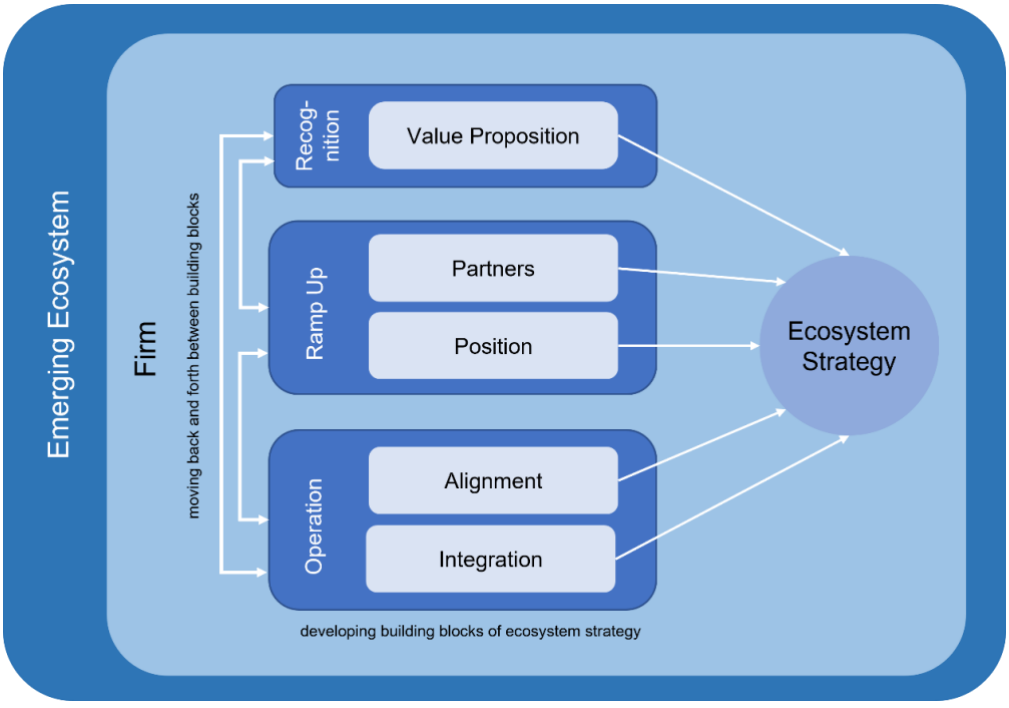

Figure 18: Conceptual Research Framework

First, the original framework could be enhanced with regards to the firm's value creation motives for ecosystem engagement. As illustrated in Chapter 5 the analysis revealed the existence of two motivational clusters (product-centric vs system-centric) that influenced why and how a firm developed its ecosystem strategy and how they positioned themselves in the overall ecosystem. The motivational clusters contribute to the understanding that ecosystem emergence does not only rest upon an overarching value proposition but also relies on the identification of the individual value offerings of its members (Thomas et al., 2022) The product-centric value creation motives have particularly been identified among industry incumbents, as well as a new entrant which had developed its own hardware device, and facilitated a gradual extension of the extant product-centric value creation of the firms. Hence it is in line with prior studies that explored how firms open their existing product towards more complex value propositions to transition towards an ecosystem-oriented business (Stonig et al., 2022; Kopalle et al., 2020). In contrast, the system-centric value creation motives were primarily pursued by new entrants and oriented towards the enablement of new value propositions for other ecosystem members or customers.

This is in line with prior research which explored how new entrants seek to leverage ecosystems to implement disruptive value propositions (Ansari et al., 2016; Snihur et al., 2018). Yet, while prior research found that firms pursing disruptive motives struggle to win incumbent firms as partners as they fear negative consequences on their core business (Ansari et al., 2016), the present thesis shows how these value creation motives were complementary to those of the product-centric firms. As shown in the adapted framework the value creation motivation of a firm then influences how it approaches the development of the ecosystem strategy and finally the strategic approach the firm pursues in terms of how it engages with other ecosystem members.

The conceptual framework initially proposed three stages of strategy formation which were drawn from the strategic alliance literature and seemed to fit with extant ecosystem lifecycle research. This was necessary, as the ecosystem literature mostly focused on the dynamics on the ecosystem-level but did not

offer a detailed processual account of how strategy may unfold on the firm-level. In the original framework it was further assumed that firms would address certain building blocks of the ecosystem strategy in each of the stages and that adjustments to the strategy would require firms to iteratively manoeuvre between the stages. Revisiting this assumption, the empirical findings led to the identification of three sequential development stages: Starting from the exploration of potential opportunities of digital technologies and dyadic connections with other firms (Set-Up) to a more deliberate engagement with the ecosystem and extension of the ties (Scale) and a refinement of the ecosystem activities and stronger consideration of the ecosystem's beneficiaries (Sharpen).

By exploring the transition from a technological emphasis on creating connections and interfaces to a stronger consideration of the beneficiaries and the market around the ecosystem, the framework was further extended to account for the two strategic layers across which the ecosystem strategy unfolds:

(1) a technological layer on which firms determine how they want to be embedded in the ecosystem technologically; and

(2) a market layer on which firms explore and determine how to address customers and create value.

The identification of a distinct market layer underpinning a firm's ecosystem strategy shows that strategy research ought to pay closer attention to the role of customers and their influence on the development of ecosystem strategies and subsequently for the emergence of novel ecosystems. This is particularly relevant, as to this date, the role of customers has largely been overlooked in ecosystem strategy research and they have mostly been considered passive recipients of the ecosystem value proposition (Autio and Thomas, 2020).

Finally, while the initial framework presented the ecosystem itself as an external, environmental influence on the ecosystem strategy of a firm, the analysis revealed interdependency between the development of firms' strategies and the emergence of the ecosystem. The study thus sheds light on the links between the firm and ecosystem-level. (Felin and Foss, 2023) highlighting how the activities

conducted at each stage reflect on the ecosystem-level thus influencing its development. The detailed implications of this contribution will be discussed in Section 8.3.

Beyond these insights on the overarching strategy development process, the empirical findings further advance the understanding of the building blocks underpinning an ecosystem strategy, which were refined based on the detailed analysis of the underlaying activities.

The initial framework introduced the building blocks as the core foundations of an ecosystem strategy but treated them as rather static and attributed the development of each one to a distinct stage of strategy formation. In contrast, the findings – by unveiling and aggregating the activities that firms deploy to implement these building blocks across time – suggest that they represent dynamic and continuously evolving processes. In fact, the understanding that the ecosystem strategy rests on dynamic processes rather than static building blocks helps to explain that while the formation of the ecosystem strategy proceeds sequentially, the firms adapt their strategy over time through the deployment of these processes, which thus provide a source for dynamism. Consequently, the processes support a firm's ability to adjust to and navigate the emerging ecosystem.

By exploring the contribution of each process with regards to the overall ecosystem strategy, the structure of the processes could also be refined further. For example, the building blocks 'value proposition' and 'integration' were subsumed under the process termed 'shaping' as both rely on the deployment of activities that promote the formation of the ecosystem itself. In total this led to the discovery of four ecosystem-relevant processes (Partnering, Positioning, Aligning and Shaping) which are deployed along the three development stages and contribute to different aspects of the ecosystem strategy as depicted in Figure 18. Section 8.4 will discuss details with regards to how the refined understanding of the building blocks as processes contributes to the understanding of the foundations of ecosystem strategy development in emerging ecosystems.

Finally, while the conceptual framework remained vague in the sense that it proposed that the building blocks jointly underpin an ecosystem strategy without further differentiation, the "Typology of Ecosystem Strategies" presented in Chapter 7 offered a more nuanced view of the strategic approaches that were enabled by the strategy development process. It outlined four distinct but complementary strategic approaches which were differentiated along two dimensions (value creation motive and relational approach) and hence relied on the combination of the findings in Chapters 5 and 6. The implications of this typology for firm strategy and ecosystem emergence are discussed in Section 8.5.

Figure 19 combines the empirical findings briefly introduced in this section into a process-oriented framework, which consists of three parts: First, the figure indicates that different value creation motives lead to a firm's engagement in the ecosystem. Second, the core of the framework is the detailed depiction of the strategy development process which is at the centre of the framework. The process shows how the dynamics across the three stages and two layers unfolds through the deployment of the four ecosystem-relevant processes. Specifically, it shows how the deployment of the processes is directed at different objectives at each stage. Furthermore, the core part of the framework indicates how the firm-level activities correspond to developments on the ecosystem-level. Thirdly, the framework suggests that the development of the ecosystem strategy enables the pursuit of four different strategic approaches in the emerging ecosystems.

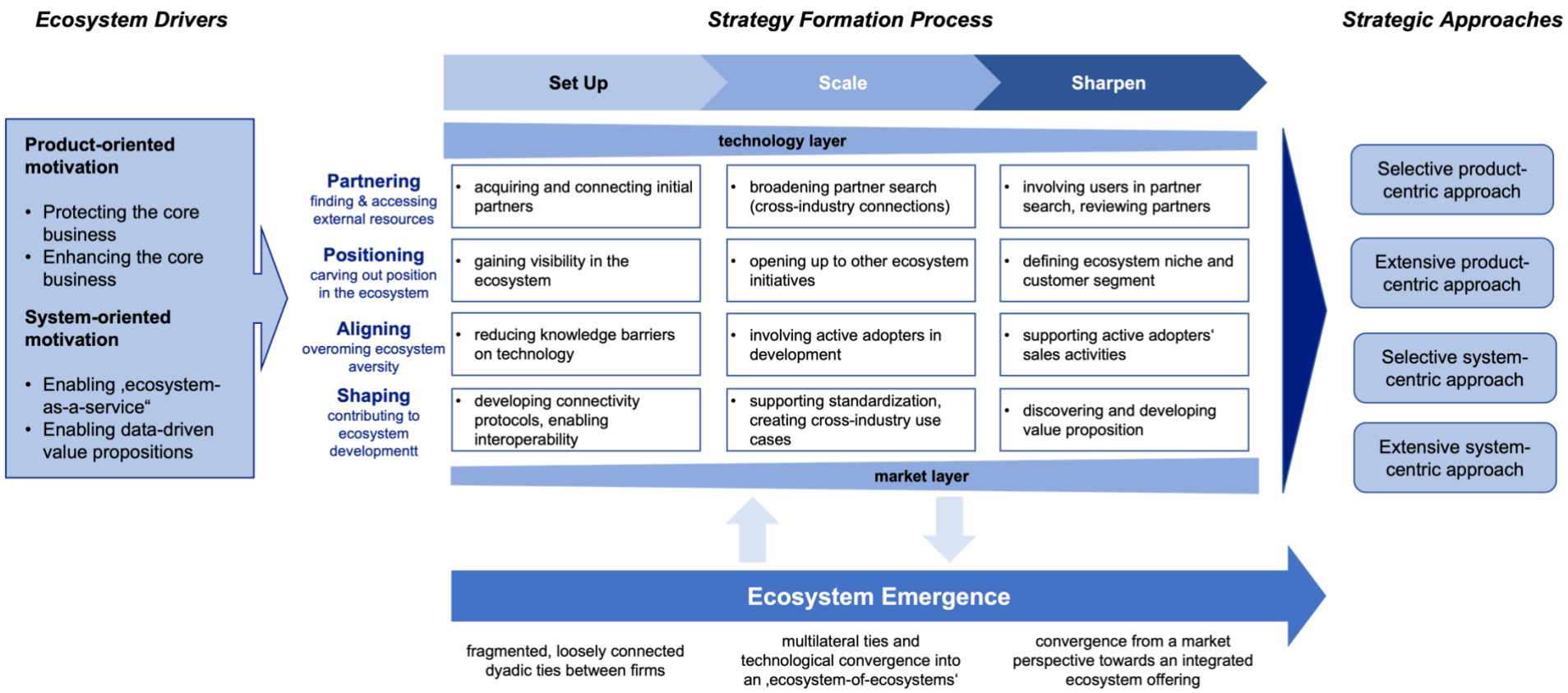

Figure 19: Framework: Strategy Formation in an Emerging Ecosystem

8.3. Dynamic view on strategy development in emerging ecosystems

The second contribution of this study advances our understanding of how firms develop and adjust their ecosystem strategy over time and in accordance with the emergence of the overall ecosystem. In doing so, the thesis responds to calls suggesting that research must focus more closely on the dynamics and changes that influence ecosystems and strategies of firms within ecosystems (Rong et al., 2015; Philips and Ritala, 2019) to offer a better understanding of the complexities of strategy development in an emerging ecosystem.

The study identifies a pattern of strategy development in an emerging, decentralised ecosystem by proposing that it unfolds across three sequential stages: Set-Up, Scale, and Sharpen. Unravelling this process further shows that the process evolves on two strategic layers: an initially dominant technological layer, which determines the technological foundations of the ecosystem strategy and a market layer, on which the firm defines the value proposition(s) they pursue and the customers they seek to address, and which increases in relevance over time. Prior strategy research in the context of ecosystems treated customers as rather passive receivers of the value created in the ecosystem (Autio and Thomas, 2020). These studies either explicitly or implicitly assumed that the orchestrator alone or in exchange with other ecosystem complementors is capable of developing an appealing value proposition for the beneficiaries (Adner, 2017; Jacobides et al., 2018; Dattee et al., 2018; Lingens et al., 2021b) but the recipients were not seen as active contributors to the development of the value proposition.

In fact, the demand site of the ecosystem has primarily been considered in the context of service ecosystems and marketing research which has emerged as a relatively separate research stream (Autio and Thomas, 2020). Therefore, the understanding that firms in the emerging ecosystem deliberately addressed the market layer of the ecosystem to outline the value proposition for example through the breakdown into smaller use cases or by providing ways for users to co-create value indicates, that the role of customers in the context of ecosystem

strategy development requires further attention. This transition towards a recognition of customers as active agents in the determination of value has previously been observed in other disciplines, for example in the shift from the goods-dominant to the service-dominant logic in marketing (Vargo and Lusch, 2004)

While prior studies suggested that firms in emerging ecosystems adopt or alternate between strategies to balance value creation and value capture (Hannah and Eisenhardt, 2018), the present study distinctively maps out the process explaining *why and how* firms arrive at an ecosystem strategy that enables them to create value with other ecosystem members in the first place. Furthermore, the findings enhance prior studies on strategy development in nascent ecosystems that sit at the intersection between knowledge ecosystems and innovation ecosystems and require balancing an exploratory (knowledge generation) and exploitative (value creation) ecosystem layer (Visscher et al., 2021). While this work suggested different levels of maturity in strategy development based on how firms navigate these two layers, the present research adds to this stream of research by explicitly considering the role of temporality in the development of an ecosystem strategy. Furthermore, it does so in the context of an innovation ecosystem that is oriented towards value creation.

The top-down perspective of ecosystem formation through the implementation of an ecosystem blueprint (Adner, 2017; Lingens et al., 2021b) suggests that firms have a clear idea of their ecosystem strategy and the final design of the ecosystem from the beginning. In contrast, the identification of the three stages suggests that in an emerging ecosystem an ecosystem strategy is the result of the gradual accumulation of experience and refinement of ecosystem objectives in accordance with developments on the ecosystem level. It thus more closely resonates with the collective perspective on ecosystem emergence (Dattee et al., 2018; Thomas et al., 2022) but extends this view from a firm perspective by exploring how the unfolding of firm's strategy across ecosystem members advances the ecosystem emergence in the absence of an orchestrator. The process perspective suggests that a firm's strategy development starts from the exploration of opportunities and the establishment of dyadic connections on the

technological layer ('Set-Up'). On the ecosystem-level, this leads to a fragmented landscape of loosely tied connectivity efforts.

Subsequently, the firms begin to increase the number of connections beyond their industry boundaries through further partnering or engaging with other ecosystem initiatives ('Scale'). This development in the strategy, highlights how the firms become aware over time of the opportunities that the ecosystem provides as a whole and increasingly use it to enhance value creation opportunities. On the ecosystem-level the firms activities contribute to the convergence of the fragmented connectivity efforts towards an overarching, industry-spanning ecosystem.

Finally in the third stage, the firms further develop their strategy on the market layer by paying closer attention to the ecosystem beneficiaries to establish appealing value propositions. This usually results in the refinement of the firm's ecosystem position and partner structure ('Sharpen'). With regards to the ecosystem, these activities promote the development of a common ecosystem vision as well as the creation of a market around the ecosystem, contributing to a better understanding of how firms develop markets around their ecosystem offerings (Nenonen et al., 2020; Autio, 2021).

Consequently, and despite the main focus on the firm as the unit of analysis, the investigation of ten case firms within the same ecosystem enabled initial inferences about the interdependencies between the firm- and ecosystem-level. Hence, the study makes a first attempt to bridge the two levels to understand how the development of the firms' ecosystem strategies correspond to the state of the ecosystem and vice versa. Through the evaluation of these interdependencies the research project responds to recent calls (Felin and Foss, 2023) calling for more attention on ecosystem emergence from the firm level. The discovery of these interdependencies also contributes to the co-evolutionary view in ecosystem research (Moore, 2006; Hou and Shi, 2021) as they suggest that ecosystem strategies do not only co-evolve in accordance with horizontal interdependencies between the firm and other ecosystem members, but also in accordance with vertical interdependencies between the firm and the ecosystem.

Taken together, the dynamic and temporal perspective on the strategy development of firms in emerging ecosystems enhances variance-based theories on strategies in nascent ecosystems (Hannah and Eisenhardt, 2018; Visscher et al., 2021), offering an in-depth, process-based view on strategy development (Cloutier and Langley, 2020). Specifically, it provides a detailed account on the role of temporality in strategy development thus eliciting the dynamics which influence the development of a firm's ecosystem strategy. Overall, this contribution therefore adds to the scholarly understanding of ecosystems emergence from the ecosystem-level (Thomas et al., 2022; Pushpananthan and Elmquist, 2022; Thomas and Ritala, 2021; Dattee et al., 2018) by offering a complementary, firm-level perspective.

8.4. Four processes to develop an ecosystem strategy

The third contribution of the study advances the foundations of ecosystem strategies as it uncovers the processes which underpin the development of an ecosystem strategy. Specifically, the analysis explored the activities that firms deployed in support of their ecosystem strategy and revealed that these can be aggregated into four ecosystem-relevant and interrelated processes: Partnering, Positioning, Aligning and Shaping. As the research indicates, a firm's ecosystem strategy originates from the continuous deployment of these four processes which build the foundation of the firm's ecosystem strategy. The related findings thereby offer an understanding of the development of these processes which represent the building blocks of an ecosystem strategy.

While the building blocks per se are not entirely novel as some of them have been discussed by prior ecosystem research, the emphasis has primarily been ***that*** an ecosystem strategy relies on the presence of these building blocks (Adner, 2017). The few studies which addressed the development of the building blocks focused on ecosystem orchestrators and usually only considered a single building block, for example studying how firms identify partners for their ecosystem efforts or how they align partners towards a common value proposition (Lingens et al., 2021b; Lingens and Huber, 2021; Lingens et al., 2022).

The current research adds to this research as it focuses on the specific activities the firms deploy to facilitate the development of these building blocks. Moreover, it uses the qualitative design to understand how these activities are adjusted over time. It thereby adds to the understanding of ecosystem strategy foundations by uncovering *why and how* the building blocks are developed and adapted and how they advance the evolution of the ecosystem strategy. Overall, the study finds that in fact an ecosystem strategy should not be considered to rest upon static building blocks. Instead it proposes that they are processes which continuously evolve and provide a source for dynamism in the development of the ecosystem strategy. This suggests that firms depending on their particular background and value creation motives must deploy these processes to successfully navigate the ecosystem.

Furthermore, to the best of the researcher's knowledge, this research project is one of the first to consider the interrelatedness of these processes and how they jointly promote the development of an ecosystem strategy. Specifically, the analysis of the four processes revealed that there are two core processes which directly impact how a firm interacts with other ecosystem members either directly (partnering) or indirectly (positioning), and which are deployed by all firms in the ecosystem. Furthermore, the analysis uncovered two enabling processes which help a firm to resolve bottlenecks that are related to the implementation of the firm's ecosystem strategy (aligning) or the emergence of the ecosystem as a whole (shaping). The relevance of these enabling processes varies based on the firms' background and ecosystem strategies.

The discovery of these processes as the foundation of an ecosystems strategy implies that a firm's ecosystem strategy can evolve bottom up and that the dynamism to adjust to the changing environment originates from the deployment of ecosystem-related activities that endogenously form into relevant processes (Schriber and Löwstedt, 2020). This understanding provides a further perspective on the foundations of an ecosystem strategy beyond the current dominant view that ecosystem strategies are enacted through dynamic capabilities. This dominant view primarily evolved from studies exploring how firms implement their ecosystem leadership or orchestration strategies through

dynamic capabilities which enable them to sense ecosystem opportunities, seize the opportunities by building relations to form an ecosystem and reconfiguring the ecosystem to resolve bottlenecks over time (Foss et al., 2023; Kindermann et al., 2022; Linde et al., 2021; Helfat and Raubitschek, 2018). However, the deployment of dynamic capability rests on the assumption that firms deliberately seek to adapt their resource base (Teece et al., 1997) which applies to instances in which firms purposely decide to create and manage an ecosystem and have a clear vision of their ecosystem strategy. In contrast, in the present context, the ecosystem strategy unfolded gradually, and the firms' ecosystem activities did not start from a clear ecosystem vision or the attempt to implement a complex value proposition. Instead, the firms began to gradually deploy relevant activities to evaluate how they should engage in the emerging ecosystem and identify suitable value creation opportunities.

The identification of the four ecosystem-relevant processes thus complements work that illustrated how firms adapt their activity systems to enable a gradually unfolding ecosystem strategy in response to changing business requirements (Stonig et al., 2022). The work of Stonig et al. focused on the adaption of the activity system of a single, incumbent firm which positioned its product as a platform by opening the product to complementors. The present study extends this work by outlining the distinct processes that apply to the strategy development process across different types of firms and which facilitate strategies in ecosystems which are not controlled or governed by these firms.

Overall, the study adds to the understanding of the foundations of strategy formation in ecosystems by typifying four common processes that enable the strategy development process, but which are underpinned by distinct activities that may vary across firms. This shows that the strategy development process in emerging ecosystems is idiosyncratic and depends on the firm's background, value creation motive and stage of strategy development. Furthermore, it proposes, that the strategy development process is also equifinal in the sense that despite the idiosyncratic activities across firms, the different value creation motives, and variations in the deployment of the processes, in the end each case firm arrived at their ecosystem strategy.

The following sections discuss each of the four processes and the relevance and implications they have for the development of the ecosystem strategy in more depth.

8.4.1. Partnering

In the absence of a central orchestrator which identifies and connects partners across the ecosystem, each firm conducted individual partnering efforts. The firms approached partner search and management in a rather unbounded, highly fragmented, and dynamic ecosystem landscape.

Specifically, the study shows how non-focal firms in an ecosystem approach firm-to-firm partnering as they establish relationships with other members within the same ecosystem. This adds a novel view to partnering of non-focal firms in ecosystems, as prior research focused on how firms partner with an established ecosystem to enhance innovation capabilities (Selander et al., 2013) or leverage an established ecosystem leader's reputation and user base (Ceccagnoli et al., 2012), hence the focus has been on partnering from ecosystem-to-firm rather than firm-to-firm.

The partnering process contributes to the development of the ecosystem strategy as it opens pathways for innovation through novel resource combinations or the improvement of an existing offer by providing a more seamless experience. However, aside from the technical driven partnerships with market-dominant actors, partnering involves continuous efforts to find and manage partners, but also to dissolve partnerships if they no longer fit with the firm's ecosystem objectives.

On the technological layer, partnering rests on reciprocal exchange to ensure seamless integration between the partners. Hence, the partnering process corroborates and complements earlier research on managing ecosystem partnerships. However, while this work focused on platform leaders' efforts to maintain connections with complementary apps by developers to ensure quality over time (Hilbolling et al., 2021), the current research shows how this can be

extended to a context in which neither firm can determine the technological underpinnings of the ecosystem and hence mutual agreements must be achieved.

The main implication regarding the partnering process is the consideration of partnering on the market layer of the ecosystem strategy. The analysis revealed how firms systematically seek market-oriented collaboration to tap into the opportunities the partnership can provide beyond novel value creation, for example, as the firm can access new sales channels or customer groups through the partner or benefit from the partner's market reputation. While the recognition that firms leverage relationships to facilitate value creation and achieve competitive advantage is not novel and has been studied in the context of relationship marketing, these relationships have usually referred to customers, suppliers or bounded strategic networks (e.g., alliances) (Egan, 2011). The present study's findings provide a new angle on relationship marketing by empirically highlighting how firms seek to use the ecosystem to extend their relationships beyond the above-mentioned stakeholders, thus showing that firms must extend their understanding of relationships to include the ecosystem perspective (Payne and Frow, 2017).

8.4.2. Positioning

The second core process in the development of an ecosystem strategy has been identified as positioning, which enables firms to find a position in the ecosystem that extends beyond their immediate partners and determines their affiliation with other ecosystem members. Prior research adopted two perspectives on positioning n ecosystem:

(1) positioning across ecosystems involving a firm's decision to either join only a single ecosystem or strategically contribute to several ecosystems (multihoming) to spread risks and prevent dominance of a single orchestrator (Jacobides et al., 2018)

(2) positioning has strongly been understood as the role a firm obtains and defends (Adner, 2017; Iansiti and Levien, 2004b).

Arguably , this study understands positioning not as the role a firm adopts vis-à-vis other firms in the ecosystem but in the relational position it pursues to engage with other ecosystem members.

As the analysis revealed, the firms deploy technological boundary resources in the form of open APIs or gateways to signal openness to the ecosystem and facilitate interoperability. In doing so, they achieve a more embedded position in the wider ecosystem by enabling affiliation and indirect relations with other members beyond immediate partnerships.

Further, upon the recognition that there would be no winner-takes-all dynamics tipping the ecosystem towards a particular initiative that would absorb others (Cennamo and Santalo, 2013) the firms had to decide how to position their ecosystem efforts with regards to parallelly existing ecosystem initiatives. The firms began to carve out niches within the ecosystem which focused on specific sub-value propositions, thus refining the rather loose and broad value proposition of 'connecting devices across a home'.

By showing how these positioning efforts unfolded cooperatively, with firms seeking to focus on discrete value propositions that differed from those of other ecosystem members, these positioning efforts promoted a growing sense of reciprocity among the ecosystem members, as they did not compete over the same value proposition. This indicates that taken together the technological- and market-layer positioning efforts of the firms collectively advanced the configuration of the ecosystem's alignment structure towards the overarching value proposition of a connected home.

8.4.3. Aligning

Contrary to what the literature suggests, aligning in the context of the emerging ecosystem did not refer to a firm's attempt to align its ecosystem partners towards their vision of the ecosystem (Lingens and Huber, 2021; Lingens et al., 2021b). Instead, aligning was concerned with a firm's stakeholders that were not immediate ecosystem members but held relevance for the successful ecosystem implementation of the firm. Prior research labelled these stakeholders active

adopters and primarily located those outside the firm as actors that occupy a gatekeeping role towards the ecosystem beneficiaries (Adner, 2017). Besides, these the present research introduces a second group of 'active adopters' that is of relevance for incumbent firms. The analysis reveals that aligning can also be inwards-oriented and requires the alignment of internal stakeholders. Furthermore, the study provides a better understanding of how to achieve the alignment of these active adopters. In general, aligning evolves as an enabling process for the ecosystem strategy that helps to resolves bottlenecks among critical stakeholders of the firm.

With regards to externally oriented aligning, the activities were directed at installers who represented gatekeepers towards the respective firms' customers. The firms viewed the strong ties with those stakeholders as a core capability and source of competitive advantage in the context of the core business. However, as the firms sensed the reluctance among installers to adapt to the ecosystem activities they engaged in alignment to avoid the strong ties becoming a core rigidity (Leonard-Barton, 1992). The findings suggest that the activities underpinning the aligning process aimed to reduce the knowledge gap and highlight how the stakeholders could profit from supporting the ecosystem. It included activities such as the provision of training coupled with the incentivisation to participate in those training through the introduction of certified installer schemes which increase the visibility of the participant installers. Thus, external aligning in the context of an emerging ecosystem must look beyond ecosystem partners to consider the wider environment of potentially relevant actors.

Further, aligning also holds relevance for towards internal stakeholders, as incumbent firms may face tensions between their core business and ecosystem activities. The ecosystem activities inevitably influence the core business, as they are directed at identifying innovation opportunities by drawing on complementary products from other ecosystem members to enable new or extended product features. This often causes tensions which needs to be actively managed to mitigate the not-invented here syndrome. While prior research specifically focused on the importance of actively managing not-invented here-

syndrome in innovation ecosystems that are designed to enable outside-in open innovation (Amann et al., 2022), the present findings extend this view towards the coupled process of open innovation aimed at connecting and combining complementary products to facilitate novel resource combinations and use cases (Gassmann and Enkel, 2004).

More specifically, the innovation activities in the ecosystem build on interaction between the ecosystem partners and the connection of products through interfaces. This shifts the locus of innovation beyond the individual firm's control and resembles an interactive coupled process of open innovation (Piller and West, 2014). As this increasingly blurs the ownership of the innovation processes and creates strong interdependencies between the ecosystem partners, the core business is sometimes averse towards the ecosystem activities, because they fear the loss of control over the innovation process and product features. This reluctance hampers the firm's ability to leverage the full innovation potential and therefore aligning activities should also directed inwards. By showing how teams responsible for the ecosystem strategy of the firm involve the core business in workshops and exchanges with ecosystem partners and enable them to take the customer's perspective, the study contributes to understanding how firms implement countermeasures to prevent not-invented here syndrome (Hannen et al., 2019) and align internal stakeholders towards the ecosystem strategy development.

8.4.4. Shaping

The fourth process the research project identified encompasses activities that firms deploy to actively shape the foundations of the ecosystem from a technological and market perspective. The process is hence considered an enabling process as it facilitates the emergence of the ecosystem itself.

In the absence of a central orchestrator or platform leader that defined the underlying technological layer of the ecosystem (Parker and Van Alstyne, 2018; Tiwana et al., 2010) several technologies emerged simultaneously causing fragmentation and problems of interoperability. To overcome this fragmentation which the firms determined as a bottleneck for ecosystem development, firms

conducted several activities that supported interoperability and the development of the ecosystem's technological underpinnings.

The product-centric firms deploy activities to develop connectivity standards to reduce complexity and support the convergence of the ecosystem members on the technological layer. A key activity is the engagement in standard-setting organisations that form around established protocols (Risteska Stojkoska and Trivodaliev, 2017; Solaimani, Bouwman and Secomandi, 2013) and the study shows that the collective efforts in the standard-setting organisations replace the decision-making of a central orchestrator to define the technological layer of the ecosystem (Miller and Toh, 2022). At the same time, the system-centric firms offer technological platforms which enable them to act as brokers or more specifically as tertius iungens, i.e., the third who connects (Kwon et al., 2020). Thereby the system-centric firms contribute to overcoming fragmentation by bringing together two or more previously unrelated members of the ecosystem and enabling interoperability and exchange of data across connectivity protocols.

The shaping process also includes market-oriented activities addressing the discovery of a value proposition for the ecosystem. While extant literature sees the central orchestrator as responsible for steering the iterative value proposition development process (Dattee et al., 2018; Ansari et al., 2016), the identification of the shaping process suggests that in the present context, the discovery of one or more value propositions for the ecosystem is not only an iterative process but also one that unfolds collaboratively among the ecosystem members and through the involvement of stakeholders and beneficiaries.

In particular, the discovery process is based on activities which firms deploy to generate individual insights from their customers and users coupled with exchanges among the ecosystem members either through ecosystem initiatives or in overarching associations to jointly define measures to build the market around the value proposition(s). This closely resonates with and build on the emerging stream in the marketing literature on market shaping which suggests that firms can actively create and influence new markets (Nenonen et al., 2019; Nenonen and Storbacka, 2020). Particularly, the findings corroborate and extend

prior research suggesting that shaping does not necessarily depend on a central orchestrator and can instead be facilitated through intermediaries (Randhawa et al., 2022). By showing that shaping can also be the result of collective action among the ecosystem members, the study highlights the importance of collaboration with other ecosystem members within and across ecosystem initiatives for market shaping around the ecosystem. It thus offers a third opportunity for ecosystem shaping beyond shaping by the orchestrator and shaping through an intermediary.

8.5. A typology of strategies in emerging ecosystems

The fourth and final contribution of this study is the identification of a typology of four co-existing strategic approaches that the firms adopt in the emerging ecosystem. By comparing how each of the firms navigate the strategy development processes and acknowledging differences and commonalities across the firms, the study suggests that at this early stage of ecosystem emergence, firms pursue slightly different strategies. These strategies however are generally characterised by a relational approach which aims for joint value discovery and value creation with other ecosystem members.

In detail the research shows how a firm's ecosystem strategy rests upon a firm's individual value creation motivation (system vs product) and the approach to build direct and indirect relations with other ecosystem members (extensive vs selective) to enable value creation. An interesting recognition was, that while the firms in the study acknowledged the presence of other firms which also tried to find partners, win customers, and explore opportunities for value creation in the ecosystem, they did not perceive these activities as a threat for their own ecosystem efforts. Instead, they considered them to be complementary and beneficial for the growth of the overall ecosystem.

Only a few studies provide a nuanced view on ecosystem strategies beyond the emphasis on roles and role execution, for example by uncovering strategies that firms adopt for platform entry vis-à-vis an existing platform (Karhu and Ritala, 2021) or by uncovering strategies that firms pursue to navigate co-opetitive tensions in a nascent but clearly bounded ecosystem (Hannah and Eisenhardt,

2018). The present typology of ecosystem strategies adds to this stream of literature as it offers an understanding of ecosystem strategy at the infancy on an ecosystem's development and in response to technology-driven convergence. At this stage the boundaries and components of the ecosystem cannot yet be clearly defined, and the study argues that the firms' strategies are oriented towards exploration in the form of joint value discovery and value creation with other ecosystem members.

This reciprocal understanding of ecosystem strategy extends extant research that primarily approached ecosystem strategies as co-opetitive and focused on balancing joint value creation and individual value capture (John and Ross, 2022; Jacobides, Knudsen and Augier, 2006; Iansiti and Levien, 2004b). It highlights how the co-existence of complementary strategic approaches that foster a relational and collaborative development of ecosystem strategies enables the firms to prevent power struggles which may hinder the successful emergence of an ecosystem (Ozcan and Santos, 2015). The typology of four complementary ecosystem strategies hence proposes that ecosystem strategies can be reciprocal and jointly facilitate the successful formation of an ecosystem.

The findings of the study complement prior work which suggests that firms may adopt mutual behaviour to establish a new platform in extension to an existing one (Khanagha et al., 2020). Extant research explored newly developed platforms that pursued a distinctly different value proposition than the established platform ("eating from different tables") to avoid hostile responses of other ecosystem members or the platform leader. It found that once firms grow their ecosystem activities the value propositions start overlapping and leading to a shift towards competitive strategies as ecosystem members start eating "from the same table" (Khanagha et al., 2020, p.24). However, Khanagha et al.'s study represented a case with a clear difference of power between the existing and newly forming platform which may support the initially friendly behaviour of the newly forming platform. In the present context, the mutually supportive behaviour in contrast is rooted in the desire to build the ecosystem in the first place.

The typology thereby adds to a more nuanced understanding of ecosystem strategies in different lifecycle stages of the ecosystem by showing the existence of mutual strategies in the context of a newly forming, decentralised ecosystem. Using the metaphor adopted by Khanagha et al (2020) – at this stage, the firms are not concerned with eating a meal either at the same or different tables. Instead, the focus of the ecosystem strategy at this early stage is to jointly provide ingredients that help to prepare a meal in the first place. Thus it suggests a shift from the focus of approaching ecosystem strategies as being concerned with "baking and slicing a pie" (Jacobides et al., 2006; Karhu and Ritala, 2021) by achieving a competitively favourable position to increase their share of value appropriation, towards a reciprocal and relational view on ecosystem strategies in which firms seek to collaborate with other ecosystem members to grow the pie for everyone (Chen and Miller, 2015)

Nevertheless, it is important to acknowledge that these strategic approaches have been identified in the early stages of an ecosystem with expectations among the ecosystem members that there is the possibility to jointly grow the market around the ecosystem. It is therefore plausible to assume that once the ecosystem reaches a more mature stage, the firms' ecosystem strategies are likely to shift towards competition over appropriating the value created in the ecosystem. Yet, this notion only further highlights the importance of approaching ecosystem strategies as dynamic and interrelated with the development of the ecosystem, rather than static and determined by the role a firm occupies in it.

8.6. Answering the research question

This chapter showed that the findings resulting from the exploration of the ten case studies yield implications for strategy research in the context of emerging ecosystems without a central orchestrator. The present section summarises these implications and details they answer the research question.

The research was guided by the overarching research questions *"Why and how do firms develop their ecosystem strategy in an emerging ecosystem with no central orchestrator?".* The research question was broken down into two sub questions: (1) "*How does a firm's ecosystem strategy unfold over time?"* and (2) *"Which*

processes do firms deploy to support their ecosystem strategy and how are they developed?". Over the course of this thesis these questions have been answered in detail through the presentation of the empirical findings in Chapters 5 to 7 and the discussion of the implications and contributions in this chapter.

With regards to the first question, the thesis showed how a firm's ecosystem strategy *dynamically* and *sequentially* unfolds across *three stages* and *two layers*. The findings unravelled that an ecosystem strategy evolves from an exploratory beginning (Set-Up) to the growth of the ecosystem activities (Scale) and the refinement of the ecosystem strategy (Sharpen). The study showed that over time firms shift their attention from the technological layer and the enablement of connections and interoperability to the market layer and the refinement of the underlying value proposition(s) and target customers. In doing so, it revealed how the strategy development process contributes to the emergence of the ecosystem and proposed close interdependencies between the two levels.

Relatedly, and in answer to the second research question, the research revealed that a firm's strategy development in an ecosystem is underpinned by *four interrelated processes.* The findings depicted how the processes that firms deploy in the context of their ecosystem strategy are similar across firms but rely on idiosyncratic activities due to differences in the value creation motives and strategies they pursue. The research thus extends work on the foundations of ecosystem strategy beyond the enactment of dynamic capabilities.

The study yielded an additional finding which emerged from the data analysis. With regards to the type of strategy that firms pursued, it showed that in an emerging ecosystem that presumingly offers the potential for growth, firms pursue ecosystem strategies that emphasise collaboration for joint value discovery and creation rather than co-opetition in the form of joint value creation and individual value capture. Hence, the thesis developed a typology of four complementary and relational strategic approaches which firms adopted in the emerging ecosystem.

Finally, the study combined the empirical insights into a holistic, process-oriented framework which illustrates how firms develop their ecosystem strategy in an emerging, decentralised ecosystem.

Taken together, the research contributes to ecosystem research in strategic management and innovation with regards to the emergence of ecosystems. Adopting a firm-level process perspective the research outlines how firms develop their individual ecosystem strategy and how these individual actions are entangled with the emergence of the ecosystem. The study therefore holds implications for research on emerging ecosystems particularly in the absence of a central orchestrator on the firm- as well as on the ecosystem-level.

9. Conclusion

This chapter concludes this thesis and is structured as follows: Section 9.1 offers a summary of the key theoretical contributions of the research. Section 9.2 explores the implications for management practice. Section 9.3 outlines the limitations of the study and develops avenues for future research. The thesis ends with concluding thoughts of the researcher, reflecting on the overall research journey throughout this project.

9.1. Theoretical contributions

The thesis set out to contribute to ecosystem research by adding to a gap in the literature in the context of nascent ecosystems with no central orchestrator. Particularly, the research objective of this work was to explore how firms develop their ecosystem strategy and its underlying foundations in the context of an organically emerging ecosystem over time. By exploring these research objectives in the context of the smart home ecosystem in Germany, the study makes two key contributions to the field of ecosystem research.

First, by developing a processual perspective of strategy development in nascent ecosystems, the study adds to our understanding of how ecosystems emerge. As shown in Chapter 6 and discussed in Chapter 8, the research finds that in the absence of a central orchestrator the sequential development of firms' strategies gradually contributes to the formation of the ecosystem. Hence, the research contributes to the growing body of literature on ecosystem emergence by outlining the interdependencies between the firm and ecosystem level, particularly in the absence of a central orchestrator. The study suggests that to understand ecosystem emergence, it is critical to focus on how the firms that compromise the ecosystem approach their ecosystem strategy.

The strategy development process developed in Chapter 6 also reveals that for ecosystems that form around broad or novel value propositions for which a market does not yet exist, firms deliberately deploy activities to address the demand side of the ecosystem. In doing so, the firms seek to engage customers and build the market around the ecosystem. The study therefore advocates that

the role of ecosystem beneficiaries should not be treated as passive value recipients, and instead they should be actively included in the development of ecosystem strategies and the consideration of the ecosystem's value proposition.

Second, the research project provides a more nuanced understanding of strategies in ecosystems beyond the extant perspective on co-opetition and the adoption of beneficial roles and positions. The findings presented in Chapter 7 and discussed in Chapter 8 introduce a typology of four complementary strategic approaches that firms adopted in the emerging ecosystem. Particularly, it has been found that in decentralised and nascent ecosystems firms pursue relational and collaborative strategies that are oriented towards mutual value discovery and creation and the joint formation of the ecosystem. Building on the debate on ecosystem strategies that is usually concerned with finding the right balance between value creation and appropriation, this research argues that at the early stage of ecosystem formation, ecosystem members should instead emphasise value discovery and creation to jointly lay the foundation for the ecosystem's development.

Overall, while prior research focused on two paths of deliberate ecosystem emergence around a central orchestrator, i.e., top-down, and bottom-up, this study focused on the third perspective, whereby ecosystems emerge organically through the convergence of industries driven by digital technologies. In this context, the study provided a detailed account of how firms that operate in increasingly interconnected business environments and which are faced with growing interdependencies for the realisation of their innovation activities respond to these changes through the gradual development of an ecosystem strategy.

9.2. Managerial contributions

The findings and particularly the framework developed on the basis of the findings, could be of benefit for practitioners that need to manage firm strategies in currently emerging, decentralised ecosystems.

First, the study highlighted that firms could pursue different paths of value creation in an ecosystem, which require different approaches to strategy development. Hence, it is important for managers to clearly determine their value creation motives in the context of their overall business activities to avoid getting lost in the plethora of value creation avenues the ecosystem offers. The outline of the value creation motives in this study may provide a starting point to this assessment. Relatedly, the study identified four different strategic approaches in the ecosystem that can be derived from the value creation motivation and overall ecosystem objectives. As these approaches require different degrees of resource investments and approaches to relationship building and maintenance with other ecosystem members, managers should be realistic in evaluating whether the desired value creation path matches the constraints under which they engage in the ecosystem. For example, a firm that only has limited resources to maintain relationships with other ecosystem members is likely not to succeed if they pursue strategies that are based on extensive relations in the ecosystem.

Second, the study shows how managers must balance implementing their firm's individual ecosystem strategy with contributing to the promotion of the ecosystem per se. The "Typology of Ecosystem Strategies" suggests that it in fact is beneficial for firms to strive for collaboration, leveraging the diverging objectives of other ecosystem members and creating a win-win-situation for all parties involved instead of creating their own, fragmented ecosystem initiatives.

Due to the strong emphasis on orchestrators in extant research and the popular examples of Apple, Amazon, or Facebook, firms generally tend to assume that they should pursue an orchestrator role as this also promises greater influence on the ecosystems development (Jacobides, 2019b). The typology instead proposes other opportunities that do not necessarily require the adoption of an orchestrator role. Indeed, the findings suggest that the emphasis on influence and occupying an orchestrator role may have negative consequences for the ecosystem's emergence. Collaborative and relational approaches may be more promising for the broad discovery of value creation opportunities. Hence, despite the expectations that firms may hold about their role and influence based on their background or core business, they should critically reflect whether the pursuit of

the orchestrator role helps or hinders not only the ecosystem's emergence but also the success of their individual ecosystem strategy.

Third, when it comes to the enactment of the ecosystem strategy, the framework developed in this study can hopefully be used by managers to address the different elements underpinning an ecosystem strategy. Particularly, the display of the two strategic layers (technological and market layer) suggests that managers should look beyond technological requirements, which are usually the initial focus in ecosystem strategies as they are developed in response to digital technologies. Instead, the study shows that for an ecosystem that forms around a new value proposition, managers should actively engage in building the market around this value proposition. This means they or the teams responsible for the ecosystem strategy should generate market insights that help them to sense customer needs to refine the value proposition accordingly, but also develop the ability to clearly articulate the benefits of the proposed value proposition to the beneficiaries. In this regard, the activities deployed by firms towards market shaping and partnering in this research, may suggest possible measures for firms to engage customers in the strategy development process. This not only helps firms refine their own ecosystem strategy, but also contributes to the discovery of the ecosystem's overarching value proposition.

Fourth and with regards to partnering and collaborating with ecosystem members, managers – especially those from incumbent firms – should reconsider their understanding of business relationships. Relationships in ecosystem are usually non-hierarchical and not underpinned by contractual agreements which determine the contribution of each firm. Instead, they are facilitated by the shared desire to create value. As the partnering process outlines, they require reciprocity, collaboration, and constant exchange on both sides. From a managerial perspective this implies that firms must develop the ability to look beyond their own product's features and consider their product in its wider embeddedness to identify potential partners and determine interfaces with other ecosystem members that can be the starting point for the development of ecosystem use cases. Furthermore, while particularly incumbent firms may be used to engage in collaborations in which the input of each partner can be clearly

defined ex ante, in ecosystems firms must be open to engage with their ecosystem partners in exploratory ideation activities that may lead to novel use cases in the ecosystem.

Finally, the aligning process highlights that firms must carefully assess their ecosystem environment to identify external and internal stakeholders that present relevant 'active adopters'. While such active adopters may not directly contribute to the ecosystem, they still hold a crucial position in the ecosystem by acting as a form of gatekeeper. Hence, they occupy a critical position that could sabotage the successful implementation of an ecosystem strategy. It is important that managers consider external stakeholders to identify potential adversaries and resolve conflicts or they may lead to unintended bottlenecks in the implementation of the ecosystem strategy. Additionally, incumbents should make sure that the core business and ecosystem activities are well aligned and that the core business is included in the development of the ecosystem strategy. If the internal stakeholders feel neglected or threatened by the ecosystem activities, they may pose risks with regards to the ecosystem activities. Hence, aligning is a decisive factor for the successful implementation of the ecosystem strategy and managers should prioritize these activities accordingly.

9.3. Limitations of the study and future research avenues

Despite careful planning and execution of this research project, this study is not free of limitations This section acknowledges these limitations and outlines avenues for future research.

The findings of this thesis are based on a multiple case study design which fits the objective of an exploratory study seeking to develop theory (Goffin et al., 2019; Eisenhardt and Graebner, 2007). Nevertheless, given the sample size and the focus on a single emerging ecosystem, the implications of this research ought to be considered vis-à-vis their applicability to other research contexts. Future research could explore to what extent the findings hold relevancy in other emerging, decentralised ecosystems. A promising empirical context to test the applicability of the framework could be the growing mobility and shared driving ecosystem. It represents a comparable context to the smart home ecosystem,

since it is also populated by incumbent firms (car manufacturers, public transportation companies) and new ventures and currently facing struggles of emergence (KPMG, 2019). Studies in comparable contexts may provide further interesting insights to refine the framework and increase the potential to generalise the findings of the present study.

Theoretically, the findings of this research project have been identified in the emergent phase of the ecosystem lifecycle. Future research could build on the thesis' findings but focus on other stages of the ecosystem lifecycle. This would enhance the understanding of strategy development and explore how ecosystem strategies unfold throughout more mature ecosystems. Besides looking at distinct stages of the ecosystem lifecycle, researchers could also conduct longitudinal studies that explore and trace the strategy development process across the different lifecycle stages. Both approaches would offer the chance to further explore the interdependencies between a firm's ecosystem strategy and the state of the overall ecosystem. Methodologically such studies could be complemented by network modelling techniques that allow the researcher to model the development of the ecosystem level and link this back to certain stages throughout the strategy formation process. This may offer the potential to further strengthen the understanding of the links between the firm- and ecosystem-level to which this study contributed.

Process-oriented insights on the firm level as presented in this research could also hold relevance for ecosystems with a central orchestrator. Therefore, similar studies could be conducted in centralised ecosystems and focus on the development of strategies among orchestrators as well as complementors which are currently underrepresented in ecosystem research. Evaluating if and how strategy development processes may vary across different forms of ecosystems may also add insights to explore (dis)similarities with regards to the ecosystem-level processes of emergence.

By focusing on how firms develop their strategies in emerging ecosystems with no central orchestrator, this research project identified a typology of four relational and complementary strategic approaches in emerging ecosystems. In

contrast, extant research set in more bounded emerging ecosystems identified strategies that are more strongly oriented towards co-opetition even in nascent ecosystems. Building on these differences in findings, future research could explore the conditions under which firms either pursue more collaborative or more co-opetitive strategies in emerging ecosystems. Conditions that may affect the choice of ecosystem strategy could be the ecosystem members' backgrounds, the clarity of the value proposition and ecosystem beneficiaries, the heterogeneity of ecosystem members, the breadth of the ecosystem or the possibility to pre-determine the ecosystem's components. For example, the smart home ecosystem is rather broad and underpinned by several ecosystem initiatives, which contributed to different but complementary sub-value propositions under the umbrella value proposition of 'connecting the elements of the home'. While such contexts may benefit from relational, non-orchestration-oriented strategies, other contexts may instead require firms taking the orchestrator role.

Finally, it could be interesting to examine whether an ecosystem without an orchestrator at its origin will remain as such in the longer run. Hence, future research could investigate why and how one or more firms may at some point strive to occupy the orchestrator role and how this affects the strategies of other ecosystem members and structure of the overall ecosystem. With regards to the smart home ecosystem as an empirical context, these dynamics may be observable in the future, since a conglomerate of Google, Amazon, and Apple currently seeks to introduce a new, dominant standard for the technological layer of the ecosystem. This could offer an entry point to position themselves in a powerful, orchestrator-like role in the ecosystem. Taking this a step further, future research may even explore if an ecosystem orchestrator must always act on all ecosystem layers (e.g., technological, economic, institutional and behavioural as suggested by Autio (2021)) or whether some ecosystems may only have an orchestrator on a single layer, but operate self-organised on the other ecosystem layers. Hence, further observing the developments in the smart home ecosystem may yield promising insights to explore if there may be instances in which an ecosystem only has an orchestrator on a single layer or whether different orchestrators could orchestrate different layers.

9.4. Concluding thoughts and reflection on the research process

When I decided to return to academia after several years in the industry, I did not comprehend in full what doing a PhD meant, but I appreciated the chance to design my own research project and make my own small contribution to knowledge. The past four years have certainly been intense but despite the inevitable doubts that one faces through such a long project, I do not regret making this decision and I appreciate the many opportunities it provided for me personally and professionally.

As a project manager in a large industrial company, I had observed how even large incumbents were increasingly collaborating with other firms to meet the increasing complexities in their business environment facilitated by the growth of digital technologies, thus sparking my interest in ecosystem research. Yet, when initially engaging with the ecosystem literature, I was surprised by the strong emphasis on established platform ecosystems by "born-online" firms such as Facebook or Apple. Having worked for two established incumbent firms in more traditional industries for a total of ten years, I started to wonder how this type of firms would behave in an ecosystem and the implications this would have on the strategies they pursued. Hence at the infancy of my research project, I wanted to particularly focus on incumbent firms and how they could develop capabilities that enabled them to engage in an ecosystem, but quickly realised I wanted to be more open and include non-incumbent firms in my research to explore any differences and similarities.

Having worked in the industry for several years was certainly helpful in the data collection period as I was able to confidently approach firms and engage with senior staff and managers. Yet, when it came to data analysis, it was important to let go of my industry-lens and adopt an academic perspective. In the industry, due to time or resource constraints, decisions are often based on readily available information and time to evaluate the information is normally short, leading to the tendency to arrive at conclusions too quickly. Hence, throughout this research project I regularly reminded myself to ensure that I collected all the data I needed as well as to not jump to potentially premature conclusions. I found that an

important trait of a good researcher and a skill that I have developed, is to critically reflect available information in the form of extant research and to ensure that the data that is collected is relevant for the question that is asked. Furthermore, I learned to approach data from different angles, developing a set of possible interpretations of the data to reliably elicit what the data is telling me and what it is not telling me.

Unexpectedly, this research journey was interrupted at the beginning of my second year by the outbreak of a global pandemic, which affected the world as we knew it. The pandemic certainly impacted my journey as a PhD researcher, limiting the opportunities for personal engagement with peers as well as more advanced scholars, whether at the University of York or at conferences. Furthermore, it required me to rethink my research design as travelling and visiting firms became impossible for a long time. Nevertheless, creativity, adaptability, and resilience are important traits of a good scholar, and the pandemic enforced a strong learning curve with regards to those: from teaching online or in barely filled classrooms, attending virtual conferences, engaging with scholars in break-out sessions and finding other ways to connect with peers, being a PhD student at this time required fast adaptation and a large degree of creativity to address the challenges the pandemic posed.

Similar to the firms in my study, which needed time to develop their ecosystem strategy, I certainly made the same experience when it came to developing this PhD project. Overall, the past four years have been a rewarding journey and the present thesis is the material result of this process. I hope that it offers a fruitful starting point for further research on strategies in emerging ecosystems and in ecosystems with no central orchestrator.

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Appendices

Appendix 1: Interview Guideline – Pilot Interviews

A. Introduction

1. Introduce researcher, explain purpose of the study, answer any open questions
2. Background of interviewee (firm, experience, touchpoints to ecosystems)

B. Role and relevance of ecosystems in practice

1. How would you describe an ecosystem? (clarification of concept understanding)
2. In your experience, has the relevance of ecosystems for practice increased in the last years?

   If so, why do you think that is the case?
3. Are there specific types of firms or industries which you observe transitioning towards ecosystems? Why those?

C. Firms in ecosystems

4. What do you think are the main reasons for firms to engage in ecosystems?
5. Why do firms decide to create/design an ecosystem vs. why do they decide to join an existing ecosystem?
6. Do you think firms purposely develop an ecosystem strategy for themselves?
7. What do you think are the main challenges for firms to successfully utilise ecosystems?
8. Have you observed how firms address / overcome these challenges? What are your recommendations?
9. In your experience, are there are characteristics in a firm which make it likely / less likely that they face challenges in the ecosystem? If yes, what are they?

D. Firm innovation in ecosystem

10. How important do you think have ecosystems become as an enabler or motivator for innovation? What kind of innovation have you observed in the context of ecosystems (incremental, radical, business model, product)?
11. Do you think firms can use ecosystems to enhance their (innovation related) capability base? Are there differences depending on a firm's background and ecosystem role?
12. How do relationships within an ecosystem evolve, e.g., how do find firms the right partners within the ecosystem to enhance their own capability or resource base?
13. How do you perceive the role of the ecosystem leader in those innovation activities? Have you always identified a firm taking the leading role?
14. Do you think some firms are more successful than others in facilitating innovation in the ecosystem? If so, why?

E.: Any other aspects emerging from the interview

Appendix 2: Interview Guideline – Main Study: First Round

Context

1) Can you please describe your background and role within your firm?
2) Can you please recapture your company's history within the smart home ecosystem?

   Probes: When did your firm start getting involved? Why did your firm get involved? How did your ecosystem activities / smart home activities evolve over time?
3) What did your firm expect when you decided to join an ecosystem and how specific had you determined your goals? Has this changed?
4) How would you describe your firm's current role/position in the ecosystem?

Ecosystem selection and role/position

5) What initiatives (ecosystems) are you currently involved in and why these?
6) Did you change your position or involvement in an initiative at some point? If so, when, how, and why?
7) How would you describe your firm's role and why did you choose this specific role?

Other firms / partners

8) To what extent and how do you collaborate with other members of the ecosystem?
9) How did/do you choose the partners you are working with and what have you learned about finding the right partners? Did you ever introduce a new firm to the ecosystem?
10) What would you say are the key antecedents of a successful ecosystem partnership between actors?

Alignment / Developing value proposition

11) How do you reach agreements with your partners in terms of joint product development or customer access?
12) How do you come up with ideas regarding expanding your product's features in the ecosystem? Do you get help from others (consultants, other ecosystem members, orchestrator etc.)?
13) Can you give an example of a successful collaborative effort that was facilitated through the ecosystem?
14) Please describe what made this collaboration successful and explain why you chose this example?
15) What would you say were the biggest difficulties in achieving innovation across the ecosystem and how are you trying to address these?

Integration

16) How do you make sure that your product works well with other products in the ecosystem?
17) What did you learn about integration within a business ecosystem?
18) Who is responsible for the integration of your product and / or those of partners? Has this changed?

Overall learnings and adjustments to strategy

19) To what extent did you have to adjust internal working processes or guidelines to accommodate the needs of the ecosystem activities? (e.g., sharing of knowledge, greater flexibility)
20) How would you describe your firm's current ecosystem strategy and how does it differ from when you started?
21) Overall, what would you say were your biggest challenges and learnings regarding the operation in a business ecosystem and how did they contribute to your ecosystem activities?

Appendix 3: Interview Guideline – Main Study: Follow Ups

About the set-up of your ecosystem activities:

To be asked for more background information / *depends on interviewee and case*

1) Can you describe the organisational structure for your ecosystem activities? Can you describe the (organisational) relationship between developing ecosystem-related activities (e.g., new value propositions through smart products) and your core business (e.g., developing new/improving appliances)? (e.g., separate teams, ecosystem activities spread out across existing teams, project groups…)
   Why and how did you choose this set-up?
2) How do you ensure the sharing of knowledge, experiences, and learnings regarding the ecosystem activities between relevant actors in your organisation?
3) Optional: Your ecosystem activities were introduced to the market under a separate brand for the overall ecosystem. Why did you decide for this approach despite having a well-known brand for your core activities? [Why did you choose to remove the brand from the market later?]

About partnering:

4) You / someone in your company mentioned that with some of the partners are relevant, but you don't collaborate with them closely, [e.g., Alexa or Philips Hue] and some other partners, you intensely collaborate with [insert relevant example from case]
   Can you describe how the two different types of partnerships each contribute to your ecosystem strategy?
5) Is one type of partnership more relevant for your ecosystem activities? Why / why not? If yes, do you manage them differently and how? Has their relevance changed?
6) Can you explain how you find or search for new partners? (Probe: is the firm active or passive in partnering, are they looking for firms or being approached by others or both?)

Only to be asked if interviewee did not elaborate on in initial interview of if elaboration was rather short.

About alignment:

7) When we last spoke, you mentioned about the need to review and possibly revise your sales activities and processes. Has that happened and/or is it still happening? How is such a process unfolding?
8) How are you ensuring that your stakeholders are supportive of your ecosystem activities? How important is their support in terms of your ecosystem strategy?
9) How are you ensuring that installers are integrated into your ecosystem activities?
   (e.g., trainings, certified installer programs, shared presentations/show rooms)
10) How do you perceive the emergence of other smart home ecosystem initiatives in the market and how are you deciding how you want to position yourself within the broader smart home ecosystem? (e.g., no connection with similar initiatives, interface/integration with other initiatives → cooperation or competition?)

Developing the ecosystem

11) Do you offer an open interface / developer program for third parties to access your products? Why / why not?
12) If yes: To what extent and how do the developer program / open interface support your ecosystem activities?
   (Probes: user/open innovation, modularity, feedback, scalability)
13) Do you regularly collect feedback from users or stakeholders? How is the feedback you receive evaluated in terms of your ecosystem activities? How does the feedback contribute to your ecosystem activities?
14) In our last interview, you mentioned that the organisation has been actively involved in various overarching smart home initiatives, both market oriented (e.g., Smart Living Germany, Bitkom, Smart Home

Deutschland) and technology oriented (KNX, matter, VDE) Could you tell a bit more about…

a. …the motivation for joining such initiatives and,
b. …how such initiatives influence your Smart Home activities? (Probes: building network, visibility, learning, developing ecosystem, developing standards)

15) Do you engage in collaborative marketing activities with your partners (e.g., shared show rooms, joint exhibition at trade fairs, etc.)? if so, how does the process unfold?
(Probes: who initiates it? what benefits do you perceive from such a collaboration? is there a follow-up in terms of sharing learning and/or best practices? Do you usually partner with the same organisation repeatedly over time?)

About standards / lack of standards:

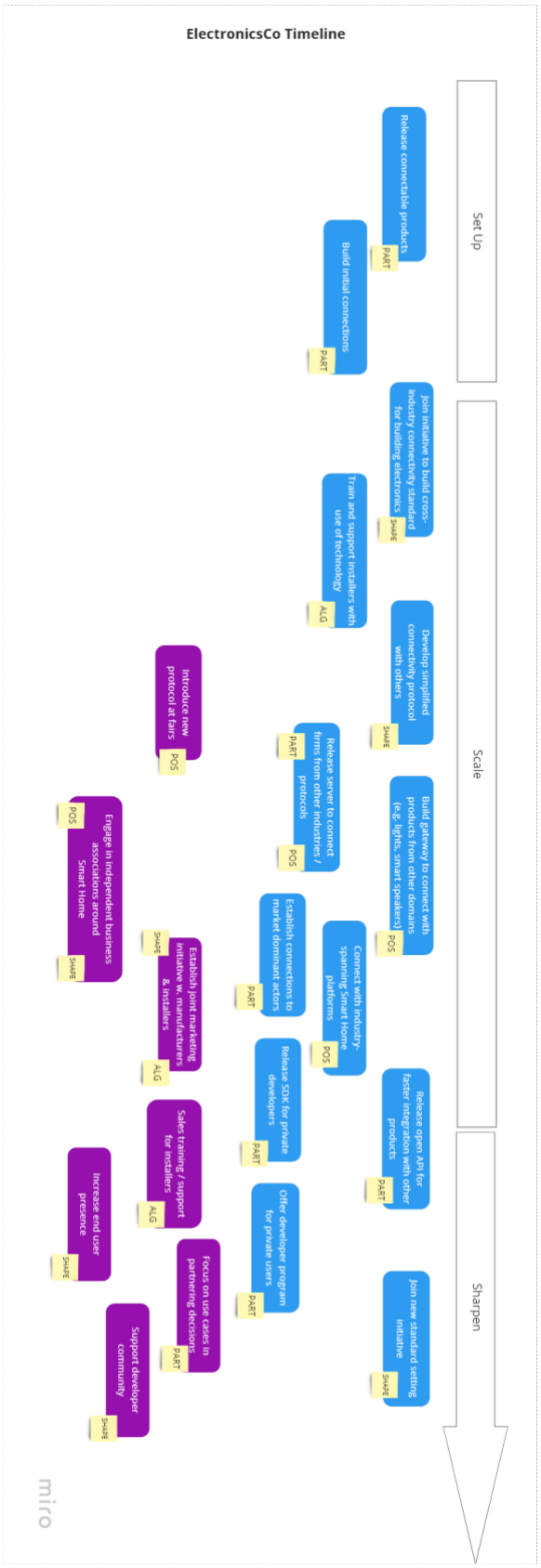
16) How do standards or rather the lack of a unified standard within the smart home ecosystem influence your ecosystem activities?
17) There are several communication protocols in the smart home ecosystem. Which one(s) did you choose and why? (Probes: why open/ proprietary, why one / several, competitive advantage, barriers, scalability, choices of competitors…)
18) What role do particular standards have for your innovation efforts in the ecosystem?
19) Do you support technological interoperability between your communication standards and other protocols? Why / why not? If yes: How? Has your approach changed over time?
20) How do you perceive efforts of further standardisation of the technological infrastructure in the smart home ecosystem?
Are you part of that conversation and how that is shaping your ecosystem strategy? Why (not)?
21) How do you think a universal standard would benefit and/or influence your ecosystem strategy? (Probes: finding/choosing partners, winning

users/ customers (lock in), position in the ecosystem, alignment of installers, reducing efforts)?

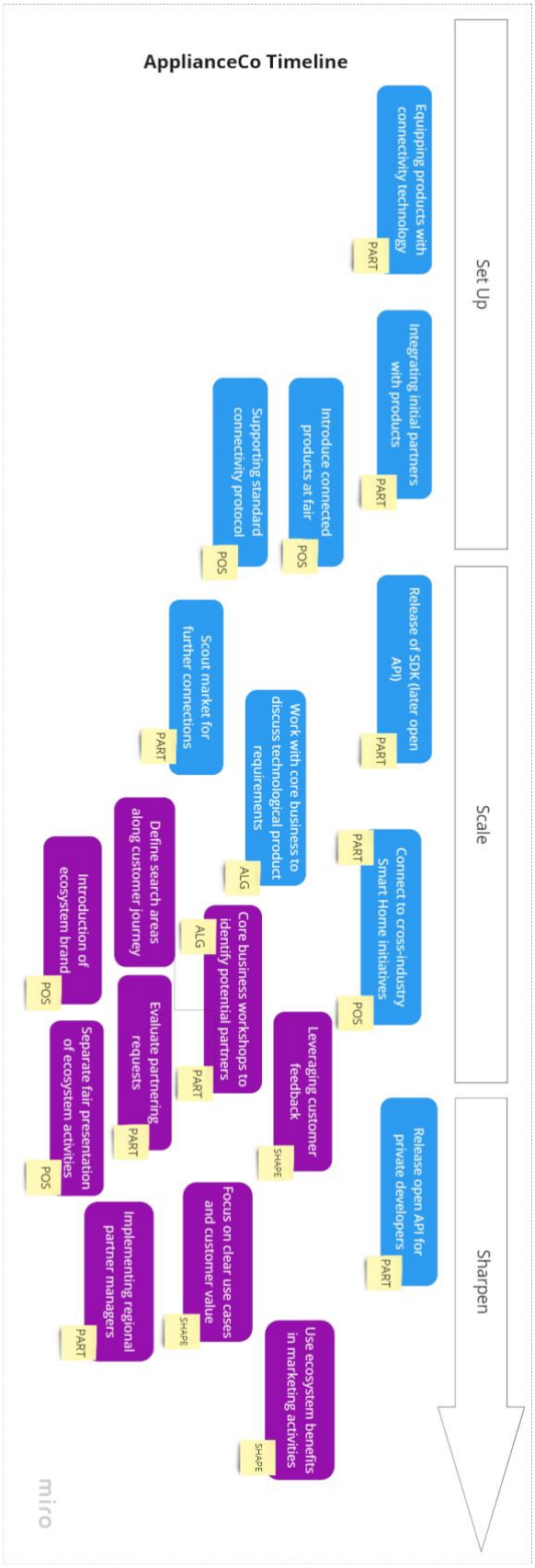
(cf. question 13: joint initiatives such as Matter, Zigbee Alliance, KNX Association)?

Appendix 4: Process visualisations

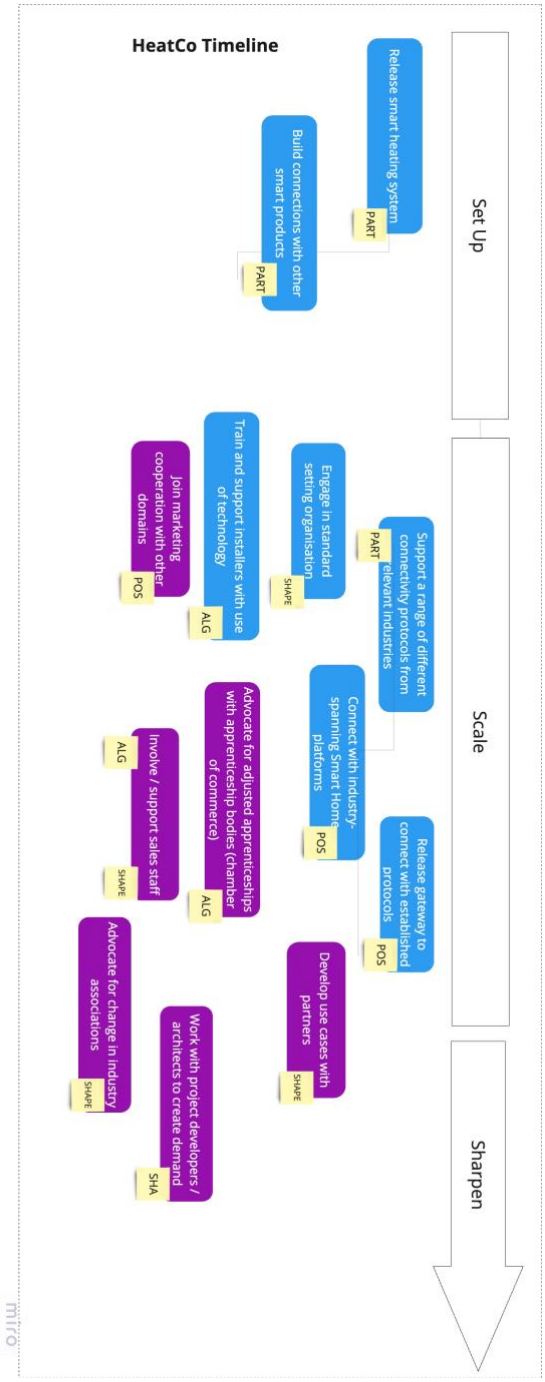
ElectronicsCo



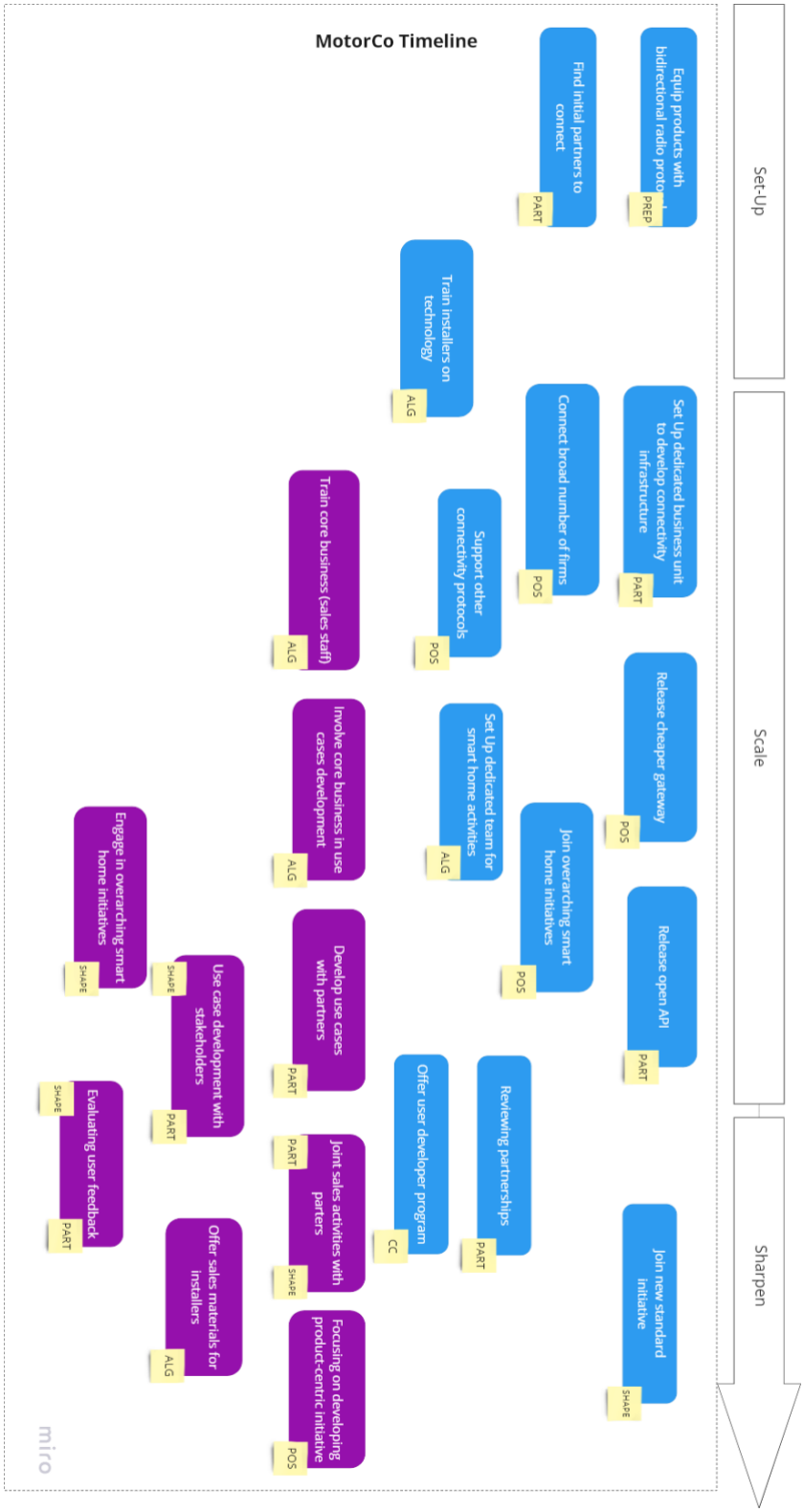
ApplianceCo



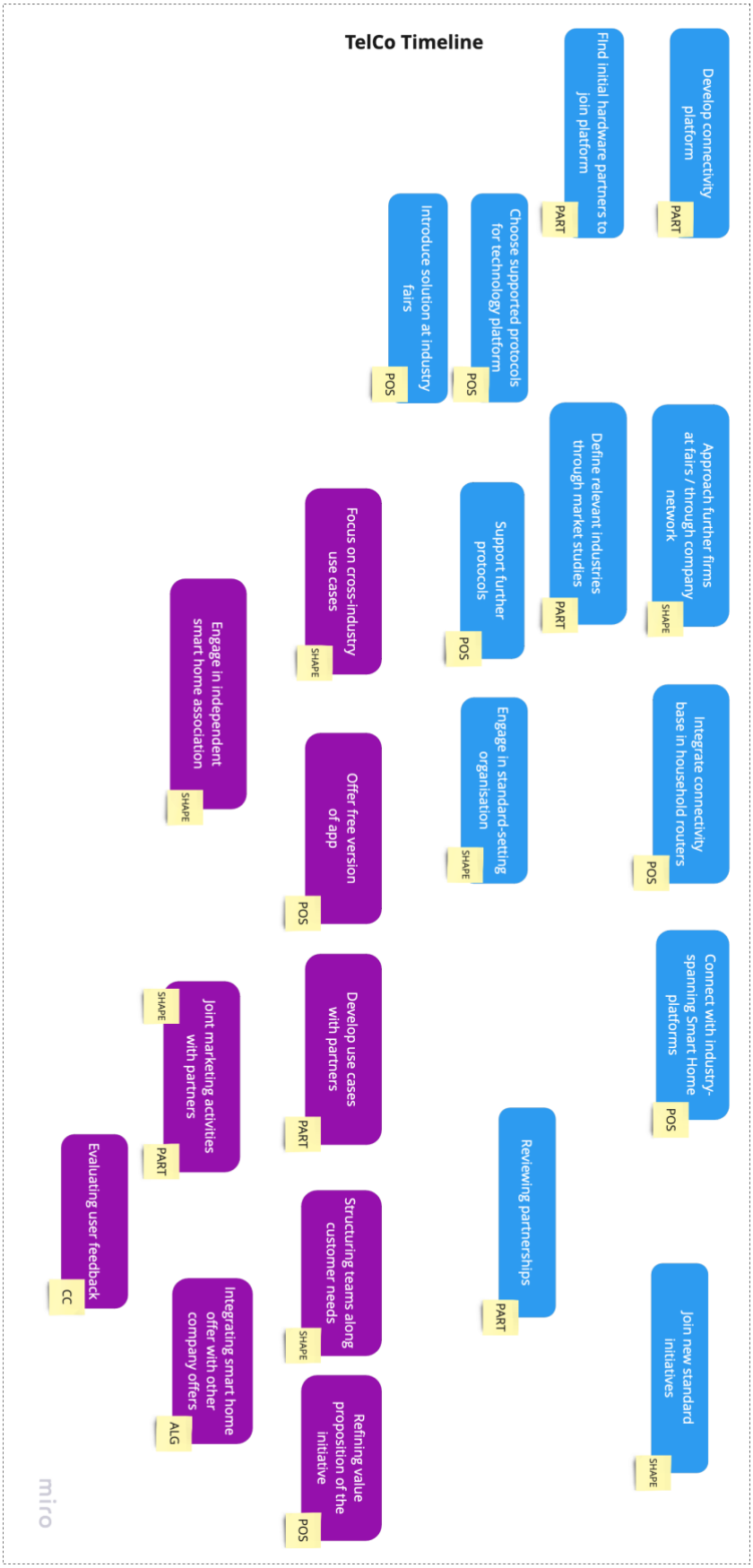
HeatCo


HeatCo Timeline
Set Up
Scale
Sharpen
Release smart heating system
PART
Build connections with other smart products
PART
Support a range of different connectivity protocols from relevant industries
PART
Engage in standard setting organisation
SHAPE
Train and support installers with use of technology
ALG
Join marketing cooperation with other domains
POS
Connect with industry-spanning Smart Home platforms
POS
Release gateway to connect with established protocols
POS
Advocate for adjusted apprenticeships with apprenticeship bodies (chamber of commerce)
ALG
Involve / support sales staff
ALG
SHAPE
Develop use cases with partners
SHAPE
Advocate for change in industry associations
SHAPE
Work with project developers / architects to create demand
SHA
miro

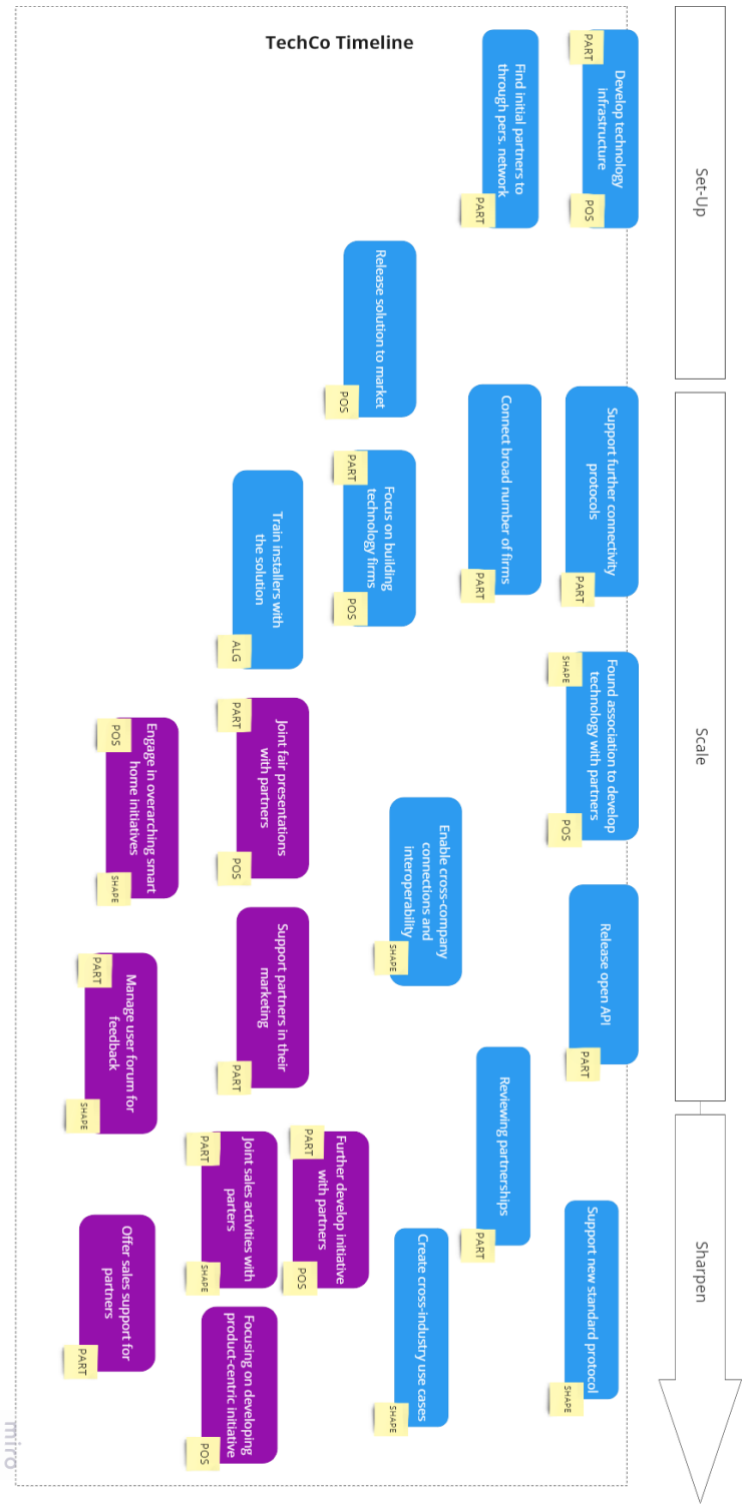
MotorCo


MotorCo Timeline
Set-Up
Scale
Sharpen
Equip products with bidirectional radio protocol
PREP
Find initial partners to connect
PART
Train installers on technology
ALG
Set Up dedicated business unit to develop connectivity infrastructure
PART
Connect broad number of firms
POS
Support other connectivity protocols
POS
Train core business (sales staff)
ALG
Release cheaper gateway
POS
Set Up dedicated team for smart home activities
ALG
Involve core business in use cases development
ALG
Join overarching smart home initiatives
POS
Release open API
PART
Develop use cases with partners
PART
Offer user developer program
CC
Reviewing partnerships
PART
Join new standard initiative
SHAPE
Engage in overarching smart home initiatives
SHAPE
Use case development with stakeholders
PART
Joint sales activities with parters
PART
SHAPE
Focusing on developing product-centric initiative
POS
Evaluating user feedback
PART
Offer sales materials for installers
ALG
miro

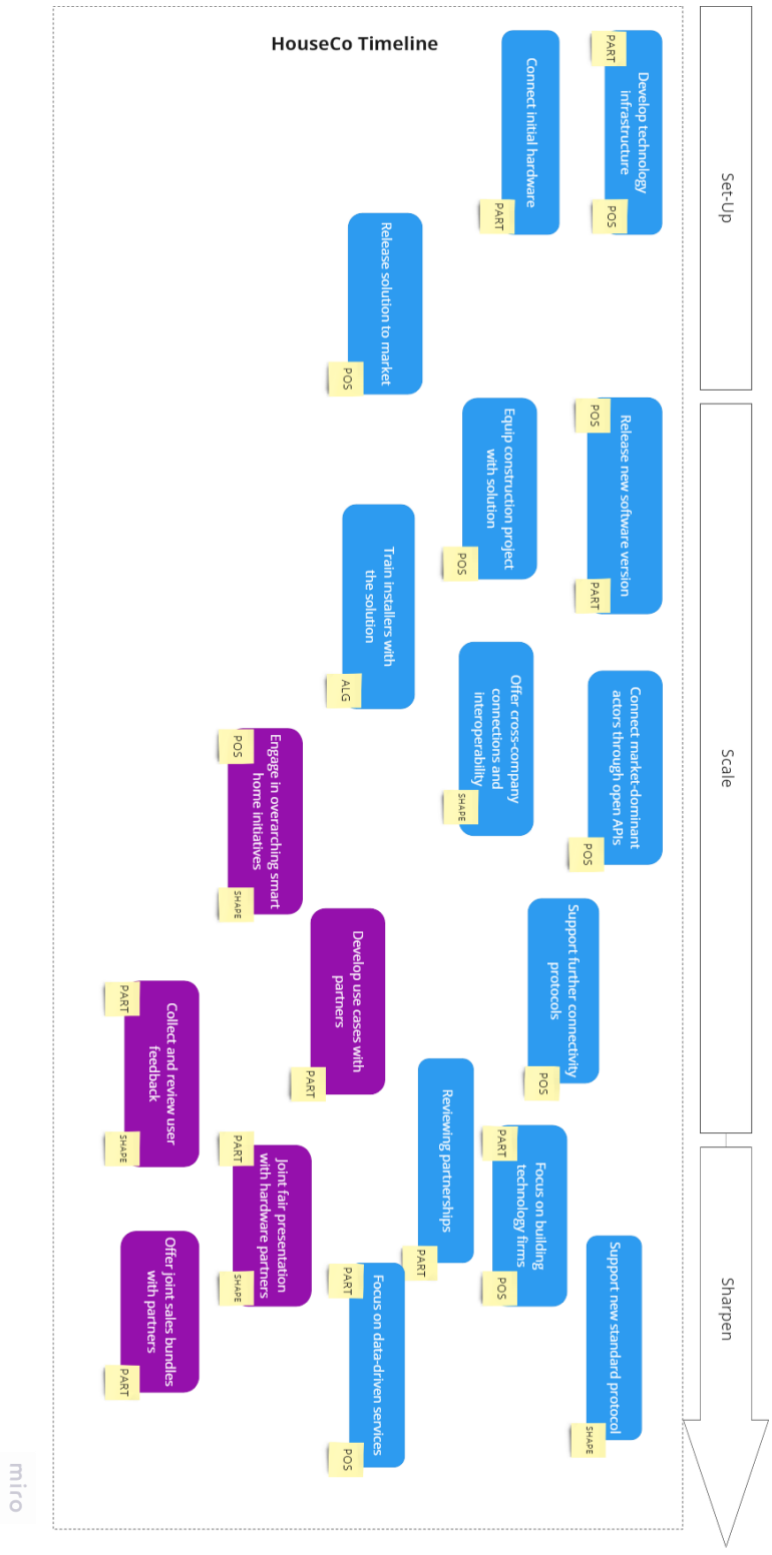
TelCo


TelCo Timeline
Develop connectivity platform
PART
Find initial hardware partners to join platform
PART
Introduce solution at industry fairs
POS
Choose supported protocols for technology platform
POS
Approach further firms at fairs / through company network
SHAPE
Define relevant industries through market studies
PART
Support further protocols
POS
Integrate connectivity base in household routers
POS
Engage in standard-setting organisation
SHAPE
Connect with industry-spanning Smart Home platforms
POS
Reviewing partnerships
PART
Join new standard initiatives
SHAPE
Focus on cross-industry use cases
SHAPE
Engage in independent smart home association
SHAPE
Offer free version of app
POS
Develop use cases with partners
PART
Joint marketing activities with partners
PART
SHAPE
Evaluating user feedback
CC
Structuring teams along customer needs
SHAPE
Integrating smart home offer with other company offers
ALG
Refining value proposition of the initiative
POS
miro

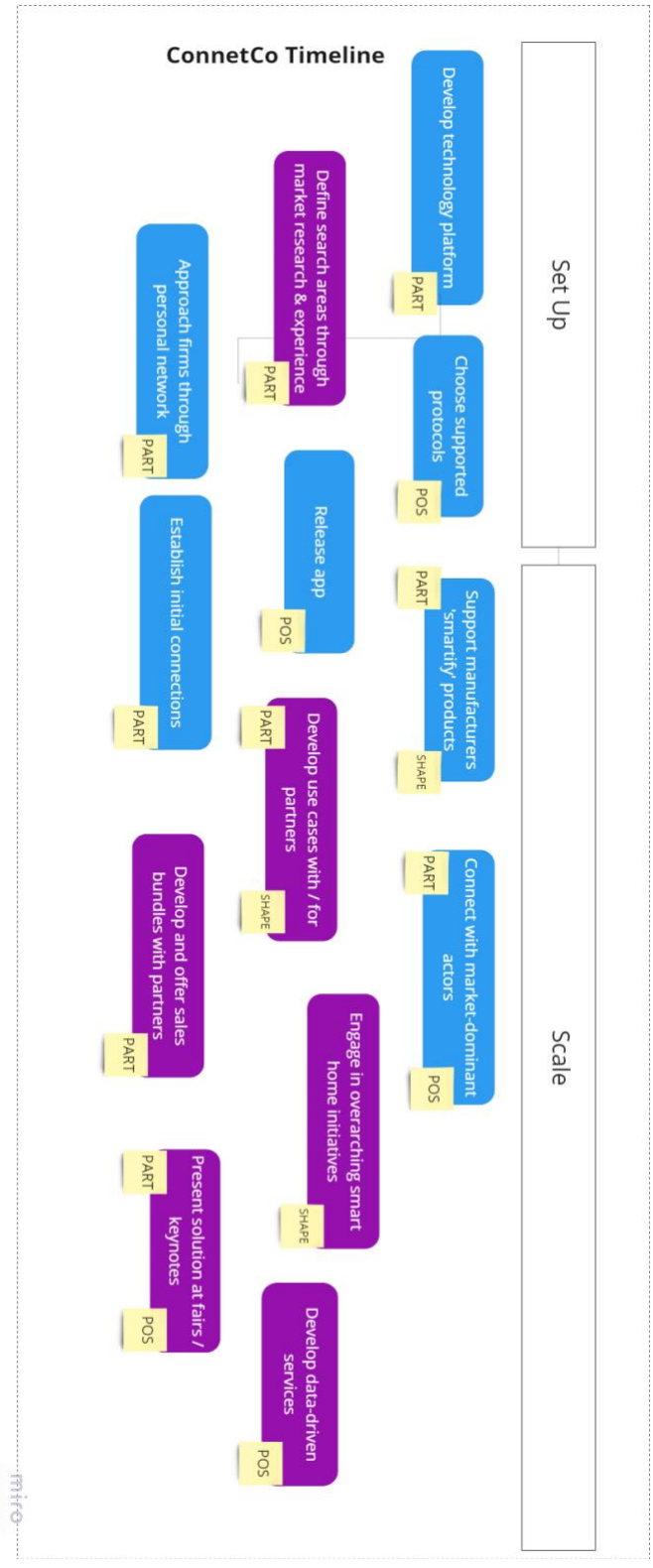
TechCo


TechCo Timeline
Set-Up
Scale
Sharpen
Develop technology infrastructure
POS
Find initial partners to through pers. network
PART
Release solution to market
POS
Support further connectivity protocols
PART
Connect broad number of firms
PART
Focus on building technology firms
POS
Train installers with the solution
ALG
Found association to develop technology with partners
POS
Joint fair presentations with partners
POS
Engage in overarching smart home initiatives
SHAPE
Enable cross-company connections and interoperability
SHAPE
Release open API
PART
Support partners in their marketing
PART
Manage user forum for feedback
SHAPE
Reviewing partnerships
PART
Further develop initiative with partners
POS
Joint sales activities with parters
SHAPE
Create cross-industry use cases
SHAPE
Support new standard protocol
SHAPE
Offer sales support for partners
PART
Focusing on developing product-centric initiative
POS
miro

HouseCo

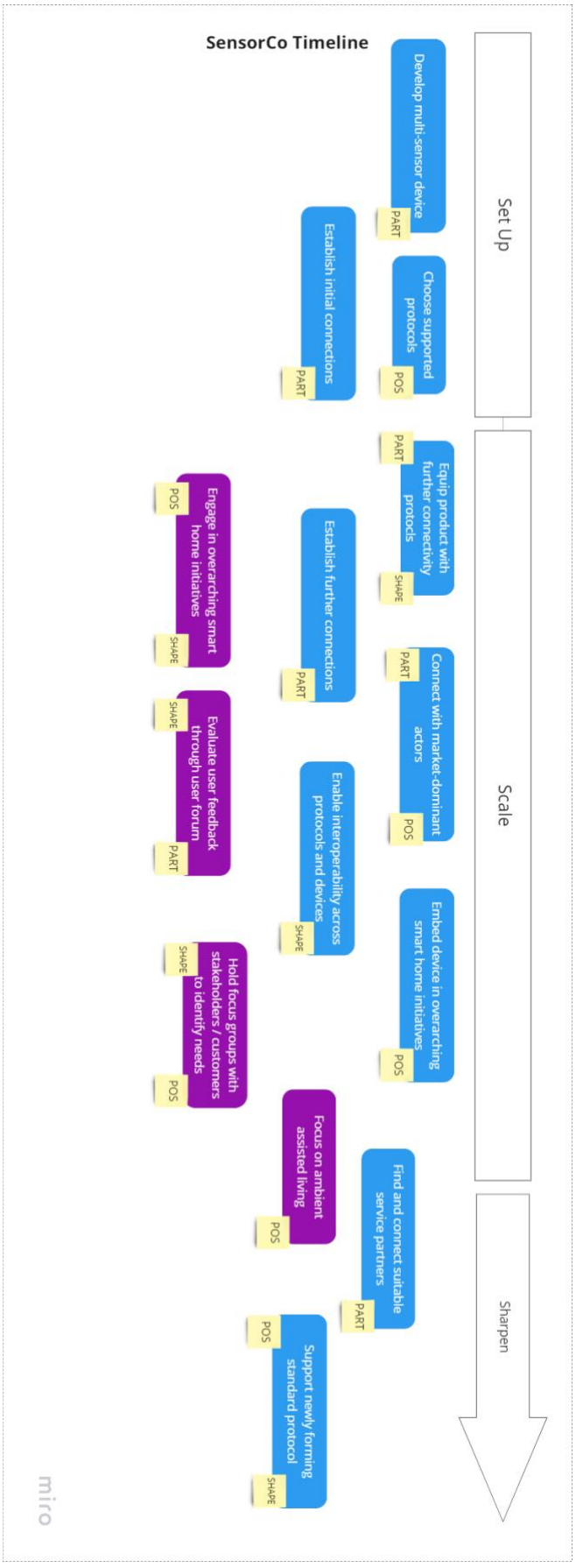

HouseCo Timeline
Set-Up
Scale
Sharpen
Develop technology infrastructure
POS
Connect initial hardware
PART
Release solution to market
POS
Release new software version
POS
PART
Equip construction project with solution
POS
Train installers with the solution
ALG
Connect market-dominant actors through open APIs
POS
Offer cross-company connections and interoperability
SHAPE
Engage in overarching smart home initiatives
POS
SHAPE
Support further connectivity protocols
POS
Develop use cases with partners
PART
Collect and review user feedback
PART
SHAPE
Reviewing partnerships
PART
Focus on building technology firms
PART
POS
Joint fair presentation with hardware partners
PART
SHAPE
Support new standard protocol
SHAPE
Focus on data-driven services
PART
POS
Offer joint sales bundles with partners
PART
miro

ConnectCo



**According to analysis ConnectCo had not yet reached Sharpen Stage, still in Scale Stage*

SensorCo


SensorCo Timeline
Set Up
Scale
Sharpen
Develop multi-sensor device
PART
Choose supported protocols
POS
Establish initial connections
PART
Equip product with further connectivity protocls
PART
SHAPE
Connect with market-dominant actors
PART
POS
Establish further connections
PART
Embed device in overarching smart home initiatives
POS
Enable interoperability across protocols and devices
SHAPE
Engage in overarching smart home initiatives
POS
SHAPE
Evaluate user feedback through user forum
SHAPE
PART
Hold focus groups with stakeholders / customers to identify needs
SHAPE
POS
Focus on ambient assisted living
POS
Find and connect suitable service partners
PART
Support newly forming standard protocol
POS
SHAPE
miro