

Designing Ecosystemic Business Models: Conceptual Foundations and Tool Support

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Preface

Studying for a PhD in information systems and researching business models, ecosystems, and the use of these concepts to solve real-world problems was an incredibly enriching experience. Applying for this PhD in 2019, I embarked on this journey in the belief that it would expand my data analysis skills and present an opportunity to apply the economic knowledge I had gained at the master's level. Six years later, little of this occurred. Instead, perhaps the most important lesson learned during my doctorate is that real progress comes from accepting, facing, and appreciating the journey:

*„Immer halte Ithaka im Sinn.
Dort anzukommen ist dir vorbestimmt.
Doch beeile nur nicht deine Reise.
Besser ist, sie dauere viele Jahre;
Und alt geworden lege auf der Insel an,
reich an dem, was du auf deiner Fahrt gewannst,
und hoffe nicht, dass Ithaka dir Reichtum gäbe.*

*Ithaka gab dir die schöne Reise.
Du wärest ohne es nicht auf die Fahrt gegangen.
Nun hat es dir nicht mehr zu geben.*

*Auch wenn es sich dir ärmlich zeigt, Ithaka betrog dich nicht.
So weise, wie du wurdest, in solchem Maße erfahren,
wirst du ohnedies verstanden haben, was die Ithakas bedeuten.“*

Konstantinos Kavafis, Ithaka (1911)

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Abstract

Today's business world has been transformed by highly connected technologies (e.g., the Internet of Things), where new customer value creation is increasingly realized by more than one organization. As a result, organizations are required to collaborate with partner organizations to create joint value propositions within ecosystems. The development of business models that successfully create, deliver, and capture value while simultaneously serving an ecosystem poses a major challenge for future organizations and for economic growth. However, designing business models pertaining to an ecosystem (i.e., ecosystemic business models) requires a new approach to innovation; thus, an ecosystemic approach to business model design poses a complex challenge that calls for appropriate conceptual foundations and tools to support them.

Although the importance of collaboration within ecosystems is widely recognized, there is currently a lack of conceptual understanding and suitable tools to facilitate the design of business models in this way. Referring to business model tools as conceptual models and formal representations, methods, and IT support, well-accepted examples such as the Business Model Canvas are rather organization-centric and fall short of supporting the design of ecosystemic business models. This requires an examination of the requirements for supporting the design of ecosystemic business models. Accordingly, numerous authors have called for research to explore the concept of business models in the ecosystem context and for new tools that can provide effective support to practitioners to prevent ecosystem failures. This dissertation seeks to contribute to this challenge and advance the conceptual foundations and tool support for integrating ecosystem thinking into business model development.

To pursue this goal, this dissertation presents five studies that make contributions to two areas, namely (1) conceptual foundations of ecosystemic business models, and (2) tool support for designing ecosystemic business models. The first two studies focus on the conceptual foundations, aiming to derive knowledge for improved business model tools. The other three studies focus on identifying, analyzing, reflecting on, and potentially adapting or designing new tools that lie at the intersection of business model innovation and multi-actor ecosystem development. Altogether, the investigation of this topic is of great importance both for research and practice with a view to unleashing the potential of new technologies and supporting the development of a viable and sustainable economy.

Zusammenfassung

Die heutige Geschäftswelt ist durch hochgradig vernetzte Technologien (z. B. das Internet der Dinge) tiefgreifend transformiert worden, wodurch neue Formen der Wertschöpfung für Kunden zunehmend organisationsübergreifend realisiert werden. Infolgedessen sind Organisationen dazu aufgefordert, mit Partnerorganisationen zusammenzuarbeiten, um gemeinsam Wertversprechen innerhalb von Ökosystemen zu entwickeln. Die Entwicklung von Geschäftsmodellen, die Werte erfolgreich erschaffen, vermitteln und erfassen und zugleich den Anforderungen eines Ökosystems gerecht werden, stellt eine zentrale Herausforderung für Organisationen der Zukunft sowie für das gesamtwirtschaftliche Wachstum dar. Die Gestaltung von Geschäftsmodellen im Ökosystemkontext, also ökosystemische Geschäftsmodelle, erfordert jedoch einen neuartigen Innovationsansatz. Ein solcher ökosystemischer Ansatz zur Geschäftsmodellentwicklung ist eine komplexe Herausforderung und erfordert geeignete konzeptionelle Grundlagen sowie unterstützende Werkzeuge.

Obwohl die Bedeutung von Kollaboration in Ökosystemen weithin anerkannt ist, mangelt es bislang an einem fundierten konzeptionellen Verständnis sowie an geeigneten Werkzeugen zur Unterstützung entsprechender Geschäftsmodelle. Unter Geschäftsmodellwerkzeugen werden dabei konzeptionelle Modelle und formale Repräsentationen, Methoden sowie IT-gestützte Werkzeuge verstanden. Etablierte Werkzeuge wie das Business Model Canvas sind primär organisationszentriert ausgerichtet und bieten nur begrenzte Unterstützung bei der Gestaltung ökosystemischer Geschäftsmodelle. Vor diesem Hintergrund bedarf es einer systematischen Analyse der Anforderungen an Werkzeuge zur Gestaltung ökosystemischer Geschäftsmodelle. Entsprechend fordern zahlreiche Autorinnen und Autoren eine vertiefte Erforschung des Geschäftsmodellkonzepts im Kontext von Ökosystemen sowie die Entwicklung neuer Werkzeuge, die Praktikerinnen und Praktikern eine wirksame Unterstützung bieten und dem Scheitern von Ökosystemen vorbeugen. Mit dieser Dissertation soll ein Beitrag zu dieser Herausforderung geleistet werden, indem die konzeptionellen Grundlagen erweitert und die Werkzeugunterstützung zur Integration ökosystemischen Denkens in die Geschäftsmodellentwicklung vorangetrieben wird.

Zur Verfolgung dieses Ziels umfasst diese Dissertation fünf Studien, die Beiträge zu zwei Bereichen leisten: (1) zu den konzeptionellen Grundlagen ökosystemischer Geschäftsmodelle und (2) zur Werkzeugunterstützung bei deren Gestaltung. Die ersten beiden Studien konzentrieren sich auf die konzeptionelle Fundierung, um Erkenntnisse für die

Weiterentwicklung von Geschäftsmodellwerkzeugen abzuleiten. Die weiteren drei Studien widmen sich der Identifikation, Analyse und Reflexion bestehender Werkzeuge sowie der potenziellen Anpassung oder Entwicklung neuer Werkzeuge an der Schnittstelle zwischen Geschäftsmodellinnovation und multi-akteursbasierter Ökosystementwicklung. Insgesamt ist die Untersuchung dieses Themenfelds sowohl für die Forschung als auch für die Praxis von hoher Relevanz, um das Potenzial neuer Technologien zu erschließen und die Entwicklung einer stabilen und nachhaltigen Wirtschaft zu unterstützen.

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Submitted Research Papers that Form Part of this Dissertation

1. Vorbohle, C., Szopinski, D., and Kundisch, D. (2021). “Toward Understanding the Complexity of Business Models – A Taxonomy of Business Model Dependencies,” *Proceedings of the 29th European Conference on Information Systems (ECIS)*, Virtual (https://aisel.aisnet.org/ecis2021_rp/128/).
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1. Engels, G., Gottschalk, S., Kundisch, D., Vorbohle, C., and Wunderlich, N.V. (2023). “Subproject C5: Architectural Management of OTF Computing Markets,” in: *On-The-Fly Computing – Individualized IT-services in dynamic markets* (pp. 203–224). Paderborn: University Library Paderborn (<https://doi.org/10.5281/zenodo.8068691>).
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Synopsis

1. Introduction and Motivation

In the future, I believe the key problem for organization design will be the management of distributed innovation in [...] dynamic ecosystems. Specifically, how should diverse entities be integrated into a coherent network that generates goods in the present and new designs for the future?

Carliss Y. Baldwin, Professor at the Harvard Business School (Baldwin 2012, p. 20)

The rise of digital technologies over the last few decades, including smart mobile devices and social media platforms, has fundamentally altered the creation, delivery, and consumption of products and services (Hess et al. 2024). These technologies create changes that are both pervasive and disruptive, a phenomenon touted as the digital transformation of the business world (Vial 2019). This transformation extends far beyond increasing efficiency through digitizing individual processes; it alters how organizations operate in general and enables new digital offerings that respond to evolving customer needs (Matt et al. 2015).

To thrive in the context of digital transformation, organizations require suitable business models to successfully commercialize digital technologies and, in some cases, disrupt entire industries (Hess et al. 2024; Kohtamäki et al. 2025). From this viewpoint, digital technologies are a means to an end and only become valuable when a “great business model” leverages them (Chesbrough 2010). A business model generally describes the focal business logic of an organization in achieving its goals (Massa et al. 2017). This business logic is often specified as the way in which an organization “creates and delivers value to customers, and then converts payments received to profits” (Teece 2010, p. 173). Innovating a business model involves organizing business logic in new ways, which in turn entails designing novel changes to key elements in a targeted and coherent manner, regardless of whether the model is being redesigned or newly formed (Foss and Saebi 2017). A prominent example is Airbnb’s digital platform-based business model, which has profoundly transformed the hospitality industry since its foundation in 2007 by redefining how accommodation services are created, delivered, and captured (Guttentag 2015).

Since researchers introduced the concept of the business model in the late 1990s, it has gained widespread adoption across multiple management disciplines, including strategic management, marketing, and information systems (IS; Alt 2020). For the last of these, it has become an important conceptual lens for various research endeavors related to business technology; thus,

it offers an important contribution to understanding how digital technologies can provide business value, and is considered a mediating concept between technological innovations and attaining strategic goals, as well as a bridge for aligning an organization's strategy and its business processes, including IS (Al-Debei and Avison 2010). The concept of the business model, therefore, has expanded the view of IS research from understanding and advancing IS to an integrated perspective of the whole business, up to and including strategically relevant questions (Veit et al. 2014).

Within the IS discipline, several authors have interpreted business models as formal conceptual representations (see Massa et al. 2017) and have highlighted the use of tool support for developing business models, as seen in Osterwalder et al. (2005), Osterwalder and Pigneur (2013), Veit et al. (2014), and Alt and Zimmermann (2014). These calls for research have produced a lively, ongoing stream of IS research under the title of business model tooling (Bouwman et al. 2020; Schwarz and Legner 2020). This literature has encouraged researchers to investigate the landscape and the value of visual representations (e.g., Szopinski et al. 2022), software tools (e.g., Szopinski et al. 2020), and classification tools such as taxonomies (e.g., Schoormann et al. 2023) for business model innovation. Moreover, it has yielded the development of widely adopted tools, such as the Business Model Canvas (BMC; Osterwalder and Pigneur 2010) and the Business Model Navigator (Gassmann et al. 2014), and has supported core contributions for understanding and developing the business models of new technologies and developing industries (e.g., Giessmann and Legner 2016).

Apart from its relevance to researchers, the concept of the business model and its applicable tools help practitioners depart from traditional business approaches and instead utilize innovative ways to create, deliver, and capture value for their organizations (Schwarz and Legner 2020). This support is perhaps more necessary today than ever. Since the launch of ChatGPT in 2022, generative artificial intelligence (GenAI) has been transforming organizations and their underlying business models, just as the internet did around the turn of the millennium (Feuerriegel et al. 2024). Consequently, the business world is expected to undergo significant changes in the coming years (Nellis 2024). A McKinsey study from 2025 highlights that nearly 50% of more than 1,000 executives “report that they will need to significantly innovate their current business models to remain financially viable over the next three years” (Banholzer and Koller 2025, para. 7).

These recent technological advancements – including GenAI, cloud computing, blockchains, the metaverse, and the Internet of Things (IoT) – and upcoming ones, such as quantum

computing and on-the-fly computing, are dissolving organizational boundaries, thereby forcing them to connect with each other by specializing in specific value-creating activities, and accelerating in value co-creation (Baldwin et al. 2024; Karl et al. 2020; Kohtamäki et al. 2024; Liu et al. 2025). In such an increasingly specialized and digitally connected business world, organizations shift their focus from producing standardized products and services toward (smart) customized solutions (Randhawa et al. 2021; Sjödin et al. 2020). While the solutions themselves may appear to be straightforward from a customer perspective (e.g., a simple graphical interface with a chatbot), delivering them requires the coordination and alignment of different organizations to create a focal (joint) value proposition (Kohtamäki et al. 2022; Wang 2021). For example, in the context of on-the-fly computing (i.e., the provision of individualized IT services through largely automated configuration and execution), different organizations such as component providers, service providers, and infrastructure providers would provide complements for the requested IT service, and combining them to create a focal value proposition for the end customer (Karl et al. 2020).

This trend is observable not only in business-to-consumer (B2C) markets, but also in business-to-business (B2B) markets, where business customers demand solutions such as “pay per part” in lieu of conventional machine ownership (TRUMPF 2020). Indeed, most studies on digital transformation recognize that, to foster digital innovation, organizations have to collaborate with other actors (Kohtamäki et al. 2025; Vial 2019). Digital transformation and the utilization of advanced technologies to deliver customized, solution-based offerings often outgrow the resources and capabilities of a single organization. Consequently, collaboration between multiple organizations from different industries is required to combine their resources and capabilities in a so-called “business ecosystem” (Kohtamäki et al. 2019; Oberländer et al. 2024; Wang 2021).

The term business ecosystem has emerged in analogy to biological ecosystems to clarify coopetition, and has become the established term used to describe collaboration in the digital age (Hou and Shi 2021; Lingens 2023). Recent research on the structural elements of ecosystems goes beyond simply describing collaborative organizations, however. Rather, it represents a distinct concept and emphasizes the joint creation of value propositions (Adner 2017) based on the multilateral and non-generic complementarities of various organizations that cooperate without hierarchical power structures (Jacobides et al. 2018).

This ecosystem-as-structure perspective shifts the focus from the success of a single business model to that of its entire ecosystem. As a result, organizations are shifting away from an

isolated, intra-organizational perspective on business model innovation to an ecosystemic, inter-organizational perspective (Dehkordi et al. 2024; Iivari et al. 2016; Sun et al. 2025). The utilization of IoT for autonomous shipping is an example of an ecosystem that spans previously unconnected industries, thereby providing opportunities for new value creation (Tsvetkova and Hellström 2022). It also highlights how, in a business environment of increasingly specialized and digitally connected organizations, failing to expand the focus to include ecosystem partners results in failure (Adner 2021). In line with this, an ecosystemic business model “focuses on both the way an organization creates and captures value, and on how the ecosystem creates and captures value to deliver a joint value proposition to customers” (Vorbohle and Kundisch 2024, p. 103). This, in turn, requires organizations to think differently and to redesign existing business models because an intra-organizational business model is no longer an adequate unit of analysis (Massa 2024).

However, translating this conceptual shift into practice is far from straightforward because organizations face multiple challenges concerning the design of such ecosystems (Fuller et al. 2019; Jacobides et al. 2024a). Practitioners struggle to define the influences of their business models on other participants, and vice versa, because they are used to thinking within their organizational boundaries (Reeves et al. 2019). In addition, as Gillian Tett explains in “The Silo Effect,” working in highly specialized areas makes collaborating even more challenging (Tett 2015). In a BCG Henderson Institute simulation case study, managers across multiple companies consistently struggled most with ecosystem strategy – only 18% succeeded in simulated competition against a simulated (AI) opponent, while 71% succeeded in the classical strategy (Fuller et al. 2019). Although the majority of executives (84%) recognize the importance of ecosystems for their strategies (Lyman et al. 2021), among organizations that have established an ecosystem, only 10% have gained sufficiently in growth, that is, generated more than 5% of company revenue from ecosystem engagements (Chung et al. 2020). In line with these findings, less than 15% of the 57 ecosystems analyzed by Reeves et al. (2019) could be sustained over time.

Interestingly, the failure of most ecosystems (85%) is primarily attributable to bad design choices rather than poor execution (Pidun et al. 2020). By comparison, start-up failure rates are similar, ranging from 70% to 90% depending on the industry and country. However, the reasons differ. Start-ups mainly fail because of financing issues or a lack of customer demand (CBInsights 2021). In contrast, ecosystem failures are most often the result of collaboration issues, such as poorly coordinated governance decisions (e.g., levels of co-specialization) or a

misaligned ecosystem configuration (e.g., incompatible value creation mechanisms; Pidun et al. 2020). For example, the tire manufacturer Michelin failed to recognize that car repair shops had no incentive to adapt to its new run-flat tire ecosystem, which led to its subsequent downfall (Adner 2017). Similarly, Jacobides et al. (2024a) have analyzed the Metaverse's lack of success and have ascribed it to conflicting interests and collaboration issues among dominant tech players. Such failures underscore the importance of proper ecosystem design. Ecosystems provide enormous potential for leveraging digital technologies (Oberländer et al. 2024) and developing sustainable economies (Schoormann et al. 2024). This leads to the overarching motivating question that guided my doctoral dissertation:

How can organizations be supported in designing a successful ecosystemic business model?

For the purpose of research, this very broad question had to be broken down conceptually and then divided into smaller, more manageable aspects and sub-questions. Ecosystems have ecosystemic business models as their underlying business infrastructure (Snihur and Bocken 2022). The ecosystem perspective requires a multi-actor assessment of how value is created, delivered, and captured, that is, an evaluation of whether a viable business model is established for each ecosystem participant (Adner 2017; Khademi 2020). The challenges of designing successful ecosystemic business models, and the importance of doing so, present a crucial practical issue as well as the potential for important research contributions. To make meaningful contributions in the field of IS research, I have employed a decomposition approach to divide the motivational research question, with its conceptual focus on business models, into two distinct research areas. The following introduces these areas and poses research questions that serve as the basis for my research.

Research Area 1: The Conceptual Foundations of Ecosystemic Business Models

Adopting an ecosystem-as-structure perspective requires conceptual reflection on the current role of the business model as a tool for aligning digital businesses that connects organizational strategy and business processes (Al-Debei and Avison 2010). To facilitate the systematic design of ecosystemic business models, further research is needed to clarify the conceptual foundations that distinguish them from intra-organizational business model design and to provide the necessary knowledge to understand the solution space and derive requirements for tool support.

In addition, as the concept of the business model emerged, many researchers investigated its constituent elements (e.g., Osterwalder et al. 2005), which has led to a deeper understanding

of how to analyze and innovate business models. For instance, Günzel and Holm (2013) have proposed four primary business model building blocks (value proposition, value creation, value delivery, and value capture), which have been employed to analyze and describe various business models across different industries.

However, despite the steadily growing interest in business models across disciplines, and despite ongoing contributions to our understanding of their underlying elements, there is still no consensus about the constituent elements of business model dependencies (Foss and Saebi 2017; Massa et al. 2017; Wirtz 2020). A detailed understanding of these dependencies is necessary to design more successful ecosystemic business models, as ecosystems emphasize the importance of dependencies between business models. Based on these gaps in existing knowledge, the first area of study in this dissertation aims to address the underlying research objective by raising the following question:

RQ1: What is the conceptual foundation of ecosystemic business model design?

Research Area 2: Tool Support for Designing Ecosystemic Business Models

Business model tooling (i.e., conceptual models and formal representations, methods, and IT support) is an important pillar in addressing the needs of digital businesses and supporting business model design (Schwarz and Legner 2020). These tools, separately and in combination, serve as boundary objects for knowledge-sharing and communication between different stakeholders (Bouwman et al. 2020). Research on cognition and business models indicates that business model tools help reduce cognitive biases, enhance ideation, increase business model coherence, and influence managers' decision-making (Massa and Hacklin 2020; Shepherd et al. 2023).

Visual representations have evolved to portray the core elements of a business model and are considered a promising approach to guiding their innovation process. For example, business model taxonomies can create an empirical understanding of how business models work in a particular industry and provide guidance for improvements (Möller et al. 2021). In addition, previous studies in the domains of IS, management, and computer science have proposed and developed several modeling languages to understand, communicate, and analyze business models (Szopinski et al. 2022). The most prominent of these is the BMC, which structures a single business model using a framework consisting of nine building blocks (Osterwalder and Pigneur 2010).

However, to design ecosystemic business models, organizations face multiple challenges that differ from designing business models that are not part of an ecosystem (Vorbohle and Kundisch 2024). These challenges call into question the predominant tools for business model innovation (Massa 2024; Turetken et al. 2019). The most widely used tools tend to focus on representing and innovating the business model from the perspective of a focal organization (aligning strategy and business processes) rather than focusing on joint value propositions, complementarities, and dependencies (Demil et al. 2018; Westerlund et al. 2014) .

For example, while the BMC and its various adaptations provide useful support for developing business models from the perspective of a single organization, they are less suited to enabling managers to reframe their beliefs on joint value creation and generate creative, viable business model ideas in ecosystemic contexts (Turetken et al. 2019). Loss and Crave (2011) have argued that the BMC is mainly applicable to individual organizations, as it assumes a linear value chain for the production, delivery, and capture of value.

Therefore, although it is assumed that business model tools impact the design of business models (Shepherd et al. 2023), applying today's most common business model tools to the context of ecosystems is not only challenging, but may even hinder rather than enhance collaboration (Turetken et al. 2019). This could have serious consequences as, for example, Zuzul (2019) has shown that using inappropriate boundary objects for cross-organizational collaboration leads to various conflicts and that the selection of boundary objects should be carefully managed and evaluated.

Although using universal tools to design business models may be tempting, such an approach risks oversimplifying the complex reality of today's business world. Business models vary widely in form, context, and purpose, and designing them is an inherently multifaceted process. Consequently, "designing business models necessitates specialized design tools and methodologies tailored to meet the unique structural and functional requirements of different instances of business models (e.g. ecosystemic, sustainable)" (Massa 2024, p. 6). It is essential, therefore, to identify, analyze, reflect on, and potentially adapt or design new tools that require further research (e.g., design-oriented research) to support ecosystemic business model design. This leads to the second research question:

RQ2: How can business model tool support be designed to meet the requirements of ecosystemic business models?

This dissertation addresses the above research questions by presenting five studies. Studies 1 and 2 address Research Area One and advance knowledge on conceptual foundations to improve business model tools. Studies 3, 4 and 5 address the specific research gaps in Research Area Two.

The first study in this dissertation (Vorbohle et al. 2021) investigates business model dependencies by developing a taxonomy based on a literature review and 14 business modeling languages, and drawing on 95 real-world examples of business models. The resulting taxonomy consists of 13 dimensions and contributes to business model research and progress on business model modeling languages.

In Study 2 (Vorbohle and Kundisch 2024), we analyze a real-world example of an ecosystem from the maritime logistics industry and derive five significant design challenges for ecosystemic business models. We then reflect on and discuss the extended role of the business model as an instrument for inter-organizational alignment and identify three implications and multiple functional design requirements for business modeling tools.

To address Research Question 2, Study 3 (Althaus et al. 2025) develops a business model taxonomy of cultural event platforms that could participate in an emerging cultural data ecosystem. We perform a cluster analysis to derive cultural event platform business model archetypes, and conduct interviews with representatives of these archetypes about the benefits and obstacles in an emerging cultural data ecosystem, which allowed us to also derive potential focal value propositions for the ecosystem. Hence, this paper contributes to the data ecosystems literature by providing industry-specific insights into how emerging data ecosystems can be developed with the help of business model taxonomies and qualitative insights¹.

Study 4 (Ksouri-Gerwien and Vorbohle 2025) develops and evaluates an actor-based modeling framework for quantitative business model prototyping and evaluation using system dynamics that explicitly incorporates the ecosystem perspective through an action design research approach. It contributes to the body of knowledge on business model innovation in ecosystems, particularly regarding quantitative prototyping and evaluation prior to market implementation.

¹ See Section 5 for a reflection on the methodological contribution of this paper.

Finally, in Study 5 (Vorbohle 2025), I investigate how visual inquiry tools can be enhanced to better support the collaborative design of ecosystems. I present the results of an observational design science research project that identifies and analyzes nine visual inquiry tools and develops key design knowledge in the form of six design principles and 16 design features to mitigate collaboration challenges among ecosystem partners. The study contributes to design knowledge on visual inquiry tools, contextualizing this knowledge for the context of ecosystemic business model design.

This synopsis is structured as follows. Section 2 describes the conceptual basis for the studies of this dissertation. In Section 3, I review important knowledge on business model innovation, multi-actor ecosystem development, and business model tooling, and present a conceptual model to describe the research focus and position the five research gaps addressed. Section 4 provides an overview of each study in this dissertation, as well as additional information on the individual contributions of all co-authors and the associated scientific presentations and publications. In Section 5, I reflect on the research methodologies employed. Lastly, Section 6 includes the contribution and implications, outlines the limitations of the research, suggests avenues for future research, and presents concluding remarks. Figure 1 provides a visual representation of the structure.

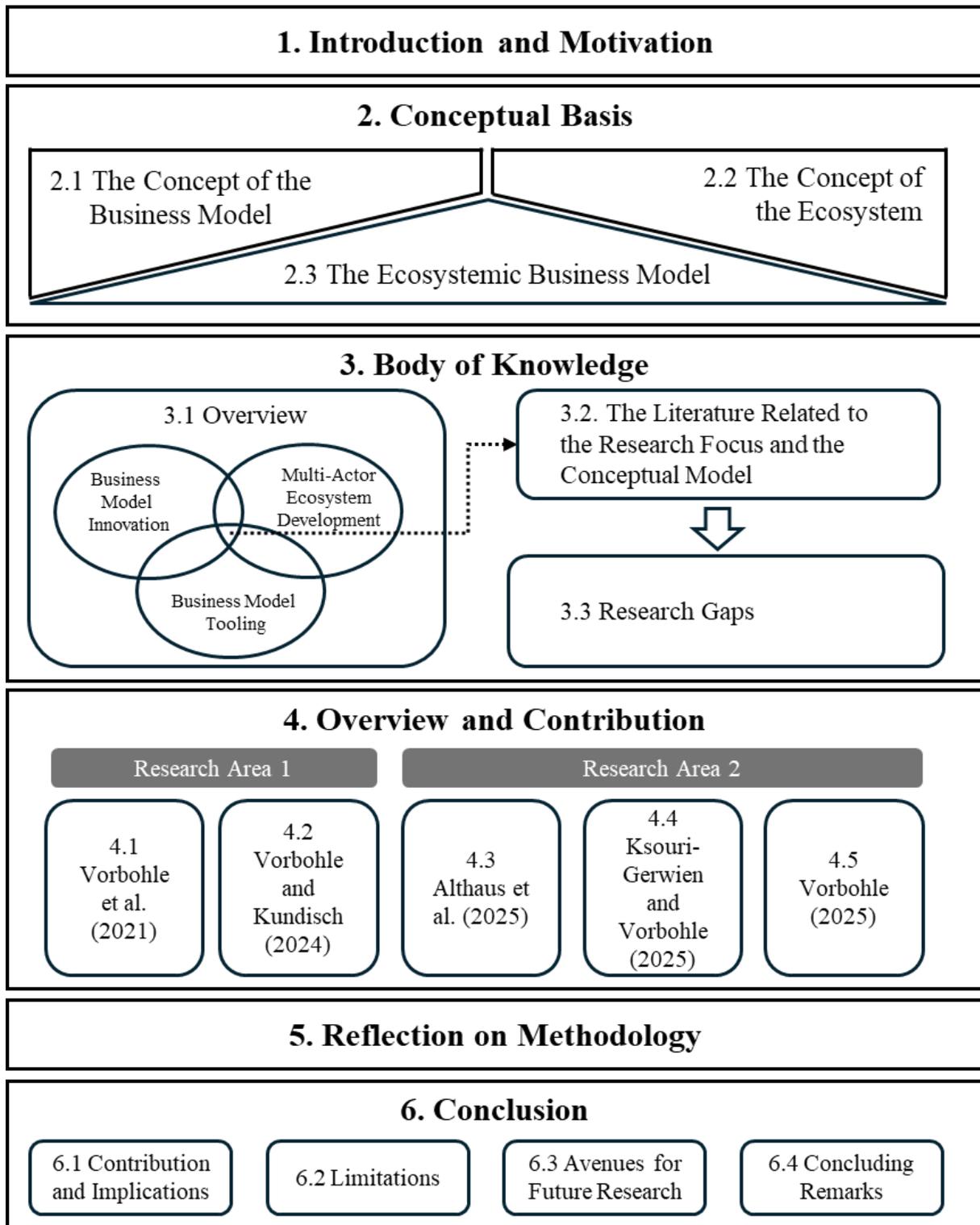


Figure 1. Overall structure of the synopsis

2. Conceptual Basis²

2.1 The Concept of the Business Model

With the advent of personal computers and the emergence of internet-based companies in the 1990s, the concept of the business model emerged as a key topic in conversations about e-business opportunities and their exploitation (Wirtz et al. 2016). For instance, when internet companies such as Yahoo and Google emerged, they leveraged new technologies to provide users with a simpler way to search for and access information. This also created new business model opportunities by enabling advertisers to target potential customers more personally (Wirtz 2020).

The new opportunities for e-businesses in creating, delivering, and capturing value in new ways have not only caught the attention of entrepreneurs and managers, but have also sparked a strong interest in business models among academics (Osterwalder et al. 2005). While the term “business model” first appeared in a 1957 study by Bellman et al. (1957), it was rarely used before the Internet boom (Osterwalder et al. 2005). Research on business models conducted at the end of the 1990s and during the first decade of the twenty-first century was motivated by the desire to explain the phenomenon of e-business and to understand the new technological avenues for how businesses could operate; however, a profound, meaningful understanding of the concept was often lacking (DaSilva and Trkman 2014). Hence, business models at that time were seen as “one of the great buzzwords of the Internet boom, routinely invoked [...] to glorify all manner of half-baked plans” (Magretta 2002, p. 86), and strategy researchers criticized them as “an invitation for faulty thinking and self-delusion” (Porter 2001, p. 73).

Since then, business model research has grown rapidly as a research field, as is evident in the number of scientific articles in IS research (Figure 1) and the existence of the *Journal of Business Models* (Nielsen et al. 2014). This interest is evidence for, on the one hand, the concept’s usefulness for analyzing and innovating organizations (Foss and Saebi 2017), and, on the other, the efforts invested in understanding and formalizing the term (Al-Debei and Avison 2010; Massa et al. 2017).

² The concepts presented in this section represent the conceptual foundation for the contributions of Vorbohle et al (2021), Vorbohle and Kundisch (2024), Althaus et al. (2025), Ksouri-Gerwien and Vorbohle (2025), and Vorbohle (2025). They therefore show similarities in content.

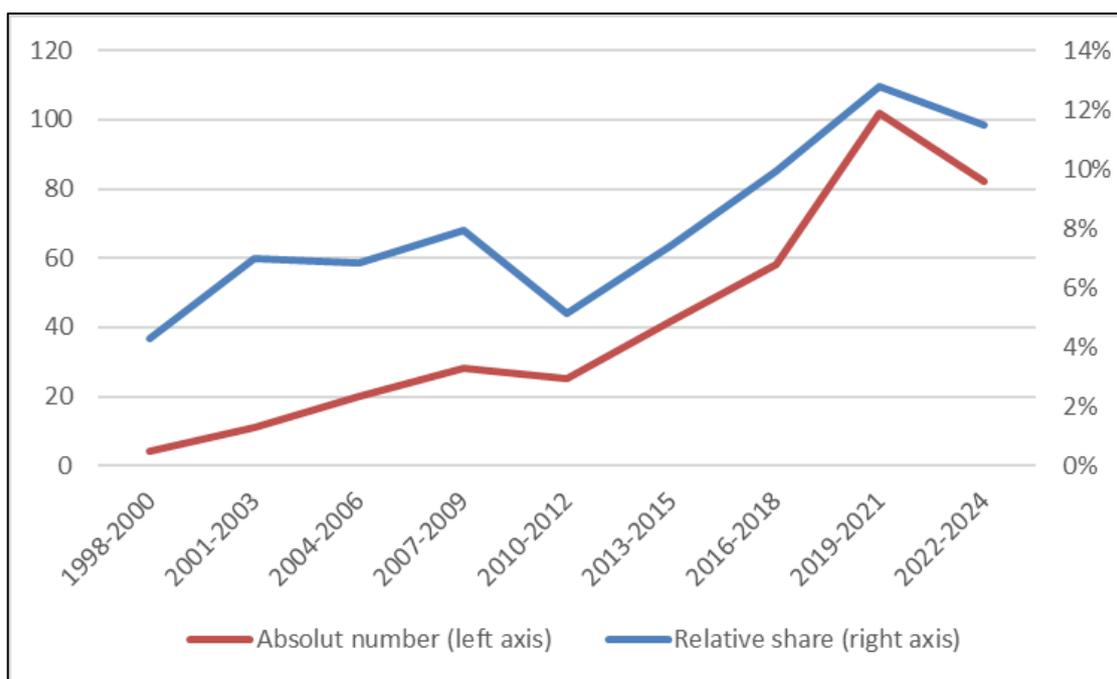


Figure 2. Number and relative share of business model publications in leading IS journals³

According to one of the earliest definitions published in the IS community, a business model is “an architecture of the product, service, and information flows, including a description of the various business actors and their roles” (Timmers 1998, p. 4). Over time, studies across disciplines have proposed a plethora of definitions. This has created confusion and disagreement among scholars about the term’s meaning and usage (Fielt 2014). In a critical review of the business model literature, Massa et al. (2017) investigate 71 original definitions of business models. They found that the concept’s evolution can be divided into three broad interpretations that focus on (1) the attributes of real organizations, (2) cognitive or linguistic schemas, and, situated between these two viewpoints, (3) formal conceptual representations (see Table 1 for examples of interpretations).

In the first realm of real organizations’ attributes, business models are interpreted as observable phenomena that can be grouped (e.g., by using a business model pattern) and empirically investigated to derive recommendations for managers. For example, business models that incorporate novel elements into their design perform better than those that do not (Zott and Amit 2007).

³ Data from the Web of Science database. Business model publications are defined by whether the term business model appears in the title, abstract, or keywords. Leading IS Journals defined by VHB-Rating 2024 \geq B. Relative share defined as business model publications divided by the number of publications that contain the term “business” in the title, abstract or keywords.

In the second realm of cognitive or linguistic schemas, researchers examine how an organization's staff members interpret its business practices. Research using this interpretation focuses on, for example, how managers' mental representations shape the decision-making process about changes to business models (Shepherd et al. 2023) and how these mental representations could create inertia regarding innovation (Tripsas and Gavetti 2000). Hence, in comparison to the first interpretation, "business models in this interpretation are not fixed attributes of the firm, but instead reside in managers' heads" (Massa et al. 2017, p. 83), and are seen as implicit narratives that create a shared understanding.

In the third realm of formal conceptual representations, business models are interpreted as explicit representations. Here, business models simplify real-world complexity by visualizing only the necessary elements for a specific design purpose, enabling firms to map various possibilities before deciding upon their implementation (Chesbrough 2010). Hence, researchers use this interpretation to reduce the complexity of business models through representations that transform tacit knowledge into tangible artifacts (e.g., the BMC), which serve as boundary objects for communication and alignment.

Table 1. Examples of business model definitions for each interpretation

Business Model Interpretation (acc. to Massa et al. 2017)	Exemplary Business Model Definition
(1) Business models as attributes of real organizations	" <i>the way</i> firms do business, creating and capturing value within a value network" (Roome and Louche 2016, p. 14)
(2) Business models as cognitive or linguistic schemas	" <i>stories</i> that explain how enterprises work" (Magretta 2002, p. 4)
(3) Business models as formal conceptual representations	"the <i>blueprint</i> of how a company does business" (Osterwalder et al. 2005, p. 2)

While some definitions may be applicable to more than one of these three interpretations, and different interpretations have been used to achieve similar research objectives, these categories have helped to accumulate knowledge more systematically and to clarify the usefulness of the concept within each interpretive realm. For example, based on grounded cognition theories, Shepherd et al. (2023) have advanced the understanding of how formal conceptual representations and cognitive schema interact to increase business model coherence, and impact decisions about changing a business model.

However, due to differing interpretations, no single definition of a business model is universally accepted (Wirtz 2020). Broadly, a business model “is a description of an organization and how that organization functions in achieving its goals” (Massa et al. 2017, p. 73). In addition, according to Foss and Saebi (2017), most definitions in the current literature are consistent with that of David J. Teece, according to which a business model is “the design or architecture of the value creation, delivery, and capture mechanisms” of an organization (Teece 2010, p. 172). Therefore, researchers mostly agree on five main elements of a business model: (1) the value proposition describing how the product or service benefits potential customers, (2) the customer or market segments the organization addresses with its value proposition, (3) the value creation mechanisms to realize the value proposition, (4) the value capture mechanisms that generate profit, and (5) the architecture explaining how the different elements connect to each other (Saebi et al. 2017).

For my dissertation, I follow this consensus and adopt the definition proposed by Snihur and Markman (2023), which builds upon the definition of Teece’s (2010) but is expanded to encompass aspects relevant beyond the confines of an organization: “A business model is a blueprint that outlines how an organization creates value, generates revenue, delivers offerings, and even interacts with its direct stakeholders (employees, customers, suppliers) and indirect stakeholders (rivals, regulators, community)” (p. 1). Hence, the definition adopted here aligns with the third interpretation of business models, which views them as formal conceptual representations.

Having outlined the term “business model”, I now describe the concept’s main function and its differences from adjacent concepts. Digital transformation has changed the view of IS research from simply developing a suitable IS to creating an integrated description and analysis of an entire business (Vial 2019). Therefore, especially in the IS research community, the business model is often seen as a necessary intermediary between an organization’s overall strategy and the more specific operational design of business processes and IS (Al-Debei and Avison 2010; Veit et al. 2014). The business model is thus recognized as a distinct concept and a bridge (i.e., a conceptual tool of alignment) between strategy and business processes. This results in two main boundaries for organizations to consider (Al-Debei and Avison 2010):

- 1) *Strategy to business model*: While strategy involves a future vision – especially “choosing what not to do” (Porter 1996, p. 45) – and focuses on how to gain a competitive advantage over competitors, the business model translates the strategy into more specific tactical choices and a logic about how the strategy creates value for its customers and thus captures

value (Veit et al. 2014). It follows that a strategy can guide the development of different business models (Casadesus-Masanell and Ricart 2010). Articulating the logic of business models can also illuminate the strategy and suggest areas for adjustment. From this perspective, the concept of the business model has overcome its initial ambiguity and its blurred distinction from strategy (Massa et al. 2017).

- 2) *Business model to business processes*: Business processes represent the operational level and provide a detailed description of how an organization's operations are executed. They depict the translation of a business model into daily business routines, including the operational infrastructure and IS to execute the business model. Conversely, changes in business processes can also lead to adjustments to the business model (Lara Machado et al. 2023).

In summary, the business model has emerged as a distinct unit of analysis and as a conceptual lens for studying how technology alters existing business models and create new ones. It exceeds and complements the scope of other concepts, such as products, services, strategy, and business processes. It is centered on a focal organization, yet some definitions extend beyond organizational boundaries and include stakeholders with whom the organization interacts when creating, delivering, and capturing value.

2.2 The Concept of the Ecosystem

The term "ecosystem" was borrowed from biology, first adopted by the sociologist Amos Hawley in 1986 to describe the arrangement of mutual dependencies within a population (Shipilov and Gawer 2020). The analogy then spread from the social sciences to business studies. Ecosystems were introduced into the business world with Moore's (1993) belief in an "ecological" approach to describe the contexts within which businesses can compete and collaborate. He defined a business ecosystem as "companies [that] coevolve capabilities around a new innovation [...] work[ing] cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations" (Moore 1993, p. 76).

Since then, researchers and practitioners have increasingly used the term ecosystem to reflect the idea that organizations and their underlying business models should not only be seen as independent actors in a single industry, but also as one part of a wider business ecosystem (Snihur and Bocken 2022). This shift has led some scholars to observe that the term ecosystem replaced the terms "industry" and "coopetition" (Ritala 2025).

When Moore (1993) introduced the term “business ecosystem”, he established one of the most popular management topics in practice and research (Kapoor 2018; Pidun et al. 2019). Other argues that he also “laid the foundation for conceptual chaos” (Lingens 2023, p. 98). His definition may initially appear accurate, but is also ambiguous, allowing for different interpretations whilst lacking a clear distinction from adjacent concepts such as alliances, networks, and supply chains (Lingens 2023). As a result, many research perspectives on the concept of ecosystems have emerged (Bogers et al. 2019). Additionally, this lack of clarity has created confusion in practice, as consultants and managers have used the term ecosystem to refer to all aspects related to cooperation or to the external business environment (Lingens 2023).

Nevertheless, many researchers have adopted and complemented Moore’s ecosystem definition (Cobben et al. 2022). For example, Iansiti and Levien (2004) have described the importance of a focal (keystone) actor to facilitate an ecosystem for innovation over time. This perspective on ecosystems is now known as the *ecosystem-as-coevolution* view (Hou and Shi 2021). However, in this view, the ecosystem affiliation (i.e., participation) is taken for granted, which has diverted scholarly attention away from the important questions of how actors’ roles should be understood and coordinated (i.e., ecosystem orchestration), how ecosystems facilitate value capture for all participating actors, how to set boundaries for the ecosystem, and – equally importantly – how ecosystems can be designed (Adner 2017; Hou and Shi 2021).

To overcome this drawback and conceptualize the ecosystem as a construct, Adner (2017) has proposed the *ecosystem-as-structure* view, which brought clarity to the growing ecosystem literature (Jacobides et al. 2024b; Lingens 2023). Adner’s structural view is built on the notion that an ecosystem is created around one focal (joint) value proposition that functions as a reference point for organizations to contribute resources and activities, and that the efforts of one organization alone cannot achieve that value proposition (Adner 2017).

In a second major conceptual contribution, Jacobides et al. (2018) have described ecosystems as a group of organizations consisting of “varying degrees of multilateral, nongeneric complementarities” (p. 2,264) coupled with the absence of full hierarchical control. Complementarities can be either generic (the elements are interchangeable across many applications) or non-generic (the elements involve some level of specialization to achieve complementarity). Specialization, according to Jacobides et al. (2018), jointly defines and sets the boundaries of ecosystems. The absence of full hierarchical control means that no single organization has the power to determine rules and governance.

Both papers, along with their three proposed defining attributes (realizing a joint value proposition; multilateral, non-generic complementarities; the absence of full hierarchical control), comprise what is referred to as the *ecosystem-as-structure* view (Hou and Shi 2021). Several studies have concluded that these attributes enable ecosystems to generate competitive advantages for the organizations involved. In addition, they help clarify the ecosystem concept more distinctly from related concepts such as alliances, supply chains, or networks (Adner 2017; Kapoor 2018; Shipilov and Gawer 2020). Following the *ecosystem-as-structure* view, an ecosystem encompasses all organizations (e.g., suppliers, customers, complementors) that participate in materializing the joint value proposition. As a blueprint for how this joint value proposition is created within an ecosystem, Adner (2017) has proposed four structural elements: (1) activities, which contribute to the joint value proposition; (2) actors, the entities that undertake the activities; (3) positions that specify the location of actors in the flow of activities across the system; and (4) links that clarify the flow of material, information, influence, and financial resources across actors. If these structural elements are not properly designed, the ecosystem will not create enough value for customers or capture enough value for every participant, and it will not be successful in the long term (Adner 2017; Hou and Shi 2021).

The *ecosystem-as-structure* view is associated with the terms “innovation ecosystem” (e.g., Adner 2017) and “business ecosystem” (e.g., Jacobides et al. 2018; Kapoor 2018). Given this overlap, a terminological distinction between business and innovation ecosystems leads to more confusion than clarity (Thomas and Autio 2020). This is also because different researchers have varying interpretations of the same terminology. For example, a 2020 literature review identifies 21 definitions of the term “innovation ecosystems” alone, and many are unrelated to one another (Granstrand and Holgersson 2020). Furthermore, other ecosystem-related terms have also been proposed, such as “knowledge ecosystems” (e.g., Järvi et al. 2018), “entrepreneurial ecosystems” (e.g., Spigel and Harrison 2018), and “digital ecosystems” (e.g., Coskun-Setirek et al. 2024). However, various attempts to clarify these terms have also led to contradicting viewpoints depending on the characteristics examined. Moreover, some terms, especially “knowledge ecosystems” and “entrepreneurial ecosystems”, have been criticized for merely rephrasing existing concepts and therefore failing to add any significant scientific contributions (Autio 2021; Lingens 2021).

The subtle distinction between ecosystems and platforms has long been the subject of extensive research (Jacobides et al. 2024b). The platform literature distinguishes two types of platforms:

transaction and innovation (Cusumano et al. 2019). Transaction platforms are multi-sided market structures that facilitate transactions between individuals or organizations that would otherwise struggle to find an appropriate exchange partner (e.g., eBay, Etsy, Uber; Parker 2016). In contrast, innovation platforms constitute modular technological architectures governed by a central actor who defines rules and access conditions, thereby enabling external innovators to develop complementary services (e.g., IOS, Android, Linux; Tiwana et al. 2010). In reality, today's most successful organizations often operate hybrid platforms that encompass both aspects; for example, Apple's App Store is a transaction platform, and its iOS is an innovation platform (Cusumano et al. 2019).

In light of this, although the terms "platforms" and "ecosystems" are closely interconnected, some differences remain (Jacobides et al. 2024b; see Table 2). While platforms provide the technological foundation for transactions or support innovation, ecosystems facilitate inter-organizational collaboration through complementary resource coordination.

Table 2. Comparison of innovation platforms, transaction platforms, and business ecosystems (based on Jacobides et al. 2024b, p. 6)

	Conceptualization	Governance structure
Innovation platforms	"Interorganizational value architectures based on modular technological architectures: Structures of interoperable technological components and complements facilitating production, integration, and extension of innovation."	Centralized governance
Transaction platforms	"Interorganizational value architectures based on multi-sided market structures: Structures of economic relations facilitating matching and value exchange between consumers and product/service providers."	Centralized governance
Business Ecosystems	"Interorganizational value architectures based on cospecialized collaborative relationships: Structures of interorganizational collaborative relationships facilitating collective value production for actors and joint value proposition for end customers."	Can be centralized (in the case of platform-based ecosystems) or distributed (if ecosystem is not platform-based)

In addition, during the course of this doctoral research, a further development in the understanding of terminology has emerged. In the 2018 publication by Jacobides et al. (2018) a distinction was still made between platform ecosystems and business ecosystems. In the subsequent 2024 publication by Jacobides et al. (2024b) however, platform ecosystems are considered a subcategory of business ecosystems (see Table 2). I therefore follow Hou and Shi (2021) in distinguishing between the *ecosystem-as-structure* view and the *ecosystem-as-coevolution* view rather than making terminological distinctions.⁴ In this dissertation, I build on the ecosystem-as-structure view to understand and outline how ecosystems can be designed in a desirable manner, as the structure view is helpful for designing ecosystems (Hou and Shi 2021).

In Study 3 (Althaus et al. 2025), we specifically examine the design of a *data ecosystem*. Data ecosystems represent a specific form of ecosystem, which coordinate complementary data assets (Legner and Otto 2023; Oliveira et al. 2019). In such settings, data serve as the key resource for the development and success of data-driven innovations (Beverungen et al. 2022). Several reviews of data ecosystems have played a crucial role in developing the concept. The first generally accepted definition states that actors collaborate to foster innovation and create new business value through data-sharing (Oliveira et al. 2019; Oliveira and Lóscio 2018). Therefore, the main idea of a data ecosystem is that participants “engage in data sharing to contribute to pursuing common goals and value propositions” (Otto et al. 2019, p. 5).

Möller et al. (2024) have further clarified the concept of data ecosystems, and identified three ways of operationalizing data-sharing in data ecosystems: (1) inter-organizational IS, (2) data intermediaries, and (3) data spaces. While inter-organizational IS share data bilaterally between supply chain participants, data intermediaries typically enable data-sharing in multilateral settings through platforms such as data marketplaces (Möller et al. 2024). Data spaces provide a decentralized data infrastructure for realizing secure, trusted data-sharing through data space connectors (Hutterer and Krumay 2022; Möller et al. 2024; Otto 2022). Data spaces do not require a central data store and thereby guarantee data sovereignty for data providers (Möller et al. 2024). Since 2019, the International Data Spaces Association has spearheaded the development of public data spaces under the concept of GAIA-X, including the case of the

⁴ In Vorbohle and Kundisch (2024) and Ksouri-Gerwien and Vorbohle (2025), we refer to “business ecosystem,” while in Vorbohle (2025) and in the following of this synopsis, I refer to “multi-actor ecosystems”. These decisions were based on the state of the literature at the time of submission and reviewer comments. However, all terms refer to the ecosystem-as-structure perspective.

cultural data ecosystem (Acatech 2023; Jarke 2023). This embodies a significant political move (aligned with European regulations) aimed at competing with the predominant American and Chinese technological conglomerates (Braud et al. 2021) by supporting the development of data spaces as a promising data-sharing infrastructure (Möller et al. 2024; Otto et al. 2021). In summary, data space-enabled data ecosystems “emerge around one or multiple (federated) data spaces. They represent the sum of collaborative data-sharing activities built on the secure and trustworthy data-sharing paradigm of data spaces to realize shared goals (e.g., innovation, compliance, optimization) for their members” (Möller et al. 2024, p. 41).

2.3 The Ecosystemic Business Model

The *ecosystem-as-structure* view provides an interesting conceptual lens through which to approach the need for innovation through cooperation across organizational boundaries. Especially since the publication of two seminal conceptual papers (Adner 2017; Jacobides et al. 2018), the concept of the ecosystem has become more application-oriented and goes beyond simply describing collaborative organizations; instead, it represents a cognitive schema that highlights the creation of a joint value proposition for the customer which a single organization cannot achieve alone. This, in turn, requires the organizations willing to participate in an ecosystem to review and adapt their existing business models (Holm and Kringelum 2022).

Organizations involved in ecosystems should focus not only on how their business model can create, deliver, and capture value, but also on identifying the elements of other organizations' business models that can complement their own to create a superior value proposition for the customer (Adner 2017). Therefore, they should consider the ecosystem structure that determines how value creation and delivery are conducted, who should perform these roles, and, consequently, the role of each organization within the ecosystem. Moreover, there is no hierarchical control in the ecosystem regarding the mechanisms of governance and power (Jacobides et al. 2018). As a result, ecosystemic business models should ensure that all contributing partners benefit, which places important requirements on value capture mechanisms (Sjödín et al. 2022). In that sense, every business model that contributes to the joint value proposition has to be viable, in order to stand on its own in the market.

However, as the business model concept mostly focuses on the perspective of a single organization – aligning an organization's strategy with its processes – it has limited utility in understanding the logic of multiple business models co-creating value in ecosystems. Research on the intersection of business models and ecosystems is in its infancy (Lingens 2023;

Mozheiko 2025). Building on the work of Amit and Zott (e.g., Zott and Amit 2010), who have expanded the concept of business models to encompass a more systemic view of the interdependent activities that an organization and its partners perform, business models have been referred to as the infrastructure of ecosystems (Snihur and Bocken 2022) and as an integral part of ecosystem design (Lingens 2023; Miché and Gassmann 2024). The concepts of both business models and ecosystems intersect through their structural elements, such as actors and accomplished activities; moreover, research in both areas focuses on designing an effective value proposition (Snihur and Markman 2023).

To distinguish business models that are part of an ecosystem and those that are not, researchers have introduced the term “ecosystemic business model,” although both “ecosystem-based” or “ecosystem-oriented business model” are also sometimes used. While the term “ecosystem business model” refers to the ecosystem’s overarching business model – that is, “a system of interdependent activities undertaken by a set of actors interacting in an ecosystem that allows the creation, delivery, and monetization of value in a collective manner” (Brea 2023, p. 4) – an ecosystemic business model refers to the individual organizational business models that are necessary to create the joint value proposition. Accordingly, an ecosystemic business model is a business model that pertains to an ecosystem.

Building on other studies of ecosystemic business models (Iivari et al. 2016; Xu et al. 2019), I consider the concept of ecosystemic business models as a boundary-spanning unit of analysis. It focuses on an organization’s ability to create, deliver, and capture value, contribute to the ecosystem’s value proposition, and ensure that all partners benefit. From this perspective, an ecosystemic business model aims to capitalize on business opportunities within an ecosystem. Designing an ecosystemic business model requires considerations about the joint value proposition and the alignment of value creation and value capture logic according to the model’s position, role, and the links within the ecosystem (Adner 2017; Gomes et al. 2023; Xu et al. 2019).

3. Body of Knowledge

This section begins with an overview of the relevant literature streams (Section 3.1), followed by a description of the conceptual model underlying this synopsis to describe the research focus (Section 3.2), concluding with a presentation of the identified research gaps (Section 3.3).

3.1 Overview

The literature relevant to the topic of this dissertation can be classified into three different research streams: (1) business model innovation, (2) multi-actor ecosystem development, and (3) business model tooling. The research focus of this dissertation lies at the intersection of these streams (see Figure 3).

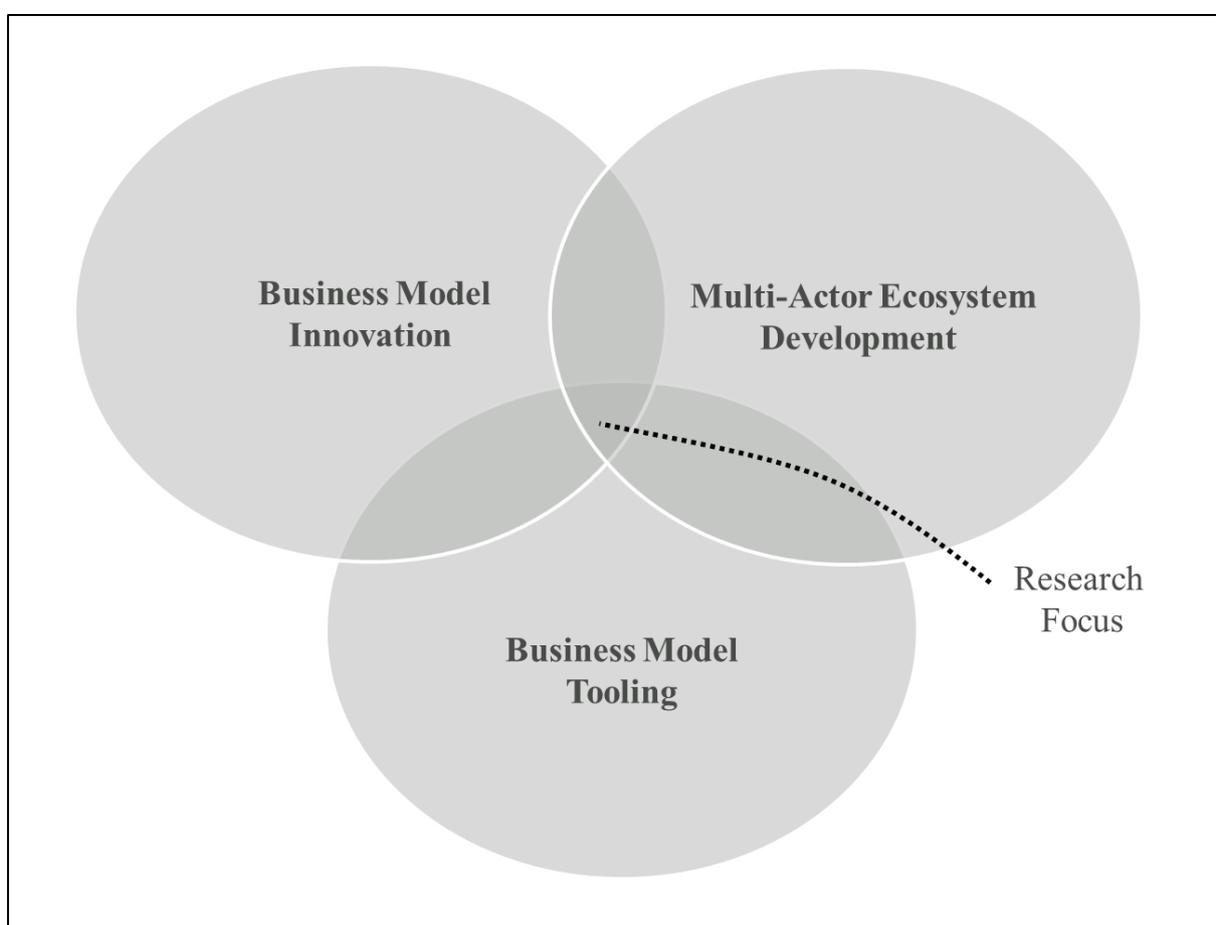


Figure 3. Venn diagram illustrating related research streams and research focus

First, *business model innovation* refers to novel ways by which an organization creates, delivers, and captures value, and has emerged as a distinct literature stream (Saebi et al. 2017; Schneider and Spieth 2013). Building on the concept of business models, this stream identifies the business model itself as a potential source of innovation, similar to product, service, or process innovations (Kohtamäki et al. 2024; Snihur and Markman 2023; Snihur and Wiklund

2019). Additionally, it can also serve as a vehicle for other types of innovation, as it creates conditions that facilitate such innovation. However, innovating existing business models is not a recent phenomenon. When James Watt invented the steam engine in the 19th century, the idea arose of not charging potential buyers a high upfront purchase costs for a steam engine but, instead, charging them only for efficiency gains (i.e., a fee proportionate to the amount of coal saved). This performance-based payment is considered to be one of the first business model innovations (Roll 2013). From a practical perspective, organizations that innovate their business model benefit from performance gains (Zhang et al. 2021), and business model innovation is the primary challenge that managers mentioned in a 2024 survey conducted by the IBM Institute for Business Value with more than 2,500 executives from 30 countries and 26 industries (IBM 2025). It is therefore not surprising that investigating how to innovate business models and their consequences for successful organizational performance has become a comprehensive and insightful endeavor in various research domains (Snihur and Markman 2023).

From a scientific perspective, the field of business model innovation research can be divided into four lines of inquiry (Foss and Saebi 2017): (1) conceptualizations and classification patterns for business model innovation as a phenomenon, (2) business model innovation as a process, (3) business model innovation as an outcome, and (4) studies on the consequences of business model innovation (both as a process and as an outcome) for organizational success. In the second line of inquiry, researchers have focused on the distinct innovation stages necessary and have proposed different process models (Wirtz and Daiser 2018). One of the most recognized business model innovation processes is the 4I-framework (Frankenberger et al. 2013), which has been adopted to analyze business model innovation in various studies, including from an inter-organizational perspective (e.g., Sturm et al. 2023). The 4I-framework was derived based on characteristics identified in the innovation management literature, and it separates the innovation process into four process phases: initiation, ideation, integration, and implementation (Frankenberger et al. 2013). The initiation phase involves activities related to analyzing and understanding the surrounding environment of the innovating organization. This includes understanding the needs of the actors involved, such as customers and suppliers, and identifying drivers for change. The ideation phase focuses on challenging the current business logic and finding ideas for potential new business models (e.g., based on the opportunities identified in the initiation phase). The integration phase involves activities for transforming the new business model ideas into a sophisticated and viable business model with a focus on

integrating all the elements of the new model, including the involvement and management of partners. Lastly, during the implementation phase, the focus is on realizing and managing internal business processes and mitigating risk through experimentation and testing.

These four phases can be further separated into two meta-phases. The first three phases can be summarized as the “design” meta-phase, while the last phase (i.e., implementation) is concerned with the “realization” of the innovative business model. Hence, in relation to business model innovation as a process, the literature has suggested viewing business model design as one major part of the business model innovation process. Massa (2024) defines it as “the creative act of crafting business architectures (or parts of them) to solve business and human problems at a profit” (p. 5).

Second, the literature on *multi-actor ecosystem development* concerns questions surrounding why and how ecosystems emerge, as well as how ecosystems can be designed successfully to benefit both organizations and society. Therefore, this literature stream is particularly interested in understanding why some ecosystems fail while others succeed, and in how design failures can be avoided. Accordingly, researchers have examined real-world examples of both successful and unsuccessful ecosystems, and derived frameworks and recommendations for developing multi-actor ecosystems. For example, Jacobides (2022) proposes an ecosystem development framework that guides organizations on how to engage in multi-actor ecosystem opportunities.

In his early works on the co-evolution view of ecosystems, Moore (1993) investigates several ecosystems, such as the early IBM ecosystem for personal computers, and derives four evolutionary stages of a business ecosystem: birth, expansion, leadership, and self-renewal. However, Moore’s development stages are based on empirical studies that cover only established settings, including an inherent ecosystem orchestrator or existing alliances rather than emerging settings without an inherent governance structure; therefore, these stages are more appropriate for such settings. For example, Gelhaar and Otto (2020), drawing on the development stages of Moore (1993), conducted a multiple-case study on data ecosystems and identified four competitive and four cooperative challenges (e.g., each trust required between data ecosystem participants) in the birth phase.

In terms of design recommendations, Bernhard Lingens's work (Lingens et al. 2021; Lingens et al. 2023; Lingens and Huber 2023) explores several ecosystem use cases through qualitative interviews, developing propositions to help organizations design more successful ecosystems.

For example, one of Lingens's et al. (2023) important insights shows that multi-actor ecosystems are less efficient in operation than traditional in-house innovations or supply chains because coordination across organizations takes time, effort, and human resources. The success of a multi-actor ecosystem, therefore, hinges on a superior joint value proposition, which is beyond the scope of a single organization. In addition, Lingens et al. (2021) has concluded that a key factor for determining the extent of the involvement of multiple actors in the ecosystem development process is the knowledge distance (between the existing business knowledge and the ecosystem's field of business) of the orchestrator(s) at the helm of the design process.

Delving deeper into the question of how ecosystems emerge, this literature stream has identified two possible design approaches that result from the absence of formal contracts. The top-down approach is associated with one central orchestrator (ecosystem planner) developing the ecosystem design and then recruiting ecosystem participants for predefined roles (Autio 2021; Hoffmann et al. 2022). In contrast, the bottom-up approach is characterized by an orchestration that is inclusive, and where the design of the ecosystem is a collaborative discovery process, typically led by one or more orchestrators. Organizations identify one (or several) joint value propositions together and then design an ecosystem (or multiple ecosystems) around each identified joint value proposition (Autio 2021; Hoffmann et al. 2022). Dattee et al. (2018) have described this iterative development process among partners as one in which "actors discover, rather than plan, the ecosystem approach" (p. 490). In reality, ecosystems have also been found to emerge through planned blueprints from a central leading orchestrator that are augmented by collaborative design approaches (Lingens et al. 2023; Sunner 2021). Both of these approaches are relevant for this dissertation, but in the studies of Althaus et al. (2025), and Vorbohle (2025), particular attention is paid to the bottom-up approach.

Third, to support the innovation and management of business models with adequate artifacts throughout their lifecycle, a literature stream on *business model tooling* has emerged based on the interpretation of business models as formal conceptual representations (Bouwman et al. 2020). Business model tools can be conceptualized as boundary objects that facilitate communication and collaboration across boundaries (e.g., semantic, syntactic, and pragmatic boundaries), and enable stakeholders to discuss and align their ideas and expectations (Schwarz and Legner 2020). Research on cognition and business models indicates that tools help reduce cognitive biases, enhance ideation, increase business model coherence, and influence managers' decision-making (Massa and Hacklin 2020; Shepherd et al. 2023). Hence, these

tools, separately and in combination, serve as important artifacts for knowledge-sharing and communication between different stakeholders (Schwarz and Legner 2020).

The most widely used tool is Osterwalder and Pigneur's (2010) BMC, which has become the quasi-standard for representing business models (Avdiji et al. 2020; Szopinski et al. 2020). Driven by the popularity of the BMC in both research and practice, researchers began developing similar artifacts. Today, various business model tools are available to support the business model innovation and management process and can be categorized into three perspectives: (1) conceptual models and formal representations, (2) methods, and (3) IT support (Bouwman et al. 2020; Schwarz and Legner 2020).

The first perspective (business model tools as conceptual models and formal representations) helps clarify, describe, and communicate the core logic and elements of a business model. Examples include business model modeling languages (Szopinski et al. 2022), and business model taxonomies (Möller et al. 2021). The second perspective (business model tools as methods) helps identify and address specific tasks when designing a business model. Examples include design thinking, stress testing (Haaker et al. 2017), and the situation-specific development of business models (Gottschalk et al. 2023). The third perspective (business model tools as IT support) enables or facilitates various business model design tasks through software, such as modeling or simulating business models. Examples include the decision support system for business model validation (Dellermann et al. 2019) and software support for using the BMC (Szopinski et al. 2020).

3.2 The Literature Related to the Research Focus and the Conceptual Model

The research that lies at the intersection of all the three literature streams described above (see Figure 3) represents a nascent field of enquiry concerned with how organizations collaboratively design business models within ecosystems using tools that support such collective innovation processes. However, researchers have proposed various tools or reviewed existing ones that can be attributed to the intersection of these streams, depending on the focus of the business model innovation process phase, on whether the ecosystem emergence approach analyzed is bottom-up or top-down, and the perspective on tool support.

For example, in his first book on the idea of designing ecosystems from a structural perspective, Ron Adner proposes the ecosystem value blueprint as a visualization approach (Adner 2013). Another example is the utilization of e3Value for analyzing and visualizing business ecosystems (Wieringa and Gordijn 2023). Additionally, some review articles partially address

the research focus of this dissertation and have analyzed various potential tools. For example, from a business model perspective, Szopinski et al. (2022) have identified various “network-based” modeling languages that can be used to represent business models and exchanges when designing ecosystemic business models. These include the Framework for New Business Models (Vorraber and Müller 2019) and the Service Dominant Business Model Radar (SDBM/R; Turetken et al. 2019), which is a visual inquiry tool for co-creating customer value. From an ecosystem perspective, Tsai et al. (2022) have identified and analyzed conceptual modeling languages and tools in a systematic literature review. However, despite considering 94 relevant studies, they conclude that “[b]ecause of the scarcity of existing Conceptual Modeling methods and tools for [Digital Business Ecosystem] DBE design and management, future research should focus on the development of such methods and supporting tools. There is an urgent need for a systematic approach guiding the integration of the multiple perspectives for modeling DBEs and thus aiming at supporting a holistic view on DBEs” (p. 22). Moreover, Arreola González et al. (2019) have analyzed 67 business modeling and value modeling approaches, including the BMC and the causal loop diagram (Casadesus-Masanell and Ricart 2010), and found limited tool support for ecosystem design.

To structure and position the research focus of this dissertation, I introduce a conceptual model that builds on Study 2 (Vorbohle and Kundisch 2024). This conceptual model integrates the business model innovation process (i.e., the 4I-framework) to highlight opportunities for research contributions.

The conceptual model can be separated into the two interrelated research areas (see Section 1). The left side of the conceptual model focuses on Research Area One, and is derived from Study 2 (Vorbohle and Kundisch 2024); it views the business model as an instrument for inter-organizational alignment within an ecosystem between multiple organizations (see Figure 4, blue shadow). While the individual organizations participating in an ecosystem each pursue their own strategies, business models, and business processes, the design of the ecosystem requires the organizations to engage in an alignment process, which involves extensive discussions and knowledge-sharing to define their joint value co-creation opportunities and the organizations’ co-specialization within the ecosystem (Jacobides et al. 2018). I therefore view the business model as a helpful concept for aligning all organizations on a joint value proposition, the actors’ roles, and their business activities. In contrast to the traditional view on business models, which primarily function as intra-organizational alignment instruments (linking strategy to business processes), ecosystemic business models also serve as inter-

organizational alignment instruments. They mediate between the strategies and processes of multiple actors while simultaneously coordinating their complementarities and dependencies to realize a joint value proposition (Vorbohle and Kundisch 2024).

Therefore, the *ecosystem-as-structure* view (i.e., framing ecosystems around a joint value proposition based on multilateral and non-generic complementarities) does not alter the core idea of the business model concept; rather, it adds another conceptual lens for considering ecosystemic business models. Designing a business model in an ecosystem context requires considering both concepts – business models and ecosystems – which, in turn, affects how business models are formally represented (Massa 2024). Building on these conceptual considerations and the in-depth analysis of business model design challenges from the ecosystem development case from the maritime industry (see Vorbohle and Kundisch 2024), I derive implications for business model tools. These implications fall into three categories: they support (1) the design of a joint vision and value proposition, (2) the design of complementarities and business model dependencies, and (3) dynamic business modeling and quantitative simulations.

The conceptual model then links these three implications to the three main phases of business model design (i.e., initiation, ideation, and integration), providing a matrix structure for Research Area Two (see Figure 4, right side). This phase-based view situates the conceptual model as a process-oriented guide for research contributions. Different implications gain prominence across phases: initiation and ideation require particular support for designing a joint vision and value proposition; ideation and integration require support for the design of complementarities and dependencies, and integration demands dynamic modeling and quantitative simulations for collective decision-making. This dissertation addresses specific research gaps that can be positioned within the conceptual model and are explained in detail in the next section.

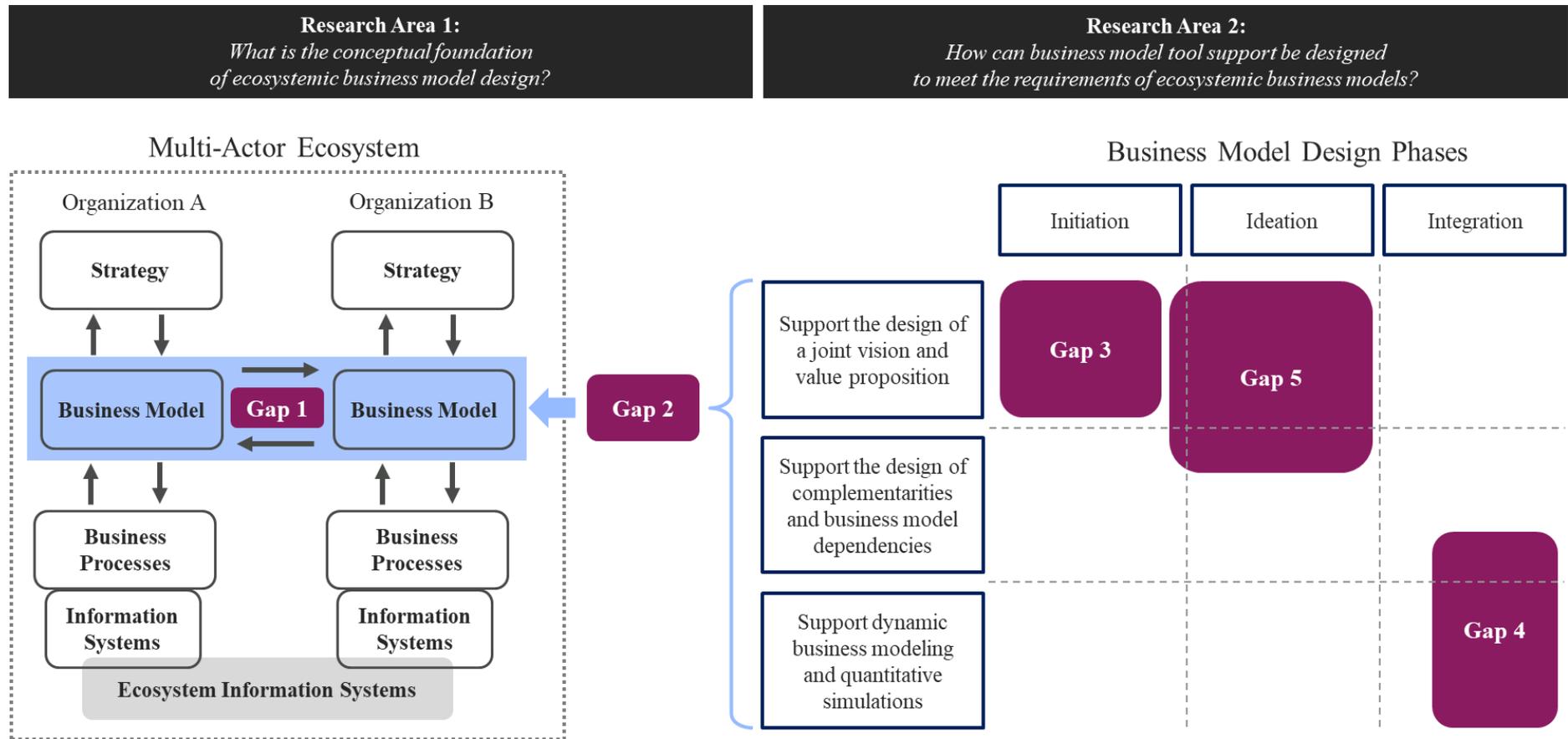


Figure 4. Conceptual model of research focus and positioning of research gaps⁵

⁵ Hint: The positioning of research gaps in partly multiple design phases and tool requirements is intentional.

3.3 Research Gaps

Building on the aforementioned conceptual model, I elaborate on the research gaps addressed in the studies of my dissertation. The research gaps (e.g., Gap 1) refer to Figure 4.

First, it is undisputed that business models and their underlying elements have dependencies on each other. For example, the BMC describes one of its nine building blocks as “Revenue streams result[ing] from value propositions successfully offered to customers” (Osterwalder and Pigneur 2010, p. 17). Hence, researchers increasingly emphasize the interconnected nature of business models, and acknowledge them as complex and interdependent systems (Kurti et al. 2021; Massa et al. 2018). Even minor changes in one business model element (e.g., monetizing content) can trigger consequences for other elements (e.g., customer support), especially in ecosystem settings where interdependencies extend beyond organizational boundaries into complex systems (Adner 2013; Foss and Saebi 2017; Schaffer et al. 2020). As a result, it is not enough to understand the components of a business model and its possible design elements. Rather, it is also important to consider and understand the dependencies within and between the components and elements (John and Kundisch 2015).

However, business model dependencies is rarely considered to represent a distinct field of research. In the analysis of the business model state of research, Wirtz et al. (2016) found evidence that the analysis of interactions and relationships between different business model actors accounts for only 5% of the literature. As a result, business model dependencies remain insufficiently conceptualized. This conceptualization, however, is particularly relevant for interpreting business models as formal conceptual representations. Despite dozens of business model visualizations having been proposed, only a few allow for the visualization of causal interactions, and these few are also assessed as cognitively ineffective (Henike et al. 2020). For example, the BMC or the causal loop diagram have proven helpful for designing business models, but they generally lack semantic constructs to represent multiple types of dependencies. This limits their ability to fully represent the complexity of business models.

Consequently, current business model tools offer only limited means to capture the intricate dependencies within and between business models that are particularly relevant for designing multi-actor ecosystems. Despite the recognition that business models consist of interdependent components and are increasingly embedded in ecosystems, there is no consensus on the underlying characteristics of business model dependencies within and between business models. The lack of conceptual clarity and systematic understanding of these characteristics

prevents both researchers and practitioners from adequately capturing, representing, and leveraging dependencies in business model design.

Gap 1: A systematic understanding and conceptualization of the underlying characteristics of business model dependencies, both within and between business models.

Second, research on business model tooling has provided a valuable foundation for designing individual business models (Bouwman et al. 2020). However, the dominant conceptual lens remains largely intra-organizational (Al-Debei and Avison 2010). This perspective assumes that value creation and capture can be represented and optimized at the level of a single organization. However, in ecosystems, business models are inherently interdependent: they should be designed around joint value propositions, non-generic complementarities, and evolving dependencies among multiple actors (Sun et al. 2025).

Current conceptualizations of business models and widely used tools do not sufficiently acknowledge the business model's role as an inter-organizational alignment instrument; they remain predominantly rooted in an organizational-centric logic. Such a perspective, however, falls short when applied to the increasingly dominant setting of multi-actor ecosystems, where value is not created in isolation but emerges through the alignment of interdependent business models across organizational boundaries. In these contexts, business models serve not merely as representations of a single company but as alignment instruments that facilitate coordination among heterogeneous actors (Mozheiko 2025). Yet, despite the practical relevance of ecosystems, research offers only limited guidance on how to use, adapt or extend established business model tools to the specific requirements of ecosystemic contexts. Consequently, managers face considerable challenges in designing ecosystemic business models, and scholars still lack a coherent conceptual foundation for understanding ecosystemic business models as well as actionable insights on how to translate this understanding into effective tool design.

Gap 2: A conceptual understanding of ecosystemic business model design and the implications of this perspective for business model tooling.

Third, despite a growing interest in data ecosystems, extant research has primarily developed cross-industry insights into their structure, governance, and value propositions (Toorajipour et al. 2024). These contributions, while valuable, remain general and offer little guidance for industries characterized by fragmented actor landscapes, heterogeneous business model logics, and ambiguous incentives for data sharing. The cultural event industry exemplifies such a context: hundreds of event platforms coexist without standardized data practices, and their

willingness to join an emerging cultural data ecosystem crucially depends on the alignment of their business models (Acatech 2023; Jarke 2023). However, from a business model innovation perspective, little is known about how to systematically classify and compare these business models, and how archetypal business models shape data-sharing readiness, potential actor roles, and thereby incentives for participation in data ecosystems (i.e., how to initiate the data ecosystem). As existing taxonomies of data-sharing business models span different industries, they disregard the unique structural and institutional particularities of the cultural sector. Moreover, research on the emergence of data ecosystems has so far concentrated on industries with established value capture mechanisms (e.g., mobility, logistics, automotive), while underexploring industries where public-private constellations and non-profit objectives prevail. This dispersion leaves scholars and practitioners without a consolidated understanding of how to initiate ecosystemic business models in emerging, sector-specific data ecosystems.

Gap 3: An understanding of industry-specific archetypal business models that support the development of focal value propositions, the identification of actor roles, and the assignment of corresponding activities in an emerging data ecosystem.

Fourth, when integrating a business model that captures value not in isolation but within an ecosystem characterized by a joint value proposition, the success of each individual business model depends on whether each of the ecosystem partners captures enough value and whether their individual business model is viable (Adner 2017; Kohtamäki et al. 2019). This shift requires tools that enable not only the qualitative design of novel ecosystemic business models but also their systematic prototyping and quantitative evaluation from an ecosystem perspective (Athanasopoulou and Reuver 2020; Bouwman et al. 2020). While system dynamics has been recognized as a promising method for modeling and simulating business models (e.g., Moellers et al. 2019), existing modeling frameworks for system dynamics remain largely confined to an intra-organizational view and to single case studies, particularly in B2C settings. They therefore fall short of addressing the multilateral interdependencies, feedback loops, and distributional value capture tensions inherent in multi-actor ecosystems (Bressanelli et al. 2024; Groesser and Jovy 2016).

For example, current modeling frameworks such as the Dynamic Business Model Canvas (Cosenz and Noto 2018) are predominantly built on the single-organizational logic of the BMC, thereby neglecting the actor-based complexity of ecosystems. Therefore, the literature lacks a framework that accounts for both intra- and inter-organizational value creation and capture in quantitative simulations using system dynamics. As a result, decision-makers lack tool support

to compare alternative business model designs across ecosystem partners, evaluate their viability, and anticipate potential conflicts in value capture.

Gap 4: A consolidation and advancement of design knowledge for prototyping and evaluating ecosystemic business models using system dynamics.

Fifth, well-established business model tools, such as the BMC, could present a source of inertia for designing ecosystemic business models by representing it only from an intra-organizational view (Turetken et al. 2019). Although various visual inquiry tools for ecosystem design have been proposed, the current landscape is opaque, with little consolidated knowledge about what tools exist, how they differ in their underlying characteristics, and to what extent they align with ecosystem design requirements. Moreover, while prior work has highlighted the importance of advanced tool functionalities (e.g., Recker 2012), there is a lack of prescriptive design knowledge on how such functionalities can be designed to address the collaboration challenges inherent in multi-actor ecosystems. As a result, researchers and practitioners lack both a structured overview of existing ecosystem visual inquiry tools and design knowledge on how to (re-)design them to facilitate cross-organizational alignment and collaboration.

Gap 5: A systematic identification and analysis of existing visual inquiry tools, and the development of contextualized, prescriptive design knowledge on functions that enhance cross-organizational collaboration for ecosystem design.

4. Overview and Contribution

This dissertation comprises five studies and employs diverse research approaches. Table 3 illustrates the interrelationship between the studies submitted as part of this dissertation, the research gaps they address, and the research approach employed.

In the following, I dedicate one sub-section to each of the studies included in this dissertation, providing a summary of the study with details on the scientific contributions made by the respective authors, and information on the dissemination of the research findings in the form of presentations and publications.

Table 3. Overview of research papers that form part of this dissertation

Conceptual Classification	Addressed Research Gap	Study	Research Approach	Publication Status
Research Area 1	Gap 1: A systematic understanding and conceptualization of the underlying characteristics of business model dependencies, both within and between business models.	Vorbohle et al. (2021)	Taxonomy Development	Published in <i>Proceedings of the European Conference on Information Systems 2021</i> (VHB-Rating 2024: A)
Research Area 1	Gap 2: A conceptual understanding of ecosystemic business model design and the implications of this perspective for business model tooling.	Vorbohle and Kundisch (2024)	Conceptual	Published in <i>Journal of Business Models</i> (VHB-Rating 2024: C)
Research Area 2	Gap 3: An understanding of industry-specific archetypal business models that support the development of focal value propositions, the identification of actor roles, and the assignment of corresponding activities in an emerging data ecosystem.	Althaus et al. (2025)	Multiple-Method Approach	Published in <i>Electronic Markets</i> (VHB-Rating 2024: B)
Research Area 2	Gap 4: A consolidation and advancement of design knowledge for prototyping and evaluating ecosystemic business models using system dynamics.	Ksouri-Gerwien and Vorbohle (2025)	Action Design Research	Under review at <i>Information Systems and e-Business Management</i> (VHB-Rating 2024: C)
Research Area 2	Gap 5: A systematic identification and analysis of existing visual inquiry tools, and the development of contextualized, prescriptive design knowledge on functions that enhance cross-organizational collaboration for ecosystem design.	Vorbohle (2025)	Design Science Research	Under review at <i>Business & Information Systems Engineering</i> (VHB-Rating 2024: B)

4.1 Study 1: Vorbohle et al. (2021)

The first study of this dissertation (Study 1) examines the largely overlooked analytical unit of business model dependencies within and between business models, which have a critical influence on business model design. Motivated by the absence of a systematic understanding of such business model dependencies in the IS literature, we conduct a literature review, analyze fourteen business model modeling languages, and examine 95 real-world business models. Following the taxonomy development method of Nickerson et al. (2013), we iteratively derive a taxonomy with thirteen dimensions that captures dependencies from three perspectives (i.e., role type, modality, and implication). The taxonomy provides a structured unit of analysis for researchers and practitioners to better conceptualize, design, and assess complex and interconnected business models, particularly in ecosystem settings. The work advances the business model concept by making dependencies an explicit analytical unit, offers a foundation for improving business model modeling languages, and outlines implications for managerial decision-making in business model innovation.

Table 4. Vorbohle, C., Szopinski, D., and Kundisch, D. (2021): Joint work, presentations, and scientific dissemination

Joint Work	<p>Co-authorship with D. Szopinski and D. Kundisch (65% C. Vorbohle, 20% D. Szopinski, 15% D. Kundisch)</p> <ul style="list-style-type: none"> ▪ Research design planned jointly with D. Szopinski ▪ Concretization of the research question jointly by all authors ▪ Literature review by C. Vorbohle ▪ Positioning of the paper jointly with D. Szopinski and D. Kundisch ▪ Taxonomy development by C. Vorbohle ▪ Write-up of paper by C. Vorbohle ▪ Write-up of the revised paper and response to the ECIS reviewers by C. Vorbohle ▪ Feedback, comments, and corrections by D. Szopinski and D. Kundisch
Presentations	<ul style="list-style-type: none"> ▪ 06/2021: Vorbohle, C., Szopinski, D., and Kundisch, D. (2021). Toward Understanding the Complexity of Business Models – A Taxonomy of Business Model Dependencies, contribution at: 29th European Conference on Information Systems (ECIS), Virtual. Presented by C. Vorbohle. ▪ 07/2020: Vorbohle, C., Szopinski, D., and Kundisch, D. (2020). Business Model Dependencies: Towards conceptualizing dependencies for extending business model modeling languages, contribution at: 10th International Symposium on Business Modeling and Software Design (BMSD), Potsdam. Presented by C. Vorbohle.
Scientific Dissemination	<ul style="list-style-type: none"> ▪ The work on this paper started in February 2020. ▪ An earlier version of this paper was published in the proceedings of the 10th International Symposium on Business Modeling and Software Design (BMSD), 2020 (VHB-Rating 2024: C). ▪ The paper was accepted for publication in the proceedings of the 29th European Conference on Information Systems (ECIS), 2021 (VHB-Rating 2024: A).

4.2 Study 2: Vorbohle and Kundisch (2024)

In the second study, we reconsider the role of the business model as a conceptual instrument of alignment not only for digital businesses but also for ecosystem alignment. Here, the business model concept acts as an intermediary between various business models within the same ecosystem. Using the case of autonomous shipping in the maritime logistics industry, we highlight five design challenges for ecosystemic business models (e.g., establishing a joint value proposition), highlighting the differences between the design of such business models and the design of more conventional firm-centric business models. Because of these differences, we argue that commonly used business model tools, such as the BMC, are insufficient to address these challenges because of their inherent focus on single-organization representations. Therefore, we conceptually examine how business model tools can be adapted, and derive functional design requirements for tools able to support the design of ecosystemic business models. This work contributes to the IS literature by bridging the concepts of business models and ecosystems, and business model tools, and by outlining research opportunities for tool development and evaluation.

Table 5. Vorbohle, C., and Kundisch., D. (2024): Joint Work, Presentations, and Scientific Dissemination

Joint Work	<p>Co-authorship with D. Kundisch (80% C. Vorbohle, 20% D. Kundisch)</p> <ul style="list-style-type: none"> ▪ Research design planned jointly with D. Kundisch ▪ Concretization of the research question jointly with D. Kundisch ▪ Literature review by C. Vorbohle ▪ Positioning of the paper jointly with D. Kundisch ▪ Conceptual model development by C. Vorbohle ▪ Write-up of paper by C. Vorbohle ▪ Write-up of the revised paper and response to the Journal of Business Model reviewers by C. Vorbohle ▪ Feedback, comments, and corrections by D. Kundisch
Scientific Dissemination	<ul style="list-style-type: none"> ▪ The work on this paper started in January 2023. ▪ The paper was initially submitted to Journal of Business Models in April 2023. ▪ The paper has been accepted for publication at Journal of Business Model after two rounds of revision in December 2023 (VHB-Rating 2024: C).

4.3 Study 3: Althaus et al. (2025)

In the third study, we examine and support the emergence of a data space-enabled cultural data ecosystem in Germany, focusing on the heterogeneous landscape of cultural event platforms. Based on the conceptual considerations (i.e., the business model as an instrument of alignment for ecosystem design) of Vorbohle and Kundisch (2024) and guided by the ecosystem-as-structure view, we argue that the willingness of cultural event platforms to participate in a cultural data ecosystem depends on the alignment between their business models and the identification of focal value propositions. To advance understanding of the diverse business model landscape within this cultural data ecosystem, and to support its initiation, we develop and validate a business model taxonomy of cultural event platforms, which describes 18 dimensions and 83 characteristics derived through iterative conceptual and empirical work with 151 cultural event platforms from German-speaking countries. A subsequent cluster analysis identifies six archetypal business models of cultural event platforms. In addition, we conduct interviews with representatives from each archetype and explore benefits and obstacles, which are used to discuss two potential focal value propositions as well as actor roles and activities needed for each value proposition to flourish. With the paper showcasing how a business model tool (i.e., business model taxonomy) can be deployed to support the initiation of a concrete ecosystem, we contribute to the data ecosystems literature by providing industry-specific insights into how emerging data ecosystems can be developed in highly fragmented industries.

Table 6. Althaus, M., Vorbohle, C., Müller, M., and Kundisch, D. (2025): Joint work, presentations, and scientific dissemination

Joint Work	<p>Co-authorship with M. Althaus, M. Müller and D. Kundisch (30% M. Althaus, 30% C. Vorbohle, 30% M. Müller, 10% D. Kundisch)⁶</p> <ul style="list-style-type: none"> ▪ Literature review jointly with M. Althaus and M. Müller ▪ Concretization of the research question jointly by all authors ▪ Positioning of the paper jointly by all authors ▪ Data collection from CEPs jointly with M. Althaus, M. Müller, A. Schmitt-Chandon (project partner), M. Peter (project partner) and N. Chuzhova (student assistant) ▪ Taxonomy development jointly with M. Althaus and M. Müller ▪ Taxonomy classification jointly with M. Althaus, M. Müller, A. Rinkowski (student assistant), N. Chuzhova (student assistant), N. Grieger (student assistant), F. Fink (student assistant), D. Funk (student assistant), and K. Zunke (student assistant) ▪ Taxonomy evaluation jointly with M. Althaus ▪ Cluster analysis by M. Althaus ▪ Execution and analysis of interviews jointly with M. Althaus and M. Müller ▪ Write-up of initial paper jointly with M. Althaus and M. Müller ▪ Write-up of the response to the reviewers and revision for Electronic Markets jointly by all authors ▪ Feedback, comments, and corrections by D. Kundisch
Presentations	<ul style="list-style-type: none"> ▪ 09/2023: Althaus, M., Grieger, N., Vorbohle, C., Müller, M., and Kundisch, D. (2023). Business Models for Cultural Event Platforms – A Taxonomy Approach, contribution at: Mediterranean Conference on Information Systems (MCIS) and the Middle East & North Africa Conference on Digital Information Systems (MENACIS), Madrid, Spain. Presented by M. Althaus. ▪ 08/2023: Althaus, M., Grieger, N., Vorbohle, C., Müller, M., and Kundisch, D. (2023). Business Models for Cultural Event Platforms – A Taxonomy Approach, contribution at: International Conference on Challenges in Managing Smart Products and Services (CHIMSPAS), Bielefeld, Germany. Presented by M. Althaus.

⁶ In the MCIS/MENACIS version of this paper, N. Grieger was also a co-author, but left the author team for the Electronic Markets version.

Scientific Dissemination	<ul style="list-style-type: none">▪ The work on this paper started in February 2023.▪ An earlier version of this paper was published in the proceedings of the Mediterranean Conference on Information Systems (MCIS) and the Middle East & North Africa Conference on Digital Information Systems (MENACIS), 2023 (VHB-Rating 2024: D).▪ The paper was initially submitted to Electronic Markets in February 2024.▪ The paper has been accepted for publication at Electronic Markets after three rounds of revision in May 2025 (VHB-Rating 2024: B).
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4.4 Study 4: Ksouri-Gerwien and Vorbohle (2025)

The fourth study develops and evaluates an approach to quantitative business model prototyping and evaluation that explicitly incorporates the ecosystem perspective. Building on a comprehensive analysis of existing evaluation tools and frameworks for structuring system dynamics models, we show that these approaches are insufficient for supporting business model prototyping and evaluation in ecosystem settings. Therefore, we develop an actor-based modeling framework that leverages system dynamics to represent both intra-organizational and inter-organizational value creation and capture structures. By conducting a two-and-a-half-year action design research project with two German industrial companies (“Alpha” and “Beta”), we iteratively designed, applied, and refined the framework in two real-world business model innovation projects. The framework organizes system dynamics model elements around actors, enabling modular representation of multiple ecosystem actors and their reciprocal dependencies. It allows for business model evaluation from multiple ecosystem actor perspectives and facilitates scenario analysis and simulation experiments. This work advances the business model innovation literature by operationalizing the ecosystem perspective in quantitative evaluation, providing a structured method to “fail in virtuality to profit in reality.”

Table 7. Ksouri-Gerwien, C., and Vorbohle, C. (2025): Joint work, presentations, and scientific dissemination

Joint Work	<p>Co-authorship with C. Ksouri-Gerwien (65% C. Ksouri-Gerwien, 35% C. Vorbohle)</p> <ul style="list-style-type: none"> ▪ Concretization of the research question jointly with C. Ksouri-Gerwien ▪ Positioning of the paper jointly C. Ksouri-Gerwien ▪ Literature review jointly with C. Ksouri-Gerwien ▪ Artifact development jointly with C. Ksouri-Gerwien ▪ Data collection by C. Ksouri-Gerwien ▪ System dynamics modeling and artifact application by C. Ksouri-Gerwien ▪ Artifact evaluation by C. Ksouri-Gerwien ▪ Write-up of initial paper jointly with C. Ksouri-Gerwien ▪ Write-up of the response to the reviewers and revision for the HICSS versions jointly with C. Ksouri-Gerwien
Presentations	<ul style="list-style-type: none"> ▪ 01/2023: Ksouri-Gerwien, C., and Vorbohle, C. (2023). Supporting Business Model Decision-making in B2B Ecosystems: A Framework for Using System Dynamics, contribution at: 55th Hawaii International Conference on System Sciences (HICSS), Maui, USA. Presented by C. Vorbohle.
Scientific Dissemination	<ul style="list-style-type: none"> ▪ The work on this paper started in June 2021. ▪ Earlier versions of this paper were published in the proceedings of the Hawaii Conference on System Sciences (HICSS), 2023 (VHB-Rating 2024: B) and in Schallmo, D.R.A., Kundisch, D., Lang, K., Eds., Digitale Plattformen und Ökosysteme im B2B-Bereich. Schwerpunkt Business Model Innovation, Springer Gabler, Wiesbaden. ▪ The paper is currently under review at Information Systems and e-Business Management (ISeB) (VHB-Rating 2024: C).

4.4 Study 5: Vorbohle (2025)

In the fifth and final study, I investigate how visual inquiry tools can be enhanced to better support the collaborative design of multi-actor ecosystems. While visual inquiry tools (e.g., canvases) hold promise for fostering alignment, existing visual inquiry tools lack prescriptive, context-specific guidance for addressing the complex collaboration challenges of ecosystem design. Following an observational design science research approach, I systematically identify nine visual inquiry tools for ecosystem design, analyze their theoretical underpinnings, and evaluate three of the tools in artifact-in-use workshops. I then derive five meta-requirements and formulate and evaluate six design principles, each instantiated in concrete design features. The work contributes to the IS literature on business model and ecosystem design tools by contextualizing the existing visual inquiry tool design theory for cross-organizational, power-balanced collaboration. It offers actionable guidance for tool creators, bridging design principles with design features to reduce ecosystem design failures and foster more effective multi-actor innovation.

Table 8. Vorbohle, C. (2025): Joint work, presentations, and scientific dissemination

Joint Work	Single authored paper
Presentations	<ul style="list-style-type: none"> ▪ 06/2024: Vorbohle, C. 2024. Bridging Boundaries: Enhancing Visual Inquiry Tools for Ecosystems through Design Archaeology, contribution at: Thirty-Second European Conference on Information Systems (ECIS), Research-in-Progress, Paphos, Cyprus. ▪ 06/2025: Vorbohle, C. 2025. Toward Design Principles to Enhance Visual Inquiry Tools for Ecosystem Design, contribution at: Business Model Conference (BMC) 2025, Oulu, Finland.
Scientific Dissemination	<ul style="list-style-type: none"> ▪ The work on this paper started in May 2023. ▪ An earlier version of this paper has been accepted for publication in the proceedings of the European Conference on Information Systems (ECIS), 2024 (VHB-Rating 2024: A) and in the proceedings of the Business Model Conference 2025. ▪ The paper is currently under review at Business & Information Systems Engineering (VHB-Rating 2024: B).

5. Reflection on Methodology

As part of conducting research for this dissertation, I reflect on the chosen research approach in relation to existing literature and the individual research studies, with a particular focus on methodology. Furthermore, I describe the strengths and drawbacks associated with the choice of methodologies, and I reflect on my personal experiences and learnings I gained from applying the research approach.

One of the main objectives of a PhD – and usually a daunting prospect for many new doctoral students – is to make meaningful contributions to knowledge. This is especially the case when applied to the vast and constantly evolving streams of business model and ecosystem research, given that these research streams are taking place simultaneously across different academic disciplines and with varying perspectives on research contributions (Autio and Thomas 2020; Wirtz et al. 2022). In addition, business model innovation, multi-actor ecosystem development, and business model tooling are partly driven by practice, which requires integrating knowledge from both research and practice. This dissertation is based on the assumption that researching the complex and interdisciplinary phenomenon of designing ecosystemic business models requires a multitude of academic disciplines, perspectives on contributions, and practical influences. Furthermore, driven by my motivational research question, one central goal guiding my research was to develop contributions that not only contribute to academic knowledge but that are also relevant to practice. For this reason, each study employs a different research approach to address the current state of research in each identified gap and to provide a meaningful contribution.

In Study 1 (Vorbohle et al. 2021), we began with the idea that the phenomenon of business model dependencies necessitates not only theoretical but also empirical investigation, as only real-world observations can reveal all relevant dimensions and characteristics. Therefore, with the aim of conceptualizing knowledge on business model dependencies, we chose to develop a taxonomy following the method of Nickerson et al. (2013). Taxonomies support researchers in conceptualizing phenomena by classifying objects according to shared dimensions and characteristics, and therefore enjoy high popularity in IS research (Kundisch et al. 2022), particularly for understanding business models (Möller et al. 2021). Over the course of several iterations, taxonomies draw not only on academic literature (conceptual-to-empirical) as a source for creating dimensions and their characteristics, but also on the observation of empirical objects (empirical-to-conceptual) (Nickerson et al. 2013). Apart from being artifacts

for describing and classifying phenomena, taxonomies can also provide a “theory for analyzing” when very little is known about the phenomenon in question (Gregor 2006).

One major difficulty in our taxonomy development approach was defining what business model dependencies actually are (i.e., defining the object of investigation), as no prior definition existed in the literature, “partly because no generally accepted components have been established yet in literature” (Wirtz et al. 2016, p. 51). In our working definition aimed at delimiting the object of investigation, dependencies exist between two objects because of the dependence of the outcome. These two objects can exist at different levels of abstraction, such as at the level of business model elements, business model building blocks, or concrete business models. Moreover, dependencies may not only affect objects that are directly involved (i.e., first-degree dependencies) but also those that cause second-degree dependencies. For practical reasons, we focused our analysis on first-degree dependencies.

This approach proved adequate in identifying relevant articles and coding them, but it also revealed complications in regards to subsequent taxonomy evaluations and the development of archetypes. Reflecting on this issue, business model dependencies emerged as a more complex object of investigation for taxonomy development, in contrast to other domains where the objects of analysis can be clearly defined, such as business model development tools (Szopinski et al. 2020). While on the one hand, our business model dependency taxonomy enables users to identify and understand the architecture of business models more effectively, on the other, upon critical reflection, the taxonomy approach did not perfectly support the future research goal of improving business model modeling languages. As this paper was the first research project of my PhD, and with the benefit of five years of hindsight, I would approach the research goal differently in terms of methodology. I would first put more effort into defining business model dependencies more comprehensively and more clearly differentiated from other concepts, before developing a construct for business model dependencies.

The second paper, Study 2 (Vorbohle and Kundisch 2024) was driven by the aim to bridge the three literature streams and build a foundation for the research contributions of my dissertation. It therefore also serves as a published motivation for my dissertation and was discussed intensively with other researchers (e.g., at the Business Model Conference PhD colloquium in 2023). The strength of the chosen conceptual approach lies in its structured progression: it started with an illustrative case (the autonomous shipping ecosystem), identifying business model design challenges within this case, and then derived functional design requirements for tool support based on conceptual considerations for the business model as an inter-

organizational alignment instrument. I found this approach especially helpful because it demonstrates how research can systematically move from specific observations toward more generalizable conceptual and practical insights. Yet, this methodological choice is not without drawbacks. The reliance on a single illustrative case raises questions about the generalizability of the identified challenges (Tellis 1997). Other cases may face different design challenges or emphasize other aspects of ecosystemic business model collaboration. Personally, engaging with this research approach has been both challenging and instructive, as we could not rely on empirically generated results; instead, we had to convince the reviewers and editor purely through argumentation. In retrospect, this study highlights the importance of conceptual work as a legitimate and impactful research contribution, more of which, I believe, would benefit IS research.

In Study 3, Althaus et al. (2025), we conducted a multiple-method approach, which consisted of three different phases: taxonomy development and evaluation, cluster analysis, and qualitative interviews. While the taxonomy development and cluster analysis aimed at understanding and structuring the heterogeneous landscape of cultural event platform business models, interviewing representatives from eight cultural event platforms gave us contextual, in-depth insights into the potential benefits and obstacles that these platforms, as key stakeholders, would face when participating in a cultural data ecosystem (Lim 2025; Rowley 2012). In combination with the results of the business model taxonomy, the findings of the interviews also enabled us to derive potential focal value propositions for the cultural data ecosystem, and to assign potential actor roles and activities to the cultural event platforms when participating in the data ecosystem. At that time, conducting qualitative interviews was a new experience for me. Throughout the process, particularly when designing the semi-structured interview guide and analyzing and interpreting the data, I learnt that this method could provide new and valuable insights that could not be obtained using other methods. I also learnt that interviewees were more open and honest than I had expected. However, a limitation of qualitative research is its generalizability (Lim 2025). Although we used our archetypes to select interview partners, we only conducted eight interviews in total. Therefore, the perspective of interview partners for each archetype may not apply to other cultural event platforms that could also participate in the cultural data ecosystem.

Moreover, in the initial submission to *Electronic Markets* and in the first round of revision, we tried to position our multiple-method approach as a methodological contribution for initiating data ecosystems, alongside providing a new conceptual perspective on cultural data ecosystems

(based on Vorbohle and Kundisch 2024) as a second research contribution (the conceptual perspective can be found in the appendix to the published paper). Both the methodological approach and the conceptual perspective would have fitted perfectly into this dissertation, contributing to the description of the research gap and the initiation phase of ecosystemic business model innovation. However, neither of the contributions found their way into the published version of the paper, as we were unable to convince one reviewer that these contributions were worthwhile. Therefore, reflecting on this challenge, I realised that new methodological and conceptual contributions can be very difficult to get published in IS research.

The approach of action design research in Study 4, Ksouri-Gerwien and Vorbohle (2025), stands out as both rigorous and practice-oriented. By engaging in a two-and-a-half-year collaboration with two industrial organizations, we ensured that our artifact – the actor-based modeling framework – was not merely theoretically grounded but also shaped by real-world challenges of ecosystemic business model innovation. This embedding in practice is a clear strength, as it allowed iterative cycles of building, intervention, and evaluation that continuously refined the framework and enhanced its practical relevance (Sein et al. 2011). The integration of kernel theories from business model and ecosystem literature further underscores its methodological rigor, anchoring the artifact in theoretical knowledge while extending it toward novel applications.

Nevertheless, I also need to reflect upon its methodological limitations. The application and evaluation of the artifact is bound to two organizations (anonymized as Alpha and Beta), each innovating its business models, considering one key ecosystem partner. While this choice was pragmatic given the project's constraints, it narrows the generalizability of the artifact. Modeling only parts of an ecosystem raises questions about how the framework scales in more complex multi-actor settings where interdependencies are less structured. While I personally think that this issue does not influence the usefulness of the artifact, reviewers of the *Electronic Market* and *Communications of the Association for Information Systems* Journal disagreed. In addition, the need for a skilled system dynamics modeler highlights the method's complexity (Moellers et al. 2019), which may limit the adoption of our framework in less research-attuned or resource-constrained organizations. Moreover, the scope of the summative evaluation was constrained to the second organization's (i.e., Beta) business model innovation team (n = 3), which does not allow the evaluation results to be generalized, and the evaluation should be considered indicative. Nevertheless, the summative evaluation offers considerable added value.

From a personal learning perspective, engaging in action design research involves striking a balance between abstraction and usability. The iterative engagement with practitioners showed that system dynamics models must not only capture causal complexities but also remain communicable to decision-makers. We were constantly reminded that the methodological challenge in the design science research paradigm lies not only in developing theoretically rigorous artifacts, but in producing practically relevant artifacts to the problem (Peffer et al. 2007). Ultimately, this research study deepened my appreciation for action design research as a method that bridges rigor and relevance. At the same time, I have also realized the difficulties involved in publishing research results that have been developed in collaboration with practitioners, due to confidentiality agreements in place.

In Study 5, Vorbohle (2025), I refrained from producing “yet another tool” in an already existing landscape of visual inquiry tools for ecosystem design. Instead, I opted for an observational design science research approach, aiming to analyze, synthesize, and test existing tools to generate prescriptive design knowledge for their enhancement. This choice reflects a deliberate research stance. In contexts where artifacts already abound, the more meaningful contribution may lie not in proposing similar tools with a slightly different theoretical foundation but in consolidating and refining existing knowledge; addressing overlooked user challenges; clarifying design requirements; and developing design knowledge for enhancement. This approach is akin to that of Thomas Edison, one of the inventors of the light bulb, as he was interested in what he calls “perfecting”, or how *The New Yorker* put it: “Edison did not look for problems in need of solutions, he looked for solutions in need of modification” (Cep 2019).

Among the paper’s strengths, the systematic literature analysis combined with a large-scale artifact-in-use workshop and expert evaluation ensured that the developed design principles and design features provide an interesting research contribution to the emerging research area of visual inquiry tools (Avdiji et al. 2020). The artifact-in-use workshop with over 100 participants offered an opportunity to observe visual inquiry tools for ecosystem design at scale, revealing recurring user struggles such as cognitive overload and divergent conceptual understandings. These insights, combined with the perspectives of practitioners and researchers in the evaluation phase, significantly enhanced the robustness and relevance of the derived design knowledge.

However, certain methodological trade-offs also warrant reflection. The reliance on students in the workshops, while pragmatic, raises questions of validity compared to professional

practitioners. Similarly, the observational approach, while helpful in identifying challenges and producing design knowledge, limited opportunities for iterative refinement. Finally, the reliance on qualitative feedback demanded extensive coding and interpretation, inevitably bearing traces of subjectivity (Lim 2025).

Personally, I found this research study's journey intellectually demanding and exhausting, at the same time as ultimately rewarding, as it offered me the opportunity to submit my work to one of the most prestigious outlets for design science research (*Journal of the Association for Information Systems*). It significantly improved my design science research knowledge because conducting and positioning observational design science is still in its infancy, lacking clear methodological guidance (Molla et al. 2024). In addition, it has increased my appreciation for the design science research paradigm, influencing my thinking beyond research.

To conclude, the combination of these different methodologies allowed me to follow a comprehensive and diverse research approach. By using different methodologies and even applying multiple methods in some studies, I have learned that the choice of methodology must be tailored to the characteristics of the research question, and that each approach has its advantages and disadvantages.

6. Conclusion

I started this synopsis with a quote from Baldwin (2012), who stated – more than ten years ago – that the development of ecosystems will be a key challenge for organizations in the future. This vision dates back even to the 1990s when Baroudi and Lucas (1994) discussed the role of IT in designing organizations, and predicted that “the organization of the future may not be an organization at all” (p. 22). Each subsequent new technological achievement has further intensified the digital interdependency between organizations, and will probably continue to do so in the future. When this interdependence affects the very structure that supports a joint value proposition, we enter a world where ecosystem thinking becomes highly relevant, and past predictions become a reality (Wang 2021).

This dissertation advances current knowledge of designing successful ecosystemic business models and provides a novel perspective on business model innovation, particularly regarding tool support. The first two studies, Study 1 and Study 2, address Research Area One and advance knowledge on conceptual foundations to improve business model tools. The last three studies (Study 3, Study 4 and Study 5) address specific research gaps within Research Area Two and focus on identifying, analyzing, using, developing, or enhancing artifacts at the

intersection of business model design and multi-actor ecosystem development. In this section, I elaborate on the contributions and implications of this dissertation, explain its limitations, provide avenues for future research, and make concluding remarks.

6.1 Contribution and Implications

First, I discuss the overarching contribution and implications for research and theory, before presenting the contribution and implications made to each research area by the respective studies. Second, I will discuss the main contribution to and implications for practice.

Contribution to Research and Theory

The research studies that constitute this dissertation collectively advance the literature on business model innovation by (1) extending its conceptual foundations and (2) developing tool support from an organizational-centric towards an ecosystem perspective.

In the first research area (Conceptual Foundations of Ecosystemic Business Models), the contribution lies in conceptualizing business model dependencies as a fundamental unit of analysis for ecosystemic business model design. Drawing from research on business models (i.e., following the same selection of journals as Massa et al. 2017), we identify and classify thirteen dimensions of business model dependencies. The taxonomy transforms the often implicit notion of dependencies within and between business models into explicit, analyzable characteristics, enabling a more granular understanding of how different dependency characteristics shape inter-organizational collaboration. By doing so, it provides a “theory for analyzing” (Gregor 2006) for research on business model innovation. Building on this conceptualization of dependencies, I further contribute to this research area by reframing the role of the business model as an alignment instrument between ecosystem partners. Anchored in the IS literature on the conceptual foundations of business models (Al-Debei and Avison 2010), we reconsider business model tools for ecosystemic business model design and derive functional design requirements for these tools.

In Research Area Two (Tool Support for Designing Ecosystemic Business Models), I contribute to the literature on business model tooling by providing new approaches, artifacts, and design knowledge that specifically address the functional design requirements of business model tools for specific business model design phases. In Althaus et al. (2025), we address the business model design phase of initiation, where business model tools are especially required to support the design of a joint vision and value proposition. Therefore, we first follow an inductive research approach and develop a “theory for analyzing” (Gregor 2006), as we

synthesize existing knowledge, and enable a shared understanding of cultural event platforms business models in data ecosystems through the development of a taxonomy. The developed taxonomy serves as the foundation for deriving cultural event platform business model archetypes, which are then used to highlight the salient business model characteristics of each archetype and conduct interviews with representatives. Afterwards, we deductively apply the ecosystem-as-structure view as a theoretical lens to derive potential focal value propositions, potential actor roles, and activities related to these archetypes within the emerging ecosystem (Adner 2017; Hou and Shi 2021). This paper employs both inductive and deductive research approaches to inform the literature on business model innovation and data ecosystems regarding the development of focal value propositions in the emerging phase of a specific industry (i.e., the cultural event industry).

In Study 4, Ksouri-Gerwien and Vorbohle (2025), we address the crucial yet underexplored business model innovation phase of integration, during which organizations innovate their business models within ecosystem settings. Existing business model tools often fall short in quantitatively evaluating the viability of new business models under conditions of joint value creation and mutual value capture (Gilsing et al. 2022). To close this gap, we develop a “theory for design and action” (Gregor 2006), combining kernel theories from the business model and ecosystem literature to build an actor-based modeling framework for using system dynamics. Furthermore, we generalize our insights into nine good design practices that guide system dynamics modelers in using the framework. The actor-based modeling framework extends prior work on simulation-based business model evaluation (Moellers et al. 2019; Nawroth et al. 2022). Alongside the Dynamic Business Model Canvas (Cosenz and Noto 2018), our framework is the second artifact to support modeling business models in system dynamics, and the first to incorporate the ecosystem perspective into the modeling process explicitly. Therefore, this study contributes to the business model innovation and tool literature by (1) advancing the theoretical understanding of how business model tools can support quantitative evaluation in ecosystem settings, (2) providing a framework for system dynamics modeling of business models in ecosystems, and (3) strengthening the methodological foundation for simulation-based business model innovation from an ecosystem perspective.

In Study 5, Vorbohle (2025), I specifically address the business model design phase of ideation, while also partly covering the transition from initiation to ideation. Here, business model tools are required to support the design of a joint vision and value proposition, and partly to identify business model dependencies and complementarities, which are key considerations for their

later integration. While prior research has emphasized the potential of visual inquiry tools for supporting collective business model ideation (Missonier et al. 2020), little is known about how to optimize these tools to prevent collaboration failures among ecosystem partners. Therefore, this study develops a “theory for design and action” (Gregor 2006) by deriving prescriptive design knowledge for a specific class of artifacts based on an observational design science research approach (Maedche et al. 2021). By providing prescriptive design knowledge, I extend the design theory for visual inquiry tools (Avdiji et al. 2020) to the context of multi-actor ecosystem development, and contribute to design science research by illustrating how observational analysis of artifacts can yield empirically grounded, actionable design principles. Moreover, this dissertation builds on conceptual foundations, methodological approaches, and contributions to business model tooling in the field of IS (e.g., Bouwman et al. 2020), combining them with the ecosystem-as-structure view established in the strategic management discipline (e.g., Adner 2017). While each paper is intended to make a direct contribution, additional value may lie in the fact that these studies bridge the gap between the fields of IS and strategic management. For example, the Study 3 use the ecosystem-as-structure view to initiate data ecosystems. This is likely to make researchers in the respective discipline aware of the expertise available in other disciplines that could be valuable to them. Taken together, my dissertation shows how the business model concept serves as a linchpin for developing multi-actor ecosystems and the accompanying tool support.

Implications for Practice

The results of this dissertation also carry important implications for practice. Specifically, executives, innovation managers, consultants, policymakers, and public innovation agencies practicing ecosystemic business model design, as well as practitioners from adjacent fields, can benefit from the research results in multiple ways.

For *executives*, the dissertation provides a conceptual lens for shifting from an organization-centric to an ecosystemic perspective on business models. It sheds light on how business model dependencies influence the joint value creation and capture, while also providing a framework for understanding the business model as an instrument for aligning multiple actors in ecosystem development. By conceptualizing ecosystemic business models as a boundary-spanning design problem, executives are encouraged to consider other business models at an early stage in the innovation process. This enables them to make better informed decisions in an increasingly technology-driven business world.

For *innovation managers* and *consultants*, the work contributes by informing them in selecting, developing, and adapting business model tool support, as well as by proposing new artifacts. It particularly demonstrates how taxonomies, visual inquiry tools, and simulation-based modeling frameworks can respectively support initiation, ideation, and integration in multi-actor ecosystem settings. Such tools serve as boundary objects, enabling heterogeneous stakeholders to share understanding, test assumptions, and converge on viable ecosystem designs. For example, the resulting design principles and design features proposed in Study 5, Vorbohle (2025), offer concrete guidance for developing or adapting visual inquiry tools to prevent ecosystem failure.

For *policymakers* and *public innovation agencies*, the findings underscore the importance of intentionally fostering ecosystems as vehicles for innovation and digital transformation. Particularly in heterogeneous and fragmented industries, such as the cultural event industry, the dissertation illustrates how public and private actors can align incentives and develop shared joint value propositions based on data-sharing activities (Althaus et al. 2025). It thus informs the design of policy instruments, funding programs, and regulatory frameworks that encourage new ecosystems.

In sum, this dissertation translates the abstract notion of “ecosystemic business models” into more practical knowledge. It demonstrates how IS research can inform practice by combining theoretical concepts with knowledge of artifact analysis, utilization, and design. Practitioners are thus equipped with a more in-depth understanding of what ecosystemic business models are, and the specific tools available for designing them.

6.2 Limitations

Like any research, the studies in this dissertation have limitations that need to be acknowledged and could be addressed in future work. Some limitations arise from the methodologies used, while others stem from decisions made during their implementation, or from external factors, such as data availability. Whereas details on the individual studies’ limitations are discussed in each paper, this section aims to discuss three general limitations that apply to this dissertation.

First, the conceptual foundations of business model and ecosystem research have evolved during this dissertation and will continue to evolve. For example, despite significant conceptual advances, the debate about what precisely constitutes an ecosystem and how this concept provides value for practical action is ongoing and unlikely to be resolved in the near future. Both research fields on business models and ecosystems are still transitioning from an *ostensive*

understanding (i.e., focused on meaning, structure, and representation) toward a *performative* understanding (i.e., the relationship between using the concepts and their non-/financial consequences). This conceptual progression limits the explanatory power of the design-oriented studies presented in this dissertation. While the dissertation demonstrates that business model innovation, for example, when supported by visual inquiry tools and quantitative system dynamics models, can facilitate shared understanding and collaboration among stakeholders, it cannot establish a causal relationship between the use of these tools and the ultimate performance of organizations. In other words, whether innovating ecosystemic business models through dedicated tools leads to superior success compared to more traditional, organizational-centric approaches remains an open, empirically unresolved question.

A second limitation of this dissertation concerns the contextual focus of the empirical analyses. While the studies aim to offer practice-oriented insights, they are situated in specific domains, such as the maritime logistics industry (Vorbohle and Kundisch 2024), the cultural event industry (Althaus et al. 2025), and the industrial industry (Ksouri-Gerwien and Vorbohle 2025), which constrains the generalizability of findings across industries and multi-actor ecosystem contexts.

Third, regarding the design science research approaches employed in this dissertation, selecting appropriate methods poses a challenge. For instance, in the observational design science research approach, a large-scale online workshop was conducted with students to derive meta-requirements (Vorbohle 2025). It is acknowledged that these meta-requirements could have been developed using alternative methods (Möller et al. 2020). Such methods include focus groups of between four and twelve interviewees, who collectively elaborate and reflect on a designated artifact (Tremblay et al. 2010). Furthermore, although the proposed guidelines for conducting applied research methods (e.g., literature reviews following Webster and Watson 2002), various aspects, such as search items and search sources, are based on individual decisions, which inherently entails limitations.

6.3 Avenues for Future Research

This dissertation opens several paths for future research in the intersection of business model innovation, multi-actor ecosystem development, and business model tooling. In the following, I will discuss five possible avenues for future research.

First, future research could build upon our implications for business model design and the derived functional design requirements for business model tools (Vorbohle and Kundisch

2024) and address specific functional design requirements with other possible tools that are not covered by the studies of this dissertation. This dissertation, therefore, covers only a small subset of the research opportunities proposed by Vorbohle and Kundisch (2024). The first attempt to investigate the value of existing business model modeling languages for supporting ecosystem design has been made (Vorbohle and Kundisch 2022). Furthermore, tools such as the complementary matrix proposed by Massa and Hackling (2020), could be adapted to the context of ecosystems and generate highly interesting contributions to this topic. Against this backdrop, I believe that especially design science research already offers much valuable knowledge, such as modeling complex systems or frameworks for artifact evaluations (Venable et al. 2016).

Second, addressing the first limitation of this dissertation (performative understanding), future research could conduct longitudinal, cross-contextual studies, and integrate complementary theoretical perspectives, such as organizational learning theory (Argyris and Schön 1978) or dynamic capabilities theory (Teece et al. 1997) to understand and trace the performative consequences of using ecosystemic business model tools over time. This avenue is probably the most challenging, but if conducted properly, it could make an extremely valuable contribution to science and practice.

Third, addressing the second limitation (contextual focus), future research could extend the validation of the insights gained in specific industries to other industries, thereby strengthening their external validity and theoretical generalizability within the IS discipline (Thomas et al. 2022). In addition, while this dissertation is anchored in the concepts of business models and ecosystems, and thus, develops knowledge for a specific class of artifacts, it opens avenues for future research that enable contributions to be made to the understanding and design of a broader class of artifacts (i.e., further generalization). For example, it would seem fruitful to investigate the application of the actor-based modeling framework proposed in Study 4 (Ksouri-Gerwien and Vorbohle 2025) or the prescriptive design knowledge for visual inquiry tools developed in Study 5 (Vorbohle 2025) in other contexts of cross-organizational collaboration, such as data sharing (Lefebvre et al. 2025).

Fourth, teaching ecosystemic business model design is an intriguing topic that could be explored further in research. Business model innovation introduces students to a practical challenge highly relevant to many organizations, and teaching it has already become the subject of research (Schlimbach et al. 2024; Szopinski 2019). Future research could focus on

identifying learning goals, discover effective ways to teach students about ecosystemic business model design, and explain the advantages and disadvantages of using different tools.

Fifth, given the number of different studies on tool support, it is an interesting direction to integrate this support into a larger tool ecosystem that facilitates the development of ecosystemic business models, and integrates tools across the different business model innovation phases. Following this idea, future research could explore a software toolkit that addresses all of the phases and requirements. For example, researchers could combine the approach used in this dissertation for analyzing different business models of ecosystem partners with a business model taxonomy and the derivation of focal value propositions based on qualitative insights (Althaus et al. 2025), and then use visual inquiry tools to further ideate on specific focal value propositions. This integration would offer a more seamless design approach, and the software toolkit to be explored could leverage existing software considerations, such as the co.LAB platform from Roschnik et al. (2024). Overall, integrating different tools into a software toolkit would help provide a structure to the heterogeneous field of ecosystemic business model design and enable combining existing tool features that are currently used and implemented in a somewhat separate manner. Moreover, such a tool ecosystem could be supported by recent technological advancements in GenAI, which are opening up many new opportunities in business model innovation (e.g., Lecocq et al. 2024).

6.4 Concluding Remarks

This dissertation was initiated at the onset of the coronavirus pandemic and completed amid the rapid emergence of GenAI – two phenomena that have profoundly reshaped the way organizations create, deliver, and capture value. Together, they underscore both the urgency and the enduring relevance of business model innovation, as well as the growing necessity of collaboration across organizational and industry boundaries.

I hope that this dissertation contributes meaningfully to the evolving body of knowledge on business model innovation, multi-actor ecosystem development, and business model tooling within the IS community and beyond. In particular, the findings on tool support for ecosystemic business model design aim to offer practical value to researchers, educators, and practitioners alike. The overarching aspiration was to harness technological progress to develop business models that empower customers to solve their problems, enable organizations to remain adaptive and competitive, and ultimately foster the collaborative renewal of industries in times of accelerating transformation and growing uncertainty.

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