Towards a Maturity Model for Digital Platform Ecosystem Orchestration

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Towards a Maturity Model for Digital Platform Ecosystem Orchestration

Master thesis

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Abstract

An increasing number of companies aspire to incorporate digital platforms in their business models. However, the process of establishing and maintaining a successful digital platform is a challenging and intricate process. For the digital platform to be successful, platform owners need to be able to successfully coordinate and promote the interdependencies and interactions between the actors in the ecosystem. Hence, platform owners need to develop specific capabilities for orchestrating the digital platform ecosystem. To understand what capabilities are required and how these can be developed, this thesis designs a maturity model for digital platform ecosystem orchestration (the MM-DPEO). The maturity model will help platform owners assess their current state of orchestration capabilities and provide a roadmap to improve their maturity level related to their capabilities. The maturity model is iteratively developed, beginning with its conceptualization using pertinent literature and then refining and enhancing it through a Delphi study. Moreover, the model is empirically evaluated for its understandability, ease of use, usefulness, and applicability. Overall, this thesis contributes to the academic understanding of orchestrating digital platform ecosystems and addresses the practical need of platform owners to assess and develop their orchestrating capabilities.

Keywords - Digital platform ecosystems, Maturity model, Orchestration, Value co-creation

Executive Summary

In the rapidly evolving digital landscape, digital platforms have emerged as highly appealing business models and strategies, serving as a promising catalyst for economic growth. As such, organizations of all types are seeking to integrate digital platforms into their business models. However, the process of establishing and maintaining a successful digital platform is a challenging and intricate process. Whereas traditional firms confine their operations within the boundaries of a company or supply chain, digital platforms establish an ecosystem of autonomous agents to co-create value. Hence platform owners need to be able to successfully coordinate and promote the interdependencies and interactions between the ecosystem actors, a process commonly referred to as orchestration. In practice, however, platform owners seem to have inadequate capabilities to cope with the challenges of orchestrating a digital platform ecosystem. Moreover, not much research has been done on the required capabilities platform owners should have to orchestrate a digital platform ecosystem successfully.

Maturity models can be used to address this need by providing guidance to companies in establishing and improving their capabilities. A maturity model is a conceptual framework that characterizes a set of capabilities in a specific area and describes an anticipated, desired, or typical evolutionary path for these capabilities. Despite the importance of digital platform ecosystem orchestration, a dedicated maturity model in this area is currently lacking. Therefore, this thesis aims to develop a maturity model specifically designed for platform owners to orchestrate digital platform ecosystems.

To ensure methodological rigor, the development of the present maturity model followed the procedure model for developing maturity models as proposed by (Becker et al., 2009). The development process involved five distinct steps. In the first step, the research problem was identified and contextualized. The second step involved assessing existing maturity in similar or related domains of digital platform ecosystems. Building upon these insights, the third step was determining the development strategy. As the assessment concluded that the existing maturity models insufficiently tackled the complexities of orchestrating digital platform ecosystems, there was opted to create a new maturity model. The fourth step comprised an iterative development process. This step constitutes the core activity of the maturity models development process and was conducted in two rounds. The first round focused on conceptualizing an initial version of the maturity model based on insights derived from the literature. In the second round, this version was iteratively refined and enhanced through a Delphi study involving three iterations with eleven experts. The findings from this research informed the final version of the model, named the Maturity Model for Digital Platform Ecosystem Orchestration (MM-DPEO). The final step involved evaluating the model with practitioners. Four semi-structured interviews were conducted, focusing on evaluating the model's understandability, ease of use, usefulness, and applicability.

Hence, the present thesis resulted in the Maturity Model for Digital Platform Ecosystem Orchestration (MM-DPEO). The MM-DPEO allows platform owners to self-assess the current level of maturity of their orchestration capabilities and for road mapping future improvements. Overall, the MM-DPEO consists of nine orchestration capabilities categorized in four dimensions (Figure 1). The dimension of 'Framing' contains two capabilities, namely 'Envisioning' and 'Positioning',

which center around influencing and altering the perception of existing and potential producers. Moreover, the dimension 'Activating' contains two capabilities, namely 'Convening' and 'Onboarding', which revolve around the structuring of the digital platform ecosystem to facilitate value co-creation. In the dimension of 'Synthesizing', three capabilities are identified, namely 'Coordinating', 'Governing', and 'Reforming'. These capabilities focus on creating an environment conducive to interaction and cooperation and minimizing obstacles to collaboration. The final dimension 'Mobilizing' contains two capabilities, namely 'Reinforcing' and 'Rewarding', which are centered around building commitment among the producers and promoting their retention within the digital platform ecosystem.

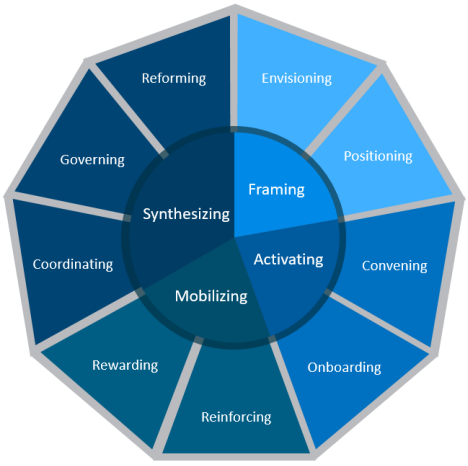

Figure 1: Overview of the Capabilities and Dimensions of the MM-DPEO

The MM-DPEO is further structured as a matrix. Hence, for every capability, comprehensive descriptions are provided, delineating the specific characteristics associated with each stage of maturity. Overall, the maturity model uses four maturity levels to characterize the maturity, spanning from an initial stage to a leading stage. In Figure 2, the capability 'Envisioning' with its maturity descriptions can be seen.

Dimensions	Capabilities	Maturity Levels			
		Level 1 – Initial stage	Level 2 – Development stage	Level 3 – Advanced stage	Level 4 – Leading stage
Framing	Envisioning	Maturity Description C1/L1	Maturity Description C1/L2	...	Maturity Description C1/L1
	Legitimizing	...	...	...	...
Activating	Constructing	...	...	...	...

Capability	Description	Maturity level 1 - Initial stage	Maturity level 2 - Development stage	Maturity level 3 - Advanced stage	Maturity level 4 - Leading stage
Envisioning	the ability to envision and strategize the potential value proposition of the platform.	A formalized vision does not exist, or is limited and informal. Consequently, minimal or no practices are in place to strive towards a potential future of the platform. The primary focus is on understanding the platform's basic features and functionalities and its direct benefits without considering how it could collaboratively build and enhance the value proposition.	A vision is defined, but includes limited adherence and anticipation of the potential value complementors can bring. There are strategizing, roadmapping, and navigation efforts of the potential value proposition of the platform but these are not fully formalized and maintained.	The platform's vision is well-defined and maintained with formalized practices. The envisioning extends beyond the value of the core platform, recognizing the potential value contribution from the complementors. The vision serves as a unifying force, guiding actions, and inspiring collective effort of the complementors. Strategizing, roadmapping, and navigating are well executed and based on a deep understanding of the envisioned value proposition of the platform.	Comprehensive practices are in place whereby the platform's vision is actively created and regularly reviewed, refined, and adapted to changing circumstances and emerging opportunities. Strategizing, roadmapping, and navigating are continuously refined and enhanced to adapt and evolve with the new understanding of the platform's potential value proposition.

Figure 2: The Capability 'Envisioning' in the MM-DPEO

In conclusion, the MM-DPEO contributes to addressing the challenge of insufficient capabilities of platform owners in orchestrating digital platform ecosystems. By identifying nine essential capabilities for successful orchestration, the model provides a valuable framework for platform owners to assess and enhance their orchestration capabilities. Moreover, the MM-DPEO serves as an effective tool for prioritizing improvements and monitoring progress. Besides its benefits to practice, this thesis also advances the academic literature by offering novel insights into the conceptualization of digital platform ecosystems and their orchestration. Additionally, it provides a concrete example of rigorously developing a maturity model, contributing to the field of maturity model development.

The present thesis, however, also has some limitations that offer opportunities for future research. One limitation is the abstract and conceptual nature of the maturity model, which limits its usefulness as it may not fully address the specific information needs of particular contexts or domains. To overcome this, future research could tailor the model to specific contexts. Secondly, the methods employed in the design and evaluation of the thesis may have introduced potential biases, and hence, the MM-DPEO requires further validation. Finally, more investigation is needed to determine the extent to which increased maturity of orchestration capabilities leads to improved performance.

Preface

In September 2022, I embarked on my Master's thesis journey at Deloitte, marking the end of my educational career. This experience has been incredibly rewarding and transformative, allowing me to gain invaluable knowledge and personal growth. As I approach the completion of this thesis, I want to take a moment to express my sincere appreciation to all those who have supported me and contributed to this process.

First, I am incredibly grateful to my supervisors, Baris Ozkan and Leonid Chechurin. Your unwavering support, guidance, and commitment to excellence have played a vital role in shaping the direction of this thesis. I sincerely appreciate the time you dedicated to our meetings, even when I needed them on short notice. Your mentorship and constructive feedback have pushed me to explore new ideas, overcome challenges, and maintain a high standard of academic rigor.

I would also like to extend my sincere thanks to my supervisors from Deloitte, Eelco Verheyen and Iman Haghighirad. Your trust, encouragement, and the opportunity you provided me to undertake this research have been invaluable. I am especially grateful for the meetings and numerous brainstorming sessions we had, where your perspectives and insights have helped me gain clarity and navigate through challenges.

Moreover, I would like to express my heartfelt thanks to all those who participated in my research either through the Delphi study or interviews. Your willingness to share your time and insights have significantly influenced the quality of this thesis.

Lastly, I want to express my heartfelt appreciation to my friends and family. Your unwavering presence and support have meant the world to me throughout my thesis and entire studies. My friends have been a source of joy, providing me with memorable moments that I will cherish forever. To my family, I can't thank you enough for your unconditional love and support. Your belief in me and your encouragement has been my rock during this academic journey.

Thank you, I hope you enjoy your reading.

Noëlla Verschuren
Eindhoven, Juli 2023

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Chapter 1

Introduction

1.1 Trends and Challenges

In the rapidly evolving landscape of the digital age, digital platforms have emerged as highly appealing business models and strategies, serving as a promising catalyst for economic growth (Acs et al., 2021; Asadullah et al., 2018). By leveraging platforms, organizations can benefit from various advantages, including increased market reach, cost efficiencies, enhanced innovation, and flexibility, ultimately leading to delivering heightened value to their customers (Parker et al., 2017; Tiwana, 2013). Moreover, platforms result in higher operating profits, market values, and growth rates (Yoffie et al., 2019). As such, organizations of all types, from emerging enterprises to established industry leaders, are seeking to integrate digital platforms into their business models (Ramasundaram et al., 2023; Kapoor et al., 2021).

However, bringing about and sustaining a digital platform is neither easy nor automatic. Digital platforms combine and deploy technologies in new ways to incubate and coordinate an ecosystem of supply and demand (Hein et al., 2020). Whereas traditional firms confine their operations within the boundaries of a company or supply chain, digital platforms establish a network of autonomous agents to co-create value (Hein et al., 2020). Consequently, a digital platform can be thought of as a collective of firms and individuals around a digital platform, in other words, a digital platform ecosystem (Spagnoletti et al., 2015; De Reuver et al., 2018).

For the organization wanting to establish a digital platform ecosystem - henceforth the platform owner - it is a challenge as they bear primary responsibility for designing, functioning, and maintaining these ecosystems (Helfat & Raubitschek, 2018; Iansiti & Levien, 2004b). Platform owners need to be able to successfully coordinate and promote the interdependencies and interactions between the actors in the ecosystem, a process commonly referred to as orchestration (Autio & Thomas, 2021; Chen et al., 2022; Valkokari et al., 2017). However, these are complex tasks given the number of actors involved, the multi-faceted characteristics of these ecosystems, the highly dynamic environment, and the high uncertainty (Helfat & Raubitschek, 2018; Mukhopadhyay & Bouwman, 2019).

1.2 Problem statement and Objective

In practice, firms have failed at an alarming rate when adopting and navigating digital platform ecosystems. Research by the BCG Henderson Institute found that more than 85% of digital platforms fail, with about $50 billion worth of capital lost every year (Pidun et al., 2020; Yoffie et al., 2019). Many of these failures can be attributed to the inability of platform owners to effectively orchestrate their ecosystems (Pidun et al., 2020). Specifically, platform owners seem to have inadequate capabilities to cope with the challenges of orchestrating digital platform ecosystems (Karimi

& Walter, 2015; Ramasundaram et al., 2023; Turber et al., 2014; Yablonsky, 2020). Consequently, research is necessary to assist platform owners with creating a comprehensive set of capabilities for successfully orchestrating digital platform ecosystems.

Although the importance of orchestration has been widely recognized in the literature, there has not been much research focusing on the required capabilities platform owners should have to successfully orchestrate a digital platform ecosystem from inception to maturity. Identified studies and frameworks with an explicit focus on the orchestration of digital platform ecosystems have typically considered necessary structural properties and mechanisms (De Reuver et al., 2018; Hein et al., 2020), high-level organizational tasks to effect orchestration (Isckia et al., 2020; Fehrer et al., 2018), third-party orchestration activities (Selander et al., 2013), specific orchestration activities (Teece, 2017; Goldbach & Kemper, 2014; Tan et al., 2015; Ozcan & Eisenhardt, 2009), or focused on the top-down implementation of the desired ecosystem architecture without covering aspects that relate to orchestration (Adner, 2017). While the aforementioned studies provide valuable insights, they do not comprehensively and holistically address the capabilities that the platform owner should develop, improve and sustain to orchestrate a digital platform ecosystem. Consequently, the question remains as to how platform owners capabilities should be leveraged for the successful orchestration of digital platform ecosystems.

Maturity models can be used to address this need by providing guidance to companies in establishing and improving their capabilities. A maturity model is a conceptual framework that characterizes a set of capabilities (or processes, systems) in a specific area and describes an anticipated, desired, or typical progression of these capabilities (Becker et al., 2009). A maturity model can help practitioners identify the capabilities required and guide them to derive an informed approach for improving these capabilities to achieve increased firm performance (De Bruin et al., 2005). Overall, these models represent an established means of supporting the effective management of complex and heterogeneous phenomena (Ahern et al., 2004). Hence, maturity models can be a valuable instrument to assess and improve the capabilities needed for the successful orchestration of digital platform ecosystems. Consequently, the objective of this research is as follows:

> *To develop a maturity model for platform owners with the aim of orchestrating digital platform ecosystems.*

This research aims to achieve the objective by developing a maturity model based on findings from literature and a refinement and enhancement process through a Delphi study. The maturity model will be useful for assessing and developing platform owners capabilities in the context of orchestrating digital platform ecosystems. Specifically, the maturity model can be used by platform owners to identify and assess the current state of their capabilities and develop a roadmap to improve their maturity concerning these capabilities, overall helping platform owners successfully orchestrate their digital platform ecosystems (Teece, 2017; Blaschke et al., 2018). For literature, this research will contribute a novel and validated model to the body of digital platform ecosystem literature.

1.3 Overview of Research Design

The maturity model was developed following the Procedure Model for Developing Maturity Models proposed by Becker et al. (2009), drawing upon the principles of Design Science Research. Accordingly, the development process comprised of five distinct steps. In the first step, the problem is identified as discussed in the Introduction. Additionally, to facilitate a holistic understanding of the research problem, this step provides the theoretical background on digital platform ecosystems and its orchestration. The second step involves assessing the existing state of maturity models for orchestrating digital platform ecosystems in the literature. This assessment is carried out by means of a Multivocal Literature Review and a gap analysis guided by predefined criteria. This analysis

substantiated the notion that there is a need for a maturity model for digital platform ecosystem orchestration. In the third step, building upon these insights, the development strategy is determined. The opted development strategy is to create a new maturity model. Additionally, the process for developing the maturity model is specified. The fourth step involves an iterative development process. Hence, an initial version of the maturity model is created based on insights derived from the literature which is subsequently refined and enhanced through a Delphi study, consisting of three iterations involving eleven experts. Derived from these research findings, the final model is established. The final model comprises of four dimensions, namely 'Framing', 'Activating', 'Mobilizing', and 'Synthesizing'. Additionally, nine capabilities were identified, namely 'Envisioning', 'Legitimizing', 'Convening', 'Onboarding', 'Reinforcing', 'Rewarding', 'Coordinating', 'Governing', and 'Reforming'. Each of these capabilities is accompanied by four levels of maturity, along with comprehensive maturity descriptions detailing the corresponding characteristics that align with each capability for the respective maturity level. Finally, in the fifth step, the model is evaluated through multiple interviews with practitioners, thereby evaluating its understandability, ease of use, usefulness, and applicability in the field.

1.4 Thesis Outline

The thesis has been structured into nine chapters. Chapter 1 serves as an introduction, setting the context and outlining the research objectives. In Chapter 2, the relevant theoretical background is discussed on which this research has been built. Chapter 3 analyzes and compares existing maturity models within the domain of digital platform ecosystems and related fields. Chapter 4 provides an extensive elaboration of the research design, outlining the methodology employed for the development of the maturity model. Chapter 5 focuses on the conceptualization of the maturity model based on literature. Chapter 6 focuses on the refinement and enhancement of the maturity model through a Delphi study. It discusses the adopted protocol and presents the results derived from each round of the Delphi study. Chapter 7 presents the final maturity model derived from the research findings. In Chapter 8, the evaluation of the final maturity model by practitioners is discussed. Finally, the last chapter concludes this research, highlights its limitations and suggests directions for future research.

Chapter 2

Background and Theoretical Underpinnings

As is often the case in new research disciplines, the research on digital platform ecosystems and their orchestration has been conducted using different definitions and multiple perspectives (Poniatowski et al., 2021; Thomas et al., 2014). Hence, this section elaborates on the specific perspectives adopted in this thesis regarding digital platform ecosystems and their orchestration. Specifically, in the present thesis, the value co-creation concept is employed as a theoretical lens (Galvagno & Dalli, 2014; Lusch & Nambisan, 2015; Ranjan & Read, 2016). Additionally, this paper draws on inter-organizational network literature, ecosystem literature, the resource-based view (Wernerfelt, 1984), and the dynamic capabilities perspective (Eisenhardt & Martin, 2000).

2.1 The Digital Platform Ecosystem: Core Components

Early perspectives on digital platforms were from a technical, firm, and internal-resource-centric view (Poniatowski et al., 2021; Thomas et al., 2014). The digital platform was seen as a technical structure on which complementary products, technologies, or services could be developed (Asadullah et al., 2018). However, merely seeing a digital platform as a technical structure is not enough for organizations to grasp the challenge of managing a digital platform. Platforms move beyond the confines of conventional industry boundaries toward ecosystem structures (Thomas et al., 2014; Loonam & O'Regan, 2022). Thereby, the digital platform should not only be seen as a network of software modules but of loosely coupled autonomous actors conducting transactions and creating and implementing innovations (Wang, 2021; Hein et al., 2020), moving the locus of value creation outside the firm (Lusch & Nambisan, 2015; Parker et al., 2017). Hence, this paper uses the concept of 'digital platform ecosystems' as a means for analyzing digital platforms.

We define a digital platform ecosystem as a network of interconnected entities that interact through a digital platform to co-create, exchange, and consume value (Tan et al., 2015; De Reuver et al., 2018; Wu & Tsai, 2022). The co-creation, exchange, and consumption of value can be seen as a dynamic process in which actors jointly create and acquire value through service exchange and resource integration (Galvagno & Dalli, 2014; Lusch & Nambisan, 2015). Overall, the term 'digital platform ecosystem' refers to the platform and its network of actors interacting on the platform (Figure 2.1) (McIntyre & Srinivasan, 2017). The concept of an ecosystem emphasizes the informal nature of the inter-organizational network, the simultaneous collaboration and competition among actors, their high level of interdependence, and their capacity to adapt to external changes (Moore, 1993; Iansiti & Levien, 2004a,b).

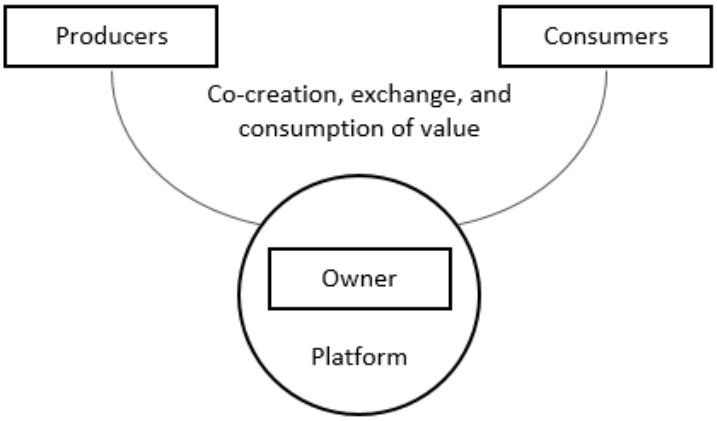

Figure 2.1: Diagram of the Relationships between the Actors in the Digital platform Ecosystem (based on Van Alstyne et al. (2016))

2.1.1 The Actors in a Digital Platform Ecosystem

A digital product or service of the digital platform is ultimately realized and used by the actors within the ecosystem as the platform connects different types of actors through intentionally created constellations (Lusch & Nambisan, 2015; Hein et al., 2019; Van Alstyne et al., 2016). Digital platforms typically cater to two or more independent groups of actors (Hein et al., 2020; Wu & Tsai, 2022). In this paper, we rely on a producer-consumer distinction to classify the actors that engage on a digital platform. The consumers refer to service beneficiaries as they buy and use the offerings on the platform (Wu & Tsai, 2022). In turn, they also contribute to the platforms value proposition by providing insights about how and which products and services on the platform are used (Lusch & Nambisan, 2015). The producers (e.g., third parties or complementors) refer to the actors that co-create value by providing complementary resources to the respective ecosystem (Van Alstyne et al., 2016; Hein et al., 2020; Wareham et al., 2014). Resources can be defined as tangible or intangible assets or inputs to production that an organization owns, controls, or has access to on a semi-permanent basis (Helfat & Peteraf, 2003). In other words, the producers contribute complementary products or services on a platform to serve a wide range of consumers and satisfy various requirements. The role of the producer differs from that of traditional firm-supplier relationships as the producer autonomously decides to join and participate in an ecosystem without formal contracts (Kapoor, 2018). A clear example of this producer-consumer distinction can be found in the digital platform ecosystem of Amazon. Here, the producer side comprises sellers who offer products, and the consumer side consists of individuals and organizations who buy these products. Another example is the Android and iOS platforms, which encompass app developers on the producer side and app users on the consumer side.

The third main actor in a digital platform ecosystem is the platform owner. The platform owner refers to the actor that owns the platform and focuses on ensuring efficient and effective value co-creating processes among the actors in the ecosystem (Wu & Tsai, 2022). In contrast to the classical firm-supplier relationship, in which the firm closely coordinates value-creating processes, the platform owner is in charge of a micro-economy and platform and, as such, is concerned with the coordination of the producers in order to facilitate their contributions and foster beneficial behaviors (Van Alstyne et al., 2016). It should be noted that in platform literature, different definitions for platform owners are used. Examples include 'platform leader' (e.g., Gawer et al., 2002), 'platform sponsor' (e.g., Eisenmann, 2008; Parker & Alstyne, 2008), or 'keystone organizations' (e.g., Gueguen & Isckia, 2011; Iansiti & Levien, 2004a). Additionally, a distinction can be made between a 'platform owner' and a 'platform provider' (e.g., Van Alstyne et al., 2016). This

distinction will not be made in this thesis as both actors have the potential to assume the task of orchestrating the digital platform ecosystem.

2.1.2 The Role of the Digital platform

The digital platform can be viewed as the central point of gravity within the digital platform ecosystem (Blaschke et al., 2018). For example, Android and iOS have become the cornerstone of their respective ecosystems. The technical advantages of platforms hold promise to create value for all users involved by connecting the producer and consumer side that otherwise would not have been able to connect or transact (Gawer, 2014). Consequently, all interactions between the different actors occur through the platform.

From a resource-based perspective, the digital platform can be seen as a dynamic configuration of resources that act as a foundation upon which actors co-create value through a set of specific interactions (Lusch & Nambisan, 2015; Perks et al., 2017). Hence, the platform can be seen as a manageable design artifact as well as the enabler of value co-creation activities. Perks et al. (2017) identified two ways through which platforms enable value co-creation. Namely, through 'technical architecture' and 'architecture of participation' (Figure 2.2). The technical architecture includes a set of shared technologies, standards and other tangible resources. The architecture of participation is the set of organizational norms, rules, and activities (non-tangible resources) that its connected actors use to coordinate and co-align their actions (Lusch & Nambisan, 2015; Nambisan & Sawhney, 2011). The activities of the actors (specifically the producers) maintain, integrate, configure, transform, and adapt these resources. Hence, platform resources are created, activated, and given meaning and value by the actors in the ecosystem (Perks et al., 2017) which results in value co-creation.

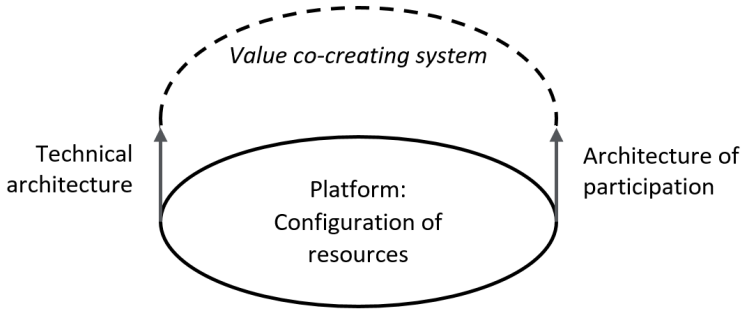

Figure 2.2: The Digital Platform as a Foundation for Value Co-creation (based on Perks et al. (2017))

Consequently, successful digital platforms facilitate a value co-creating system in the platform ecosystem (Hein et al., 2020; Perks et al., 2017). Hein et al. (2020) identify two specific value co-creation systems on a digital platform. Firstly, the value co-creation system can build on efficient and convenient facilitation of transactions (Tiwana, 2013). In this system, digital platforms help producers and consumers locate and interact with each other and exchange value mutually beneficially (Evans, 2012). For example, Airbnb is a digital platform ecosystem that facilitates transactions between property owners and people looking for temporary accommodations. Secondly, the value co-creation system can provide affordances making the digital platform a breeding ground for innovation (Hein et al., 2020; Yoo et al., 2012). In this case, the platform facilitates value co-creation by enabling novel offerings through innovative combinations of products and services, processes, and other types of knowledge not previously available to the network (Abbate et al., 2019). For example, iOS and Android are digital platform ecosystems that help app developers create applications on the platform for consumers to download and use.

2.2 Platform Orchestration: A Definition

The orchestration of digital platform ecosystems has been discussed from two main perspectives (Autio & Thomas, 2020). Namely, scholars who analyze orchestration from an IT perspective (e.g., Cennamo et al., 2018; Halckenhaeusser et al., 2020; Hein et al., 2020; Tiwana, 2013) and scholars who analyze orchestration from a Strategy perspective (e.g., Perks et al., 2017; Autio & Thomas, 2021; Bittencourt et al., 2020), the view taken in the present thesis.

Orchestration from an IT perspective, often discussed in platform governance literature, focuses on platform-related resources to orchestrate its ecosystem, for example, the architectural design of the platform and its interfaces (e.g., Cennamo et al., 2018; Halckenhaeusser et al., 2020; Tiwana et al., 2010; Tiwana, 2013; Song et al., 2015). In other words, it solely focuses on how to promote value co-creation through the mechanics of the platform. The strategy perspective is the broader, more holistic view which includes in addition to a process of the platform any other means by which platform owners are able to orchestrate the digital platform ecosystem. This is often referred to in the inter-organizational network theory (e.g., Möller & Svahn, 2009; Partanen & Möller, 2012). In this literature stream, studies acknowledge that orchestration is a dynamic activity of the platform owner (Hurmelinna-Laukkanen & Nätti, 2018; Mitrega & Pfajfar, 2015; Perks et al., 2017; Teece, 2017) and constantly requires considerable modification of existing resources and practices to create new ways of organizing the ecosystem and new ways of co-creating value (Perks et al., 2017; Teece, 2017). Hence, orchestration should be understood not as a static structural position but as a set of evolving activities, practices, and resources (Perks et al., 2017).

In the present thesis, the understanding of orchestration from a strategic perspective is taken, without a particular emphasis on processes or other structural elements of a digital platform. More specifically, the following is assumed:

> *Digital Platform Ecosystem Orchestration is the ability of the platform owner to promote value co-creation in a digital platform ecosystem.*

In order to understand digital platform orchestration from a strategic perspective, we focus on the capabilities of a platform owner. A capability can be defined as the ability of an organization to perform a coordinated set of practices, utilizing resources, for the purpose of achieving a particular end result (Helfat & Peteraf, 2003). Hence, capabilities, being an overarching concept, refer to a "firm's capacity to deploy resources, usually in combination, and encapsulate both explicit practices and those tacit elements (such as know-how and leadership) embedded in the practices" (Wang & Ahmed, 2007). In this context, practices are defined as activities conducted in a routinized way (Reckwitz, 2002). Consequently, capabilities are often firm-specific and are developed over time through complex interactions between the firms resources and practices. Additionally, they can emerge in different ways, as they may involve notably different orchestration practices. The present thesis will propose capabilities for digital platform ecosystem orchestration (henceforth, orchestration capabilities) and focuses on the evolution of these capabilities over time. Moreover, it will identify the underlying practices and resources encapsulated in these capabilities.

Overall, the orchestration capabilities of the platform owner seek to influence the behavior and outcomes of the producers to overall promote value co-creation. Hence, orchestration capabilities directly affect the value co-creation of the platform ecosystem and consequently the survival of the digital platform ecosystem (Blaschke et al., 2018; De Reuver et al., 2018; Friend & Malshe, 2016; Grover & Kohli, 2012).

Chapter 3

Related Work

According to prior literature, it is essential to substantiate the need for developing a new maturity model by comparing it with existing maturity models in similar or related domains (Becker et al., 2009; Pöppelbuß & Röglinger, 2011). Hence, the subsequent chapter discusses and compares the maturity models in similar and related domains of digital platform ecosystems. Prior to analyzing the relevant maturity models, the concept of maturity models is explained. Subsequently, existing maturity models in domains pertinent to digital platform ecosystem orchestration are identified and compared using a multivocal literature review and a gap analysis.

3.1 Maturity and Maturity Models

The term 'maturity' assumes a "state of being complete, perfect, or ready" (Simpson et al., 1989; Schumacher et al., 2016). To reach a desired state of maturity, there needs to be an evolutionary path of transformation from an initial to a target stage of progression (Fraser et al., 2002). Maturity thus implies evolutionary progress in the accomplishment of a desired state (Mettler & Rohner, 2009). The maturity of a specific domain can be measured through a maturity model.

A maturity model can be defined as a conceptual model that consists of a set of structured maturity levels for a class of elements in a specific domain (Becker et al., 2009; De Bruin et al., 2005; Röglinger et al., 2012). It represents an anticipated, desired, or typical evolution path of these elements shaped at discrete levels (Becker et al., 2009; Röglinger et al., 2012). The basic idea behind maturity models is that higher levels of maturity testify to more consistent and repeatable activity of the elements and reduce the differences between targeted and actual results, thus, giving rise to improved performance (Paulk, 1995).

Overall, each maturity model has four fundamental components. Namely, (a) maturity levels, (b) dimensions, (c) elements, and (d) maturity descriptions (De Bruin et al., 2005; Lahrmann & Marx, 2010; Pöppelbuß & Röglinger, 2011; Fraser et al., 2002). Firstly, the maturity levels represent the distinct stages illustrating the evolutionary path of the elements. They encompass the overall maturity characteristics of the elements and serve as a mechanism for evaluating the adequacy of these elements (Becker et al., 2009; De Bruin et al., 2005). Secondly, the elements are the class of entities under investigation and can be capabilities, practices, or processes of a specific domain (Becker et al., 2009; Pöppelbuß & Röglinger, 2011). To note, in the present thesis, the focus will be on capabilities, specifically orchestration capabilities. Therefore, throughout the paper, the term capabilities will be used to refer to the elements. Thirdly, the dimensions represent the overarching categories that encompass and organize the elements, ensuring a clear and structured framework. Finally, the maturity descriptions represent the maturity characteristics of each element for each level of maturity (Fraser et al., 2002; Maier et al., 2011). For an overview of the maturity model structure and the interconnections among its four core components, refer

to Appendix A.

De Bruin et al. (2005) distinguishes three types of application-specific purposes of the maturity model: descriptive, prescriptive, and comparative purpose. A maturity model serves a descriptive purpose if it is applied for assessing the as-is or current situation. Moreover, a maturity model serves a prescriptive purpose if it supports defining and implementing a development plan or roadmap to improve the maturity level. Finally, the maturity model serves a comparative purpose if it allows for comparisons across industries or regions as well as facilitating benchmarking (De Bruin et al., 2005; Pöppelbuß & Röglinger, 2011). To note, the present thesis will focus on serving a descriptive and prescriptive purpose.

Still, maturity models have some drawbacks that should be taken into consideration. Critics highlight their biggest concern of poor theoretical foundations (Halper & Stodder, 2014; Proença & Borbinha, 2018). Further, while the maturity models have a strong focus on organizational processes, personnel capacities and individual aspects are often disregarded (Pöppelbuß & Röglinger, 2011). Additionally, the validity and usefulness of these models are scarce (Tarhan et al., 2016), and they mostly lack a well-documented, complete, clear, and unambiguous development and evaluation process (Becker et al., 2009). These concerns will be taken into consideration in the development of the present maturity model.

3.2 Existing Maturity Models in Similar or Related Domains

To conduct a comprehensive and methodical analysis of the existing maturity models in similar or related domains of digital platform ecosystems, a multivocal literature review and gap analysis are conducted. The following section outlines the process of identifying and comparing the existing maturity models. Subsequently, the obtained insights are presented, highlighting the observed variations and discrepancies among the identified maturity models in relation to predetermined requirements.

3.2.1 The Multivocal Literature Review for Maturity Model Comparison

The present thesis employed a multivocal literature review to systematically identify existing maturity models in fields related to digital platform ecosystems. A multivocal literature review is a variant of a systematic literature review that encompasses the inclusion of grey literature sources (Garousi et al., 2019). Hence, it involves a comprehensive, transparent, and reproducible approach to searching and analyzing relevant literature in both academic and grey literature (Garousi et al., 2019; Okoli, 2015). This choice of method is suitable as it provides a comprehensive and rigorous approach to identify existing maturity models. Moreover, due to its inclusion of grey literature, the review acknowledges that due to the pragmatic nature and practical challenges inherent in orchestrating digital platform ecosystems, grey literature could provide some additional valuable insights that are not extensively covered in academic literature. The multivocal literature review process adhered to the established guidelines provided by Garousi et al. (2019) and is summarized in Figure 3.1.

3.2.1.1 Literature Search

The first step of the multivocal literature review was to conduct a literature search focused on identifying papers that discuss existing maturity models in fields related to digital platform ecosystems (Figure 3.1, step 1). The search encompassed the digital libraries Scopus, Web of Science, and the web search engine Google to ensure comprehensive coverage of both academic and grey literature (Ballew, 2009; Amsaveni & Manikandan, 2014; Garousi et al., 2019).

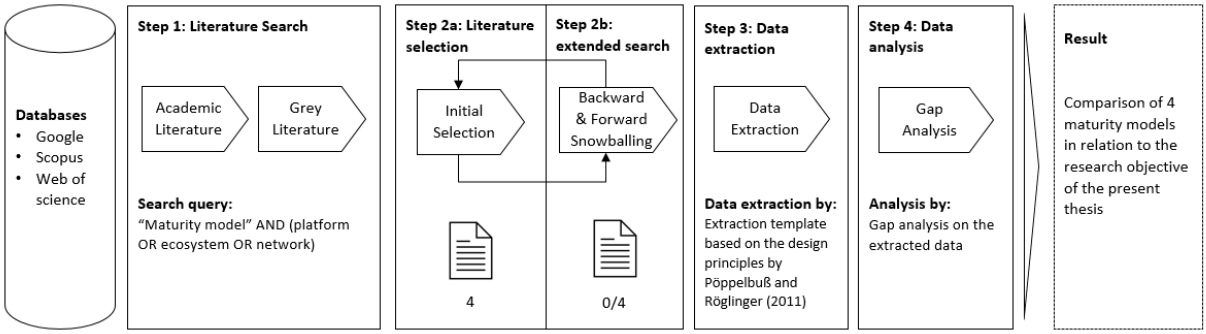

Figure 3.1: The Steps Taken in the Multivocal Literature Review for Maturity Model Comparison

To facilitate an effective search, a meticulously constructed search string was employed, consisting of keywords and Boolean logic operators. Specifically, the following search string was employed: ("maturity model" AND (platform* OR ecosystem* OR network*)). The central keyword 'Maturity model' was utilized to focus specifically on literature addressing maturity models. Moreover, to ensure a targeted exploration of maturity models that are applicable to similar contexts or exhibit a close relationship with digital platform ecosystems, the search string also incorporated the keywords 'platform', 'network', or 'ecosystem'. These terms were selected based on their conceptual alignment with the research domain, as discussed in Chapter 2. Moreover, Boolean logic operations, including the use of AND, OR, the wildcard symbol '*', and quotation marks, were strategically applied to refine the search string.

To manage the substantial amount of results generated by the search, a stopping rule was implemented (Garousi et al., 2019). Taking into account the relevance ranking algorithms employed by the search engines (Langville & Meyer, 2006), the search process was terminated upon retrieving the initial 60 hits. This threshold was selected based on careful observation, which indicated a significant decline in the relevance of the retrieved results, making it unlikely that additional searches would yield substantial findings. Furthermore, it should be noted that within the academic databases, the search was constrained to publications explicitly mentioning the keywords in the title, abstract, or keywords section, enhancing the precision and focus of the retrieval of relevant papers.

3.2.1.2 Literature Selection

A rigorous screening process was followed to identify the relevant papers (Figure 3.1, step 2). Firstly, inclusion criteria were defined to facilitate eliminating papers deemed irrelevant. The inclusion criteria encompassed three main aspects: (1) the papers should be written in English, (2) their primary focus should center on maturity models, and (3) the maturity model should address a domain closely associated with digital platform ecosystems. Moreover, to streamline the screening process, a sequential assessment approach was employed, involving the evaluation of titles, abstracts, and full texts. Initially, the titles of the papers were assessed, and if deemed pertinent, further attention was given to the abstracts. It should be noted that for the grey literature search, since abstracts were not available, this step was not performed. If a paper was considered relevant based on the title or abstract, the full text was scrutinized. By adhering to this systematic approach, a thorough evaluation was conducted, resulting in the identification of four relevant papers.

Additionally, to enhance the analysis, a snowballing technique was applied, involving a backward literature search (backward authors and backward references) as well as a forward literature search (forward authors and forward references) (Webster & Watson, 2002; Garousi et al., 2019), aiming to identify additional relevant papers. It should be noted that for the paper identified

in grey literature, formal citations were missing and hence did not partake in the snowballing. Overall, the snowballing did not yield any further papers.

In summary, the selection process resulted in the identification of four papers that discussed maturity models within similar or related domains to digital platform ecosystems. Table 3.1 provides an overview of the identified papers. Moreover, Appendix C.2 provides a discussion of the general characteristics of these papers.

Table 3.1: The Identified Papers on Existing Maturity Models in Related Domains to Digital Platform Ecosystems

#	**Authors**	**Title**
1	Deale et al. (2019)	Towards a maturity model for technology platforms in the south African healthcare context
2	Ehrensperger et al. (2021)	Toward a maturity model for digital business ecosystems from an IT perspective.
3	Jansen (2020)	A focus area maturity model for software ecosystem governance.
4	Workspan (2022)	Ecosystem maturity model - how businesses evolve to become world-class partner ecosystems

3.2.1.3 Data Extraction and Analysis

To ensure a systematic comparison of the identified maturity models, specific requirements were defined to assess these models. Given the limited empirical research on comparing maturity models, the design principles proposed by Pöppelbuß & Röglinger (2011) were adopted to structure the development of the requirements. The study by Pöppelbuß & Röglinger (2011) provides six basic design principles for maturity models. These principles state that the application domain, purpose of use, target group, class of elements under investigation, comparison with existing models, and design process and empirical evaluation should be defined and considered (Pöppelbuß & Röglinger, 2011) (refer to Appendix B for an elaborate description of these principles). Building upon the previous discourse on digital platform ecosystems and orchestration (Chapter 2) and using the design principles as a framework, the requirements were delineated and are provided in Table 3.2. Most notably, the maturity model should focus on the digital platform ecosystem domain, target platform owners, direct its attention toward orchestration capabilities as the element under investigation, and employ an iterative design process accompanied by empirical validation.

Table 3.2: The Requirements of a Maturity Model for Digital Platform Ecosystem Orchestration

Requirements	
Application domain	Digital platform ecosystems
Purpose of use	descriptive and prescriptive purposes
Target group	Platform owners
Class of elements under investigation	Orchestration capabilities
Differentiation from related maturity models	A comparison should be conducted with existing maturity models within the domains of networks, ecosystems, and platforms.
Design process and extent of empirical validation	The maturity model should be iteratively developed and empirically validated. Moreover, this process should be documented.

Hence, each of the identified maturity models underwent a meticulous assessment to determine their alignment with the specified requirements. Initially, using the general design principles by Pöppelbuß & Röglinger (2011) as an extraction template, the required information on the design choices of each maturity model was extracted from the papers (Figure 3.1, step 3). An overview of the design choices of each maturity model can be found in Appendix C.3. Subsequently, a gap analysis was performed, comparing the design choices of each maturity model against the predetermined requirements (Figure 3.1, step 4). This analysis aimed to ascertain whether the maturity models met the established requirements.

3.2.2 Comparison of the Existing Maturity Models

In total, four maturity models were identified during the analysis. The findings indicate that while the existing maturity models have made notable contributions to the field, none of them adequately fulfill the specified requirements. This section provides an overview of the disparities and limitations observed in the existing maturity models concerning the predefined requirements.

Firstly, the identified maturity models exhibit limited overlap in their application domains and lack a distinct emphasis on digital platform ecosystems as a whole. Deale et al. (2019) present a comprehensive maturity model for a digital platform ecosystem, but its scope is confined solely to the healthcare industry, restricting its applicability to other sectors within the domain of digital platform ecosystems. On the other hand, the maturity models proposed by Jansen (2020) and Ehrensperger et al. (2021) focus on related domains. The maturity model by Jansen (2020) model centers on software ecosystems, while the model by Ehrensperger et al. (2021) concentrates on digital business ecosystems. Although these ecosystems share similarities with the concept of digital platform ecosystems, as they rely on a shared technological foundation, such as a platform (Ehrensperger et al., 2021; Jansen, 2020), this aspect is not a requirement for these types of ecosystems. The maturity model put forth by Workspan (2022) adopts a more general perspective on ecosystems and implicitly assumes the presence of a digital platform within the ecosystem. While each identified maturity model contributes valuable insights to its respective domain, none of them specifically addresses digital platform ecosystems and hence might not address the entire spectrum of challenges and nuances inherent to this type of ecosystem.

Secondly, the identified maturity models diverge in their elements under investigation as they do not primarily focus on the orchestration capabilities of a platform owner. Jansen (2020) and Ehrensperger et al. (2021) approach the examination of digital platform ecosystem orchestration from an IT perspective and hence focus more on processes of the platform rather than orchestration capabilities. The maturity model proposed by Deale et al. (2019) and Workspan (2022) concentrate on the practices of digital platform orchestration and hence do not explicitly address the higher-level orchestration capabilities.

The final distinguishing factor pertains to the design process and empirical validation. Literature suggests that it is important that the maturity model is iteratively developed and empirically evaluated (Becker et al., 2009; De Bruin et al., 2005; Pöppelbuß & Röglinger, 2011). Mainly, the maturity model by Workspan (2022), which originated from gray literature, lacks explicit details regarding its development and validation processes. Consequently, this lack of transparency impedes its wider applicability in both academic and practical settings. Furthermore, the commercial nature of Workspan (2022) introduces the potential for bias, compromising its claim of providing an impartial academic viewpoint.

Chapter 4

Research Design

As stated, the aim of this research is to develop a maturity model for orchestrating digital platform ecosystems. This research is shaped by a design-oriented research approach (Hevner, 2004; Peffers et al., 2007). Design Science Research is established in information systems research to contribute to the extant body of scientific knowledge by finding innovative solutions to a class of real-world problems (Baskerville & Myers, 2009). It aims to improve problem-solving capabilities by creating 'artifacts' such as constructs, models, methods, and instantiations (Hevner, 2004; March & Smith, 1995). These artifacts, in combination with the evaluation results, represent the outcomes of the design science research process (Peffers et al., 2007). Maturity models may be understood as artifacts that serve to solve the problems of determining a company's status quo of its capabilities and deriving measures for improvement therefrom (Brooks et al., 2015). It can therefore be assumed that the development of maturity models falls within the application area of Design Science Research.

Based on the guidelines of Design Science Research in information systems (Hevner, 2004), a procedure model for developing maturity models is established by Becker et al. (2009). This procedure model proposes a seven-step development process for maturity models (Becker et al., 2009). As this work has been influential in Design Science Research and maturity model development, it was felt to serve as a solid foundation for the creation of the maturity model in this paper. Consequently, the procedure for maturity model development by Becker et al. (2009) was used as a basis for the development steps taken in this research. To reduce the complexity of this model and to align the procedure process with the structure of the present thesis, three process steps (the conception of transfer and evaluation, the implementation of transfer media, and the evaluation) were merged into one, the evaluation step (Neff et al., 2014). An overview of how the procedure model of Becker et al. (2009) translates into the procedure model of the present thesis can be seen in Appendix D. Moreover, the design steps taken in the present research are described in Figure 4.1, according to the tasks performed, the techniques used, and the output achieved in complementing the present research.

Hence, the development of the maturity model starts with the *problem identification*. In the introductory chapter (Chapter 1), the research problem was specified, practical relevance was established, and the value of a maturity model was justified. Consequently, the overarching objective of the thesis was established, which is to develop a maturity model specifically designed for the orchestration of digital platform ecosystems. Additionally, in this step, the underlying theories of digital platform-based ecosystems and orchestration are identified and expounded upon (detailed in Chapter 2). By incorporating these theoretical foundations, a clear understanding of the concept is fostered, providing a solid basis for the subsequent development of the maturity model.

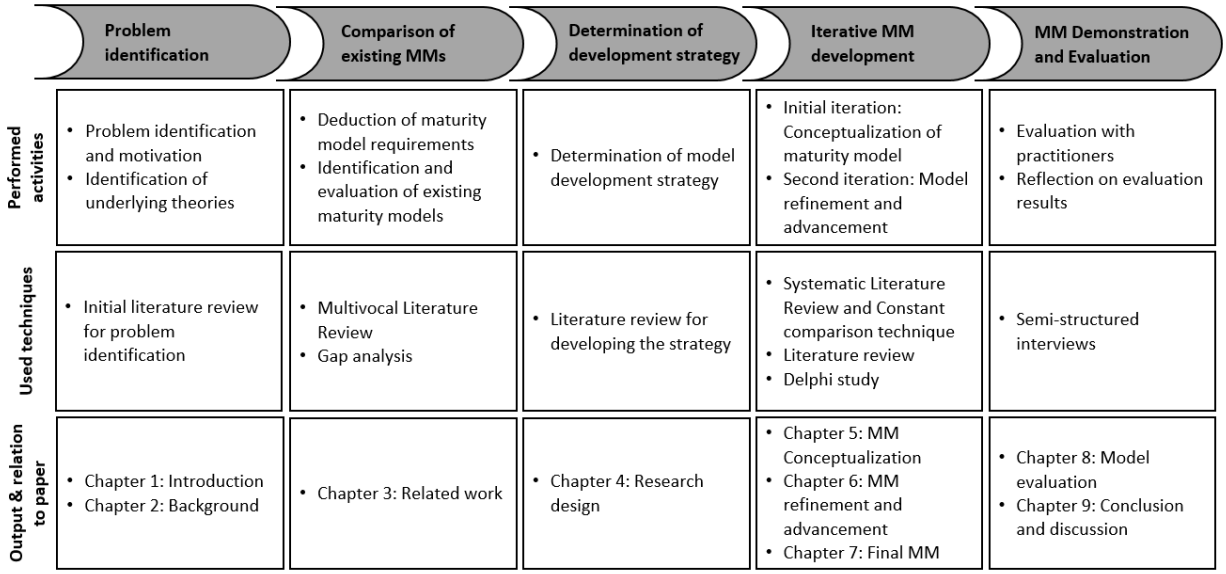

Figure 4.1: The Procedure Model (based on Becker et al. (2009) and Neff et al. (2014))

The second step is the *comparison of the existing maturity models* (detailed in Chapter 3). The goal of this step is to substantiate the need for developing a new maturity model by comparing it with existing maturity models in similar and related domains (Becker et al., 2009). Hence, firstly, a multivocal literature review was conducted to identify existing maturity models in similar and related domains. A multivocal literature review is a comprehensive, transparent, and reproducible approach to searching and analyzing relevant literature in both academic and grey literature (Garousi et al., 2019). The choice of a multivocal literature review is based on its inclusion of grey literature sources in the literature review (Garousi et al., 2019) which could potentially provide additional valuable results due to the practical nature of orchestrating digital platform ecosystems. After identifying related maturity models, a gap analysis was conducted, which compared each of the existing maturity model's design choices to predetermined requirements. The requirements were framed by the design principles as identified by Pöppelbuß & Röglinger (2011) and specified based on the previous discourse on digital platform ecosystems and their orchestration as discussed in the previous step (Chapter 2). Using the design principles by Pöppelbuß & Röglinger (2011) as a framework for establishing the requirements enabled an objective and systematic comparison of the maturity models. Overall, this analysis highlighted certain limitations of these models in effectively addressing the specific requirements of digital platform ecosystem orchestration and, hence, further demonstrated the problem's relevance, i.e., the actual need for a novel maturity model.

The third step is *determining the development strategy*. The development strategy is determined based on the insights gained from the comparison of the existing maturity models. The insights from this comparison were used to explore the possibility of utilizing the existing models as a foundation for further development (Becker et al., 2009). However, given the shortcomings and limited transferability observed in the identified maturity models, a deliberate decision was made to devise a novel maturity model. This proposed maturity model is tailored specifically for assessing orchestration capabilities in digital platform ecosystems and is denoted as the Maturity Model for Digital Platform Ecosystem Orchestration (MM-DPEO). Furthermore, during this step, the development process - the systematic approach that will be pursued for the design of the maturity model - is specified, as elaborated upon in the present chapter.

The fourth step in the research process involves *the iterative maturity model development*. This

step constitutes the core activity of the maturity model's development and is conducted in two rounds. The first round, which is detailed in Chapter 5, focuses on conceptualizing each component of the maturity model using existing literature. The conceptualization of maturity levels and dimensions draws upon prominent theoretical frameworks and theories found in the relevant literature. Additionally, the capabilities and their corresponding maturity descriptions are conceptualized through a systematic literature review and the use of the constant comparison technique (Okoli, 2015; Kitchenham, 2004; Glaser, 1965). A systematic literature review is chosen as it provides a rigorous and transparent approach to identify, evaluate, and interpret all available research pertinent to a specific topic area (Kitchenham, 2004; Okoli, 2015). Moreover, the constant comparison technique is employed as it enables systematic comparison and analysis of the capabilities identified in the papers, leading to the identification of emerging themes (Glaser, 1965). The output of this round serves as the initial version of the proposed MM-DPEO.

The second round of the maturity model development focused on the iterative refinement and advancement of the MM-DPEO (detailed in Chapter 6). As it is considered improbable that the literature review delivers enough information for a comprehensive model, it is recommended to consider exploratory research techniques for model refinement and advancement (De Bruin et al., 2005). Hence, the present thesis applies a Delphi study, which is an established exploratory research technique that seeks consensus through iterative focus-group-based research (Ritchie et al., 2013). A Delphi study is selected due to its effectiveness in improving and validating novel models (Martinek-Jaguszewska & Rogowski, 2023), as well as its appropriateness for solution development (Ritola et al., 2022). Additionally, it is well-acknowledged by scholars as appropriate and beneficial for the development of a maturity model (Becker et al., 2009; De Bruin et al., 2005; Lasrado et al., 2015; Pereira & Serrano, 2020). The output of this round serves as the final version of the proposed MM-DPEO.

The final step, *model demonstration and evaluation*, concerns the evaluation of the maturity model and is discussed in Chapter 8. Following literature guidelines on maturity model development (Pöppelbuß & Röglinger, 2011; De Bruin et al., 2005; Peffers et al., 2007; Salah et al., 2014), the MM-DPEO is evaluated with practitioners in the field of digital platform ecosystems. A semi-structured interview method is employed as the data collection approach. This method allows for predetermined questions while providing room for interaction, adaptability, and flexibility during the interview process (Kallio et al., 2016). It is selected due to its effectiveness in exploring individuals' perceptions and opinions on complex subjects, i.e., the evaluation of the MM-DPEO (Boyce & Neale, 2006; Kallio et al., 2016). Moreover, to ensure a systematic and targeted evaluation, specic evaluation criteria were chosen (Prat et al., 2015). These criteria encompass 'Understandability', 'Ease of use', 'Usefulness', 'Applicability'. Finally, this step requires the documentation and publication of the maturity model design process and the final maturity model. This is achieved by publishing this Master's thesis in the TU/e database, ensuring the dissemination and accessibility of the maturity model to relevant stakeholders.

Chapter 5

Conceptualization of the Maturity Model

The subsequent chapter presents the conceptualization of the MM-DPEO (Maturity Model for digital platform ecosystem orchestration), as outlined in the methodology section (Chapter 4). As stated, the maturity model comprises four fundamental components: (a) maturity levels, (b) dimensions, (c) capabilities (class of elements under investigation), and (d) maturity descriptions for each capability at each level of maturity (De Bruin et al., 2005; Lahrmann & Marx, 2010; Fraser et al., 2002). With this categorization in mind, the subsequent sections will explore the conceptualization and initial version of each component.

5.1 Conceptualization of the Maturity Levels

An integral component of maturity models pertains to the maturity levels. As stated, the progression of maturity levels illustrates the anticipated, desired, or typical evolution path of the elements under investigation, where the initial level denotes limited maturity and the highest level represents a state of full maturity (Becker et al., 2009). The maturity levels in a maturity model should encompass distinct levels, descriptors for each maturity level, and a generic description (Becker et al., 2009; De Bruin et al., 2005; Lahrmann & Marx, 2010). Moreover, as Pöppelbuß & Röglinger (2011) note, the maturity levels should relate to the elements under investigation. This section first discusses the conceptualization of the maturity levels and subsequently provides an overview of the identified maturity levels.

5.1.1 The Capability Lifecycle

The present thesis proposes the introduction of novel maturity levels that are specifically designed to align with the distinctive attributes of capabilities as the elements under investigation. Unlike many maturity models that adopt the maturity levels of the Capability Maturity Model Integration (CMMI) without providing a comprehensive rationale, this study acknowledges that the CMMI maturity levels are primarily developed to assess and improve processes (Chrissis et al., 2011), rather than explicitly addressing capabilities. Consequently, as there is a difference in the elements under investigation, the direct application of CMMI maturity levels for evaluating and enhancing capability maturity may fail to adequately consider and address critical aspects related to capabilities (Pöppelbuß & Röglinger, 2011). Therefore, in the present thesis, we refrain from utilizing CMMI maturity levels and instead propose novel theoretically grounded maturity levels suited for assessing and enhancing the maturity of capabilities.

Specifically, the maturity levels are conceptualized based on the Capabilities lifecycle by Helfat & Peteraf (2003). The capability lifecycle depicts a general pattern and set of possible paths

that characterize the evolution of a capability. The framework is found as a suitable basis as it is sufficiently general to incorporate the emergence, development, and progression of virtually any type of capability in any type of organizational setting (Helfat & Peteraf, 2003). Moreover, the capability lifecycle also applies to the development paths of capabilities that reach across firm boundaries (Helfat & Peteraf, 2003), hence, capabilities for digital platform ecosystem orchestration.

The capability lifecycle by Helfat & Peteraf (2003) is characterized by multiple stages, as illustrated in Figure 5.1. It commences with the 'founding stage', which establishes the foundation for subsequent capability development. Following the founding stage, a 'development stage' ensues, characterized by the gradual construction and enhancement of the capability. Eventually, capability building ceases and the capability reaches the 'maturity stage'. The 'maturity stage' entails capability maintenance, which involves actively exercising the capability to refresh the organizational memory. Once a capability reaches the maturity stage, or potentially even before that, various events can influence its future evolution. At least six additional stages the capability may branch into within the capability lifecycle. These stages encompass retirement, retrenchment, renewal, replication, redeployment, and recombination. These branching stages may unfold in diverse patterns over time, and some of them may occur simultaneously (Helfat & Peteraf, 2003).

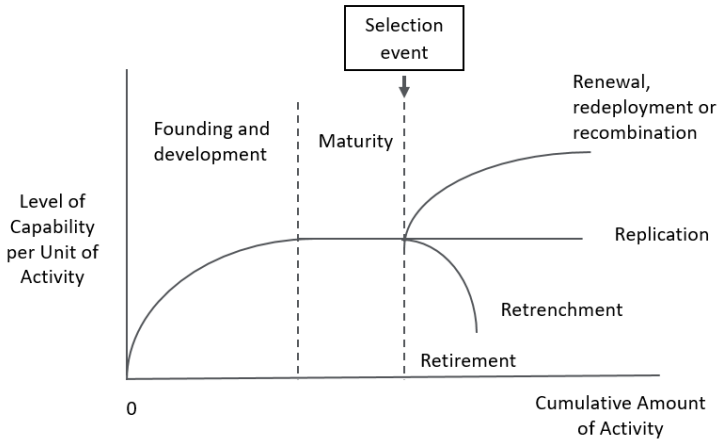

Figure 5.1: The Stages of the Capability Lifecycle (based on Helfat & Peteraf (2003))

Drawing upon this framework as a guiding principle, the present thesis advances a theoretical deduction of a four-level maturity structure for capabilities. To understand the developed maturity structure, it is imperative to underscore the differentiation between the capabilities and practices, which is key. As stated, a capability is defined as the ability of an organization to perform a coordinated set of practices for the purpose of achieving a particular end result (Helfat & Peteraf, 2003). In this context, practices are defined as activities conducted in a routinized way (Reckwitz, 2002). Hence, the maturity levels within the present maturity model encompass the progressive stages of capability lifecycle and are characterized by the underlying transitional dynamics of the associated practices. Consequently, the delineated maturity levels in this model are conceptualized as follows:

The first level, defined as the 'Initial stage', relates to the first stage of the capability lifecycle and denotes a nascent state of the capability. During this stage, the capability remains incipient, characterized by limited or no practices and an absence of clarity regarding the purpose and scope of the practices within the organizational context.

The succeeding stage, defined as the 'Development stage', represents the second stage of maturity for the capability and also relates to the second stage of the capability lifecycle. The capability lifecycle defines this stage as characterized by the gradual construction and enhancement of the capability (Helfat & Peteraf, 2003). Hence, there can be concluded that, at this stage, the capability has undergone improvement from its prior state, yet it remains in a rudimentary form and necessitating further advancement. Accordingly, this stage is characterized by basic practices, which have not reached a state of complete formalization or extensive implementation.

At the third level, defined as the 'Advanced stage', a stable and well-established capability is achieved. This stage corresponds with the 'maturity stage' of the capability lifecycle which entails capability maintenance. Moreover, the capability lifecycle identifies that at this stage, routines tend to become more ingrained and habitual. Hence, this level signifies the culmination of the capability's development, as its associated practices become fully formalized and integrated into the organization. The practices operate with a heightened degree of efficiency and effectiveness, thereby accomplishing the desired outcomes of the capability.

The fourth and final level, defined as the 'Leading stage', represents the highest level of maturity achieved by a capability. This maturity level aligns with the branches of replication, renewal, redeployment, and recombination of the capability lifecycle, as they encompass the progressive development path of maturation (Becker et al., 2009). At this level, the capability can also be classified as a dynamic capability. Dynamic capabilities refer to the consistent behavioral orientation of a firm to continuously integrate, reconfigure, renew, and recreate its resources and capabilities to achieve and sustain competitive advantage (Wang & Ahmed, 2007). Hence, this maturity level signifies the continuous improvement of the capability. At this level, the practices are continuously integrated, reconfigured and renewed, ensuring that the capability remains relevant and effective in achieving the desired outcomes.

5.1.2 The Initial Maturity levels

To conclude, this capability lifecycle framework is used as the theoretical basis for the maturity levels. The maturity levels are tailored specifically for the progressive development of the capabilities. The maturity levels are as follows:

- **Level 1 - Initial stage**: The capability is characterized by its nascent state. Hence, there are limited practices and a lack of clear understanding of the purpose and scope of the practices.
- **Level 2 - Development stage**: The capability is characterized by basic practices, which have not reached a state of complete formalization or extensive implementation.
- **Level 3 - Advanced stage**: The capability is characterized by a stable and well-founded state, where practices are formal, well-established and effectively utilized to achieve desired outcomes.
- **Level 4 - Leading stage**: The capability is characterized by continuous adaptation and innovation of the practices, ensuring its sustained relevance and effectiveness in achieving the desired outcomes.

5.2 Conceptualization of the Dimensions

In a maturity model, the dimensions represent the overarching categories that encompass and organize the elements, ensuring a clear and structured framework. The dimensions should be rooted in both scientific grounding and practical relevance (Pöppelbuß & Röglinger, 2011). Accordingly, a conceptual framework sourced from the literature is chosen to conceptualize the dimensions. Hence, this section begins with a discourse on the orchestration frameworks discussed in the literature and elaborates on the chosen framework. Subsequently, the initial dimensions of the MM-DPEO are elaborated.

5.2.1 Frameworks on Orchestration

Digital platform ecosystems have been extensively studied from various perspectives (Poniatowski et al., 2021). Moreover, numerous conceptualizations of orchestration in ecosystems and networks have been proposed in the existing literature (Shipilov & Gawer, 2020). For a comprehensive understanding of the existing literature on orchestration, detailed overviews are provided by Hurmelinna-Laukkanen et al. (2022) and Perks et al. (2017).

In the present thesis, the influential framework for network orchestration developed by Agranoff & McGuire (2001) and Järvensivu & Möller (2009) will serve as the theoretical foundation for the dimensions. As these works have been influential in both network management and ecosystem literature, it was felt to serve as a solid foundation for the maturity model. Moreover, Järvensivu & Möller (2009) assert that this framework is universal to all inter-organizational networks, hence digital platform ecosystems. According to their paper, the framework entails functions that are basic requirements for any network or ecosystem to produce value and that some level of at least implicit management in relation to the functions in the framework must exist between at least two actors (Agranoff & McGuire, 2001; Järvensivu & Möller, 2009). As the aim is to have orchestration dimensions encompassing the full range of capabilities within a digital platform ecosystem, this framework was found well-suited as the theoretical foundation for the dimensions.

In their respective papers (Agranoff & McGuire, 2001; Järvensivu & Möller, 2009), the authors define four network management functions in (inter-organizational) networks and ecosystems. The four fundamental functions identified are 'Framing', 'Activating', 'Mobilizing', and 'Synthesizing'. 'Framing' involves establishing and influencing the operating rules of the network and shaping the participants' perceptions. Setting goals is an integral part of this task. 'Activating' entails the process of identifying participants and structuring the network, while 'Mobilizing' focuses on building commitment among actors. Lastly, 'Synthesizing' relates to organizing and controlling, creating conditions for productive interaction, and removing obstacles to cooperation (Agranoff & McGuire, 2001; Järvensivu & Möller, 2009).

5.2.2 The Initial Dimensions

Hence, in the present thesis, the framework of Agranoff & McGuire (2001) and Järvensivu & Möller (2009) is employed as the theoretical foundation for the dimensions of the MM-DPEO. An overview of the initial dimensions is presented in table 5.1.

Table 5.1: The initial dimensions of the MM-DPEO

Dimension	**Description**
Framing	Reflects the influencing and altering of the perception of the existing and prospective producers to join and stay joined.
Activating	Reflects the structuring of the ecosystem to prepare for value co-creation.
Mobilizing	Reflects the building of commitment of the producers in the ecosystem.
Synthesizing	Reflects the organizing and controlling of producers, including creating conditions for interaction while minimizing obstacles to cooperation.

5.3 Conceptualization of the Capabilities

An integral component of maturity models are the class of elements under investigation, which, in the context of the present thesis, pertains to the orchestration capabilities. In the following sections, the process of identifying and synthesizing the orchestration capabilities from the existing literature is outlined, followed by an overview of the identified capabilities.

5.3.1 The Systematic Literature Review for Capability Identification

A systematic literature review was conducted to identify the orchestration capabilities of platform owners. A systematic literature review entails a thorough, transparent, and replicable process for literature search and analysis (Okoli, 2015). This choice of method is suitable as it provides a comprehensive and rigorous approach to identify orchestration capabilities by systematically synthesizing and analyzing a wide range of relevant research studies. The systematic literature review process follows common and established guidelines (Levy & Ellis, 2006; Okoli, 2015; Brocke et al., 2009; Webster & Watson, 2002) and is summarized in Figure 5.2.

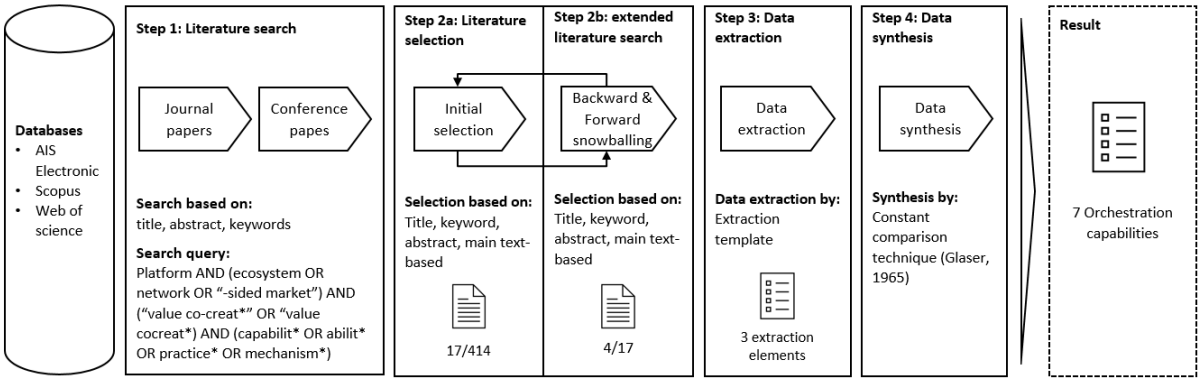

Figure 5.2: The Steps taken in the Systematic Literature Review for Capability Identification

5.3.1.1 Literature Search

The first step of the systematic literature review was to conduct a literature search focused on identifying pertinent scholarly studies published in academic journals and conference proceedings (Figure 5.2, step 1). The search encompassed the digital libraries AIS Electronic, Scopus, and Web of Science. AIS eLibrary was chosen due to its exclusive provision of studies from prominent Information Systems (IS) conferences and journals. Scopus, known as the largest abstract and citation database (Ballew, 2009; Kitchenham et al., 2007), was utilized to ensure comprehensive coverage. Likewise, Web of Science, recognized as a prominent citation database containing over 800 million references (Amsaveni & Manikandan, 2014), was included in the search process.

To facilitate an effective search, a meticulous keyword string was constructed based on the well-established PICO (Population, Intervention, Comparison, and Outcomes) criteria (Kitchenham et al., 2007). These criteria serve to delineate the research objective by identifying pertinent keywords in the research objective to formulate robust search strings. In addition, the search string was enriched by literature-derived synonyms, abbreviations, and alternative spellings for the identified keywords, thereby enhancing the comprehensiveness of the systematic literature search (Kitchenham et al., 2007). Table 5.2 provides an overview of the derived keywords.

Table 5.2: The Search String for Capability Identification

PICO element	**Keyword(s)**
Population	Platform
Intervention	Ecosystem, network, double-sided network or multi-sided network
Intervention	value co-create or value cocreate
Outcome	Capabilities, abilities, mechanisms or practices

To delineate the population of interest, the broad term 'platform' was employed in conjunction with the initial intervention emphasizing the ecosystem and network perspective. This approach

aimed to encompass a wide range of pertinent scholarly works, thus avoiding the limitation of employing more specific keywords such as 'digital platform-based ecosystems', 'platform ecosystem', or 'digital ecosystem'. The second intervention centered on identifying keywords relevant to platform orchestration. As the term 'orchestration' lacks consistent usage across the literature, its description was utilized to establish the pertinent keywords. Consistent with the previous discussion, digital platform ecosystem orchestration encompasses dynamic activities aimed at fostering value co-creation within digital platform ecosystems (Autio & Thomas, 2020; Perks et al., 2017). Consequently, 'value co-creation' was integrated as a keyword, guiding the focus of the literature search. Lastly, the outcome criteria, aimed to yield actionable outcomes that align with the research objective, focused on incorporating keywords related to capabilities.

The search string was developed utilizing Boolean logic operators, specifically the use of both AND and OR. The conjunction 'AND' was employed to connect the principal terms derived using the PICO criteria, while the disjunction 'OR' was utilized to incorporate synonyms and alternative spellings. The wildcard symbol '*' was effectively deployed to encompass multiple word variations and quotation marks were strategically applied to exclusively search for specific terms. Consequently, the resulting keyword string was employed as follows: ((platform) AND (ecosystem* OR network* OR "-sided market*") AND ("value co-creat*" OR "value cocreat*") AND (capabilit* OR abilit* OR mechanism* OR practice*)).

Moreover, the search was confined to publications that explicitly mentioned the keywords in the title, abstract, or keywords section as this facilitated a more focused retrieval of articles. Overall, the preliminary search procedure resulted in an initial pool of 414 papers.

5.3.1.2 Literature Selection

From this initial pool of 414 papers, a comprehensive screening process was conducted to identify papers relevant to the research objective (Figure 5.2, step 2). Inclusion and exclusion criteria were used to eliminate unnecessary papers (Okoli, 2015). Papers were eligible for inclusion in the systematic review if (1) they were written in English, and (2) in the case that the study had been published in more than one journal or conference, the most recent publication version was included. Additionally, given that the focus is on how platform owners orchestrate the producers in the ecosystem, the papers were excluded if they (3) focused exclusively on the perspective of customers, (4) paid attention to producers but did not examine (direct or indirect) interactions between digital platform owners and producers, or (5) studied orchestration as a structural or technical feature of the platform without linkages to orchestration capabilities of the platform owner.

Based on these inclusion and exclusion criteria, first, the elimination of duplicate works and papers not written in English was performed, resulting in a targeted subset of 283 papers for a thorough examination. Subsequently, the titles of the identified papers were carefully analyzed, and any papers unrelated to the concept of digital platform ecosystems were excluded from further consideration. If a title did not clearly reveal the application domain of the paper, it was included for review in the subsequent steps. This step led to a refined set of 109 papers. Continuing the screening process, the abstracts of the remaining papers were scrutinized, and those deemed unrelated to the research, as outlined by the exclusion criteria, were excluded, resulting in a subset of 48 papers. These papers carried on to the next stage, where the contents of the full paper were examined. Hence, the full texts of these 48 papers underwent meticulous analysis, leading to the identification of 17 papers deemed most pertinent for inclusion in the present thesis.

Due to the shortcomings associated with relying on the keyword approach (Levy & Ellis, 2006), to augment the comprehensive analysis, a snowballing technique was applied, which involved a backward literature search (backward authors and backward references) and a forward literature

search (forward authors and forward references) (Webster & Watson, 2002). Through this process, four additional papers were identified as relevant to the research topic. As a result, a final set of 21 papers was identified for synthesis and in-depth analysis.

Overall, the comprehensive screening process resulted in the identification of 21 papers that encompassed the most relevant and suitable information for the purpose of synthesizing insights on the concept of digital platform ecosystem orchestration capabilities. Refer to appendix E.1 for an overview of the identified papers.

5.3.1.3 Data Extraction

The next step entailed the systematic extraction of data pertaining to the orchestration capabilities from the identified papers, as illustrated in Figure 5.2, step 3. To ensure a structured approach, a data extraction framework was employed to extract the pertinent information from the papers. The data extraction framework focused on three key components: the paper's viewpoint on digital platform orchestration, the orchestration capabilities, and the orchestration practices. The first element, the paper's viewpoint on digital platform ecosystem orchestration, encompasses the authors' perspectives, theories, and conceptual frameworks related to orchestrating digital platforms. This information aids in gaining insights into the various viewpoints and theoretical foundations that underpin that papers understanding of digital platform orchestration. The second component, the identified orchestration capabilities, refers to the specific capabilities, mechanisms or competencies as identified by the paper. The third component, the practices, pertains to the operational aspects of the orchestration capabilities as identified by the papers, providing insights into how platform owners actually execute and manage the orchestration capabilities. This information is extracted as it will be used to conceptualize the maturity descriptions (Chapter 5.4). A summary of the filled-in framework can be found in Appendix E.3.

5.3.1.4 Data Synthesis

To rigorously synthesize the information identified in the papers, the information was subjected to qualitative classification using the Constant Comparison Technique as advocated by Glaser (1965) (Figure 5.2, step 4). This analytical technique is an iterative process that involves constantly comparing new data with previously analyzed data to refine and develop emerging frameworks or theories (Glaser, 1965). It has been commonly employed by other researchers engaged in similar review pursuits (e.g., Hakami et al., 2017; Hew & Cheung, 2014). Employing the Constant Comparison Technique, the first paper was analyzed, and its findings were used to construct orchestration capabilities that effectively capture the identified findings. Simultaneously, each constructed orchestration capability was further assigned to a corresponding dimension in the framework. For example, if a paper revealed a finding related to 'the ability of the platform owner to legitimize the value proposition of the platform' or explicitly identified a capability they defined as 'Legitimization', this finding was used to develop the capability 'Legitimizing' and subsequently linked to the dimension 'Framing'. The subsequent papers findings were compared with those of the first paper. If the findings aligned with the identified orchestration capabilities, they were incorporated into the existing capabilities. On the other hand, if the findings represented a unique or additional orchestration capability, a new capability was created to accommodate these novel insights. This iterative process continued until all the papers were thoroughly examined. Throughout the analysis, the identified orchestration capabilities were consistently revisited to ensure their mutual exclusivity, consistent abstraction level, and distinctiveness (Glaser, 1965). Overall, this rigorous examination ensured that each capability was appropriately categorized and that overlapping or redundant capabilities were minimized, contributing to a comprehensive understanding of the orchestration capabilities elucidated in the selected articles.

5.3.2 The Initial Capabilities

The initial list of orchestration capabilities can be found in Table 5.3. The identified capabilities are organized according to their corresponding dimensions.

Table 5.3: The Initial Capabilities of the MM-DPEO

Dimension	Capability	Description	Papers (examples)
Framing	Envisioning	The ability to envision and strategize the potential value proposition of the platform.	Deng et al. (2022); Foss et al. (2023); Jimenez & Valogianni (2022)
	Legitimizing	The ability to legitimize the value proposition of the platform to both the existing and prospective producers.	Foss et al. (2023); Perks et al. (2017); Siaw & Sarpong (2021)
Activating	Constructing	The ability to identify and integrate producers.	Blaschke et al. (2018); Hahn et al. (2018); Jimenez & Valogianni (2022)
Mobilizing	Position consolidating	The ability to consolidate and reinforce the platform's ecosystem position for the long term.	Deng et al. (2022); Nordin et al. (2018); Scholten & Scholten (2012)
	Stabilizing	The ability to preserve stable relations with the producers in the ecosystem.	Blaschke et al., 2018; Blasco-Arcas et al., 2020; Hein et al., 2019
Synthesizing	Coordinating	The ability to enable producers to work in the ecosystem.	Blaschke et al. (2018); Blasco-Arcas et al. (2020); Cenamor et al. (2019)
	Reforming	The ability to reconfigure the platform's structure, functionality, and underlying components.	Jovanovic et al. (2022); Perks et al. (2017); Sun & Zhang (2022)

5.4 Conceptualization of the Maturity Descriptions

The final integral component of maturity models pertains to the maturity descriptions, which represent the maturity characteristics of each capability for each level of maturity. This section will first discuss the conceptualization of the maturity descriptions, followed by an overview of the maturity descriptions pertaining to each capability for each level of maturity.

5.4.1 The Maturity Grid and Practices

Most maturity models employ a maturity grid to present the maturity descriptions (Fraser et al., 2002; Maier et al., 2011). The maturity grid showcases the descriptions at each level of maturity for each capability, organized in cells. Hence, this thesis will adopt a maturity grid format to structure the maturity descriptions for each capability at each maturity level. Figure 5.3 provides an overview of the structure of the maturity grid for the present maturity model, given the previous conceptualizations of the dimensions, capabilities, and maturity levels.

When formulating the maturity descriptions, it is crucial to ensure a logical progression of maturity levels within each capability and consistent levels of maturity across different capabilities to maintain overall consistency. Furthermore, to effectively differentiate between levels, the descriptions should be precise, concise, clear, and exclusive (Maier et al., 2011; Fraser et al., 2002). This necessitates making (1) decisions regarding the information discussed in each description, (2) justifying the information sources, and (3) establishing clear mechanisms for formulating the descriptions, as outlined by Maier et al. (2011).

Dimensions	Capabilities	Maturity Levels			
		Level 1 – Initial stage	Level 2 – Development stage	Level 3 – Advanced stage	Level 4 – Leading stage
Framing	Envisioning	Maturity Description C1/L1	Maturity Description C1/L2	...	Maturity Description C1/L1
	Legitimizing	...	...	...	...
Activating	Constructing	...	...	...	...
Mobilizing	Position consolidating	...	...	...	...
	Stabilizing	...	...	...	...
Synthesizing	Coordinating	...	...	...	...
	Reforming	...	...	...	Maturity Description Cn/Ln

Figure 5.3: The Structure of the MM-DPEO

Note: Maturity Description Cn/Ln stands for the maturity description of capability n at level n.

The process of populating the maturity descriptions involves utilizing the practices associated with each capability. Furthermore, to enhance the depth and comprehensiveness of the descriptions, additional tacit elements, such as the specific focus of the practices or the embedded know-how, were incorporated. The rationale for employing the practices stems from their role as routinized, specific activities that exemplify the operationalization and application of the capabilities (Helfat & Peteraf, 2003; Reckwitz, 2002). By incorporating these practices into the maturity descriptions, it becomes possible to provide concrete explanations of how each capability is realized and implemented. Moreover, it enables assessing the maturity level of the capabilities by formulating the extent to which the practice is developed for each maturity level. In essence, the use of practices within the maturity descriptions offers a practical lens through which the maturity of each capability can be examined and understood.

The identified papers from the systematic literature review serve as the primary information source to formulate the practices and, consequently, the maturity descriptions. These literature papers offer numerous diverse practices for each capability, as presented in the extraction template (Appendix E.3). By incorporating the information from these papers, it is ensured that relevant and credible practices for each identified capability are included. To rigorously synthesize the information extracted from the papers regarding the practices, the constant comparison technique was employed. As stated, this technique involved analyzing the papers and utilizing its findings related to practices to construct practices for each specific capability. For example, if a paper revealed a finding about the practice of 'platform owners providing performance metrics of value elements derived from the network' as a means of legitimizing the platform to producers, this finding was used to develop the practice of 'developing metrics' for the capability of 'Legitimizing'. This process was sequentially conducted on all the identified papers to ascertain whether they identified any additional practices. If new practices were indeed identified, they were incorporated accordingly. This analysis continued until all papers were thoroughly examined. As a result, an initial list of practices for each capability was generated and is presented in Table 5.4, providing a comprehensive foundation for the subsequent formulation of maturity descriptions.

The formulation of the descriptions followed a structured top-down approach guided by the maturity levels. As previously mentioned, these maturity levels provide a framework for understanding the different stages of maturation for a capability in general, making them valuable writing guidelines for conceptualizing the maturity descriptions. Hence, using the maturity levels as a guideline, the identified practices were adopted to create the maturity descriptions for each capability.

Table 5.4: The Initial Practices of the MM-DPEO

Dimension	Capability	Practice(s)
Framing	Envisioning	Visioning, Strategizing, Road-mapping and Navigating
	Legitimizing	Developing metrics and communication channels
Activating	Constructing	Developing processes, mechanisms and policies
Mobilizing	Position Consolidation	strategizing and developing processes and mechanisms
	Stabilizing	Developing an incentive structure
Synthesizing	Coordinating	Developing software tools, communication channels and institutional arrangements
	Reforming	Developing tools, methodologies, and standards

As an illustrative example, consider the capability 'Envisioning' at the lowest level of maturity. This capability encompasses practices such as visioning, strategizing, road mapping, and navigating. Moreover, the lowest level of maturity, the initial stage, is characterized by limited practices and a lack of clear understanding of the purpose and scope of those practices. Hence, there can be concluded that at this level, a formalized vision for the platform either does not exist or is limited and informal. Additionally, it can be expected that minimal or no practices are in place to strive toward a potential future for the platform, and the primary focus would be on understanding the platform's basic features and functionalities without considering how to collaboratively build and enhance the value proposition.

5.4.2 The Initial Maturity Descriptions

In the subsequent sections, the maturity descriptions detailing the corresponding characteristics that align with each maturity level for each respective capability are presented.

5.4.2.1 The Capability 'Envisioning'

An overview of the initial maturity descriptions of the capability 'Envisioning' is shown in Table 5.5. 'Envisioning' is the ability to envision and strategize the potential value proposition of the platform for its producers. The maturity descriptions refer to the practices envisioning, strategizing, roadmapping, and navigating (e.g., Deng et al., 2022; Nordin et al., 2018; Perks et al., 2017; Scholten & Scholten, 2012; Schreieck et al., 2021; Tian et al., 2021).

Table 5.5: Initial maturity descriptions for the capability 'Envisioning'

Maturity Level	Maturity Description
Level 1 - Initial stage	A formalized vision does not exist or is limited and informal. Consequently, minimal or no practices are in place to strive towards a potential future of the platform. The primary focus is on understanding the platform's basic features and functionalities and its direct benefits without considering how it could collaboratively build and enhance the value proposition.
Level 2 - Development stage	A vision is defined but includes limited adherence and anticipation of the potential value producers can bring. There are strategizing, road mapping and navigation efforts of the potential value proposition of the platform but these are not fully formalized and maintained.
Level 3 - Advanced stage	The platform's vision is well-defined and maintained with formalized practices. The envisioning extends beyond the value of the core platform, recognizing the potential value contribution from the producers. The vision serves as a unifying force, guiding actions, and inspiring collective effort of the producers. Strategizing, road mapping, and navigating are well executed and based on a deep understanding of the envisioned value proposition of the platform.
Level 4 - Leading stage	Comprehensive practices are in place whereby the platform's vision is actively created and regularly reviewed, refined, and adapted to changing circumstances and emerging opportunities. Strategizing, road mapping, and navigating are continuously refined and enhanced to adapt and evolve with the new understanding of the platform's potential value proposition.

5.4.2.2 The Capability 'Legitimizing'

An overview of the initial maturity descriptions of the capability 'Legitimizing' is shown in Table 5.6. The capability 'Legitimizing' is defined as the ability to legitimize the value proposition of the platform to both the existing and prospective producers. The maturity descriptions refer to the practice of developing the required metrics and communication channels (e.g., Foss et al., 2023; Perks et al., 2017; Tian et al., 2021).

Table 5.6: Initial maturity descriptions for the capability 'Legitimizing'

Maturity Level	**Maturity Description**
Level 1 - Initial stage	There are minimal or no practices focused on advocating and validating the value of the platform to producers, and there is a limited understanding of the importance of these efforts.
Level 2 - Development stage	basic metrics and communication channels to advocate and validate the value of the platform have been developed and implemented. The platform's value is mainly communicated in terms of tangible product attributes and does not accurately represent the complexity and intangibility of the platform's ecosystem.
Level 3 - Advanced stage	There are well-defined, valid, accurate metrics and effective communication channels to diffuse a compelling interpretation of the value proposition of the platform to both participating and potential producers. The practices are comprehensive, tailored, and target a wide range of participating and potential producers.
Level 4 - Leading stage	The metrics and communication channels to advocate and validate the platform's value proposition are comprehensive and continuously adapted and improved based on a clear understanding of the needs of the producers. There is a continuous outlook for identifying new ways to reach the target audience with a focus on proactively providing producers with pertinent, tailored information about the value of the platform.

5.4.2.3 The Capability 'Constructing'

An overview of the initial descriptions of the capability 'Constructing' is shown in Table 5.7. As stated, the capability 'Constructing' is defined as the ability to identify and integrate producers. The maturity descriptions refer to the practice of developing processes, mechanisms, and policies to identify and integrate potential producers (e.g., Blaschke et al., 2018; Hahn et al., 2018; Jimenez & Valogianni, 2022; Nordin et al., 2018; Perks et al., 2017; Siaw & Sarpong, 2021).

Table 5.7: Initial maturity descriptions for the capability 'Constructing'

Maturity Level	**Maturity Description**
Level 1 - Initial stage	producers' identification and integration are initiated on a as needed basis without an understanding of how new producers can enhance the platform's value proposition. No formal practices on identification and integration exist.
Level 2 - Development stage	basic processes, mechanisms, and policies to identify and integrate potential producers have been implemented. There is a beginning understanding of the different capabilities of producers and how they could contribute to the value proposition of the platform.
Level 3 - Advanced stage	Processes, mechanisms, and policies to identify and integrate producers are implemented and well-coordinated. The focus is on identifying potential producers who possess relevant resources and abilities, ensuring there is sufficient heterogeneity of producers and producers are effectively and effiently integrated into suitable roles.
Level 4 - Leading stage	the practices for identifying and integrating producers are comprehensive and continuously adapted and improved. There is a proactive exploration of new types of producers and a focus on fostering a dynamic and diverse ecosystem that continually evolves to maximize collaborative value creation.

5.4.2.4 The Capability 'Position consolidating'

An overview of the maturity descriptions of the capability 'Position consolidating' is shown in Table 5.8. The capability 'Position consolidating' is the ability to consolidate and reinforce the platforms ecosystem position for the long term. The maturity descriptions refer to the practices

strategizing and developing processes and mechanisms to consolidate the platforms role (e.g., Deng et al., 2022; Jimenez & Valogianni, 2022; Nordin et al., 2018; Scholten & Scholten, 2012).

Table 5.8: Initial maturity descriptions for the capability 'Position consolidating'

Maturity Level	**Maturity Description**
Level 1 - Initial stage	There is limited or no strategy to consolidate and reinforce a strategic and indispensable position of the platform within the ecosystem.
Level 2 - Development stage	A basic strategy focused on consolidating and reinforcing a strategic, indispensable position within the ecosystem is developed. There is a recognition of the potential challenges affecting its position in the ecosystem (e.g., multihoming, disintermediation, ecosystem carryover, envelopment, and backlash). Basic processes, mechanisms and guidelines are developed to address these factors effectively.
Level 3 - Advanced stage	A comprehensive strategy is formulated to consolidate and strengthen an indispensable, strategic position within the ecosystem. The strategy demonstrates a clear awareness of potential challenges that affect its position. Well-established formal processes, mechanisms, and guidelines are developed to effectively address these challenges and navigate them successfully. This includes well-established processes to leverage information flows and network effects, approaches to create lock-in effects, and a clear competitive approach to effectively handle competition.
Level 4 - Leading stage	The strategy for consolidating and reinforcing the ecosystem position is actively created and regularly reviewed, refined, and adapted to changing circumstances and emerging opportunities. Comprehensive practices are in place to continuously, proactively and effectively identify and seize opportunities (e.g., enter new markets) and react to potential threats, to reinforce its position, ensuring its relevance and competitiveness in the evolving landscape.

5.4.2.5 The Capability 'Stabilizing'

An overview of the initial maturity descriptions of the capability 'Stabilizing' is shown in Table 5.9. The capability 'Stabilizing' is defined as the ability to preserve stable relations with the producers in the ecosystem. The maturity descriptions refer to the practice of developing an incentive structure (e.g., Blaschke et al., 2018; Hein et al., 2019; Jimenez & Valogianni, 2022; Jovanovic et al., 2022; Laczko et al., 2019; Schreieck et al., 2021; Siaw & Sarpong, 2021).

Table 5.9: Initial maturity descriptions for the capability 'Stabilizing'

Maturity Level	**Maturity Description**
Level 1 - Initial stage	The interactions are primarily transactional and basic incentives are provided, with limited emphasis on mutual growth or collaborative value creation.
Level 2 - Development stage	A basic incentive structure for collaborations, has been implemented. Direct incentives (e.g. monetary rewards) and indirect incentives (e.g., software tools and information) are provided with the aim of preserving stable relationships. Additionally, standards and expectations of the collaboration have been specified. The incentive plan is functional-based (i.e., based on performance metrics) and focused on promoting immediate or short-term collaborations.
Level 3 - Advanced stage	A Clear, formal, structured incentive structure (direct incentives, indirect incentives, standards and expectations) fostering mutual understanding and commitment has been defined. The focus is on ensuring the incentives compensate and motivate producers to contribute in their most valuable way, by ensuring the incentives promote high-quality complements, balance cooperation and competition, and align with the long-term goals and motivation of the producers. The incentive plan is subjective-based and long-term oriented.
Level 4 - Leading stage	The comprehensive incentive structure is continuously adapted and improved. The engagement of producers is actively monitored and assessed to identify potential risks or challenges, where they could potentially spend their time or earn income elsewhere. Based on this assessment, the incentives are proactively refined and enhanced to ensure that these surpass these alternative opportunities

5.4.2.6 The Capability 'Coordinating'

An overview of the initial maturity descriptions of the capability 'Coordinating' is shown in Table 5.10. The capability 'Coordinating' refers to the ability to mobilize and activate producers in

the ecosystem. The maturity descriptions refer to the practices of developing software tools, communication channels and institutional arrangements (e.g., rules, guidelines, property rights) (e.g., Blaschke et al., 2018; Cenamor et al., 2019; Engert et al., 2022; Hein et al., 2019; Helfat & Raubitschek, 2018; Scholten & Scholten, 2012; Siaw & Sarpong, 2021; Sun & Zhang, 2022).

Table 5.10: Initial maturity descriptions for the capability 'Coordinating'

Maturity Level	**Maturity Description**
Level 1 - Initial stage	Minimal or no formal practices are in place for stimulating and enabling producers to engage with the platform and other actors within the ecosystem. The allocation of resources and knowledge to the demand of the producers occurs on an as-needs basis. Additionally, there is limited governance for the utilization of the platform.
Level 2 - Development stage	Basic software tools (e.g. APIs, SDKs, or payment functionalities) and communication channels (e.g., documentation, interactive forms) supporting producers and their (development of) services have been implemented. There are limited institutional arrangements (e.g., rules, guidelines, property rights) for governing the use of the platform.
Level 3 - Advanced stage	Formal well-established software tools and effective and transparent communication channels have been developed and are actively provided to producers. There is deep understanding of producers individual short and long-term needs and there is actively coordinate resources and information to meet these. The focus is on ensuring alignment and supporting ecosystem innovation advances. Additionally, institutional arrangements for using the platform are well-defined and integrated into the platform.
Level 4 - Leading stage	The software tools and communication channels to coordinate and support producers are comprehensive and well-integrated in the platform. The practices are highly agile and continuously improved based on a clear understanding of the evolving short and long-term needs of the producers. The focus is on identifying and fostering dynamic and collaborative new ways to collaboratively create value. Additionally, the comprehensive institutional arrangements are continuously refined and optimized to ensure optimal use of the platform.

5.4.2.7 The Capability 'Reforming'

An overview of the initial maturity descriptions of the capability 'Reforming' is shown in Table 5.11. The capability 'Reforming' is the ability to reconfigure the platforms structure, functionality, and underlying components. The maturity descriptions refer to the practice of developing development tools, methodologies, and standards to support modifications of the platform (e.g, Blaschke et al., 2018; Cenamor et al., 2019; Deng et al., 2022; Jovanovic et al., 2022; Perks et al., 2017; Schreieck et al., 2021; Sun & Zhang, 2022; Tan et al., 2015).

Table 5.11: Initial maturity descriptions for the capability 'Reforming'

Maturity Level	**Maturity Description**
Level 1 - Initial stage	Modifications of the platform's structure, functionality, and underlying components are conducted on an ad hoc basis without a clear understanding of the producers or wider ecosystem's needs. No formal practices for modifying the platform are defined and deployed.
Level 2 - Development stage	Basic development tools, methodologies, and standards to support modifying the platform are defined and deployed. The main focus is on maintaining the status quo around the original technical architecture, limiting the amending of new resources and routines, and flexibility to potential new value coming from the ecosystem.
Level 3 - Advanced stage	Well-established formal development tools, methodologies, and standards are defined and deployed to enable flexible and efficient modifications. The goal is to ensure scalability, compatibility, adaptability, interoperability, and modularity of the platform.
Level 4 - Leading stage	Comprehensive formal practices are defined and deployed to proactively, flexibly, and continuously modify and innovate the platform. The focus is on ensuring the platform's structure, functionality, and underlying components are at the forefront of its domain by consistently scanning the external environment for emerging technologies, and changes in producers needs.

Chapter 6

Refinement and Enhancement of the Maturity Model

The subsequent chapter outlines the iterative refinement and enhancement process of the MM-DPEO through a Delphi study. The first section provides a comprehensive explanation of the applied Delphi study protocol. Subsequent sections delve into each Delphi round's specific focus and present the corresponding refinements and enhancements derived from the input provided by the participating experts. For additional details about the Delphi study, refer to Appendix F.

6.1 The Delphi Study

In this research, the Delphi method is selected to refine the maturity model. The Delphi method is an established exploratory research technique that seeks consensus through iterative focus-group-based research (Ritchie et al., 2013). It is characterized by its structured and iterative nature and involves the collection of expert knowledge through multiple rounds of anonymous surveys (Gallego & Bueno, 2014; Paré et al., 2013; Rowe & Wright, 1999). The selection of the Delphi method is motivated by its effectiveness in improving and validating novel models (Martinek-Jaguszewska & Rogowski, 2023), as well as its appropriateness for solution development (Ritola et al., 2022). Additionally, it is well-acknowledged by scholars as appropriate and beneficial for the development of a maturity model (Becker et al., 2009; De Bruin et al., 2005; Lasrado et al., 2015; Pereira & Serrano, 2020). To ensure a rigorous and well-guided application of the Delphi method, this study follows the design principles proposed by Reeb (2023). These design principles establish a robust framework for conducting a Delphi study in the development of maturity models, ensuring methodological rigor. The principles involve (1) deciding on the focus of the Delphi study, (2) selecting the expert panel, (3) designing the rounds, and (4) determining the number of rounds. In the following paragraphs, each of these design principles will be further elaborated upon.

Firstly, the objective of the Delphi study conducted in this research was to refine and enhance the MM-DPEO through the collection of feedback on each component of the maturity model. Specifically, the Delphi study aimed to deepen the understanding of the defining characteristics of these components within the context of digital platform ecosystem orchestration. Hence, by soliciting feedback from experts, a comprehensive examination of the dimensions, capabilities, maturity levels, and maturity descriptions was conducted, ensuring their accurate representation of the intended concepts and alignment with the targeted domain of digital platform ecosystem orchestration.

Secondly, the establishment of the Delphi panel was guided by two primary considerations, namely the qualifications of the experts and the panel size, with the overall aim of ensuring valuable input (Powell, 2003). It is crucial that the criteria for expert selection align with the research's objective

and the relevant characteristics of the maturity model, such as its scope, domain, intended user, and complexity (Reeb, 2023). Moreover, the recommended panel size should be between 10 to 18 experts (Okoli & Pawlowski, 2004). In line with these guidelines, the present thesis employed a panel of eleven experts with extensive experience and knowledge on digital platform ecosystems. Moreover, to ensure a diverse range of perspectives and minimize cultural bias, a heterogeneous group of experts with varied backgrounds was selected (Delbecq et al., 1975). Overall, the panel composition included three academics, four consultants, and four industry experts each with multiple years of experience in digital platform ecosystems (refer to Appendix F.1 for details on the selected panel).

Thirdly, a qualitative survey design, using both closed and open-ended questions, was chosen for each round. The surveys provide experts first with information about a specific component of the maturity model and then require them to choose among three options: endorsing the component as is ('stay'), suggesting changes to the component ('change'), or recommending the elimination of the component ('go'). When changes or elimination were suggested, experts were prompted to provide further elaborations and explanations. After gathering all the responses, an analysis was conducted on the experts' opinions, and the findings were applied to the maturity model (Reeb, 2023; Strasser, 2017). Throughout the process, the experts received feedback on the group's responses, which served as a basis for comments and guided sequent iterations (Skinner et al., 2015). Moreover, it is important to note that the surveys were conducted independently and anonymously to prevent the influence of social pressure on the experts' judgment and to allow them the flexibility to revise their viewpoints without facing reputational repercussions (Rowe & Wright, 1999; Skinner et al., 2015).

Fourthly, the number of iterations was decided. The overarching objective is to achieve consensus. However, it is important to acknowledge that attaining an absolute consensus may not always be attainable (Paré et al., 2013). In general, it is recommended to conduct two or three rounds in a Delphi study, as a higher number of rounds may impede the convergence of expert opinions (Gallego & Bueno, 2014). Accordingly, given these considerations, a total of three rounds were planned to establish consensus regarding the components of the maturity model.

6.2 Refinements of the First Round

The purpose of the first round was to refine and enhance the complete model as conceptualized in Section 5. Hence, the model was refined concerning the dimensions, capabilities, maturity levels, and maturity descriptions. For an elaboration on the survey and an example of the layout, refer to Appendix F.2.1. Figure 6.1 presents a summary of the voting results from the first Delphi round. A comprehensive overview of the voting results and suggested changes can be found in Appendix F.2.2 and Appendix F.2.3, respectively. This section presents an overview of the refinements to the initial model based on the feedback from the first round.

Firstly, experts identified the necessity for additional capabilities, specifically the need to subdivide certain capabilities to better represent their importance and acknowledge certain significant differences. Hence, the capability 'Constructing' was deemed too broad, encompassing two distinct processes: identifying and integrating producers on the platform. As a result, it was decided to divide this capability into two separate capabilities. Through discussions with the experts and insights gathered from relevant literature, the newly established capabilities were conceptualized and named 'Convening' and 'Onboarding'. Additionally, experts noted that the MM-DPEO did not sufficiently address the ability to govern the producers' activities and behaviors. While this aspect was initially included as part of the 'Coordinating' capability, it became apparent that the coverage of governance efforts within this capability was insufficient to adequately reflect its importance. As a result, a distinct and separate capability, designated as 'Governing', was introduced to the model with a specific focus on governing producers' activities.

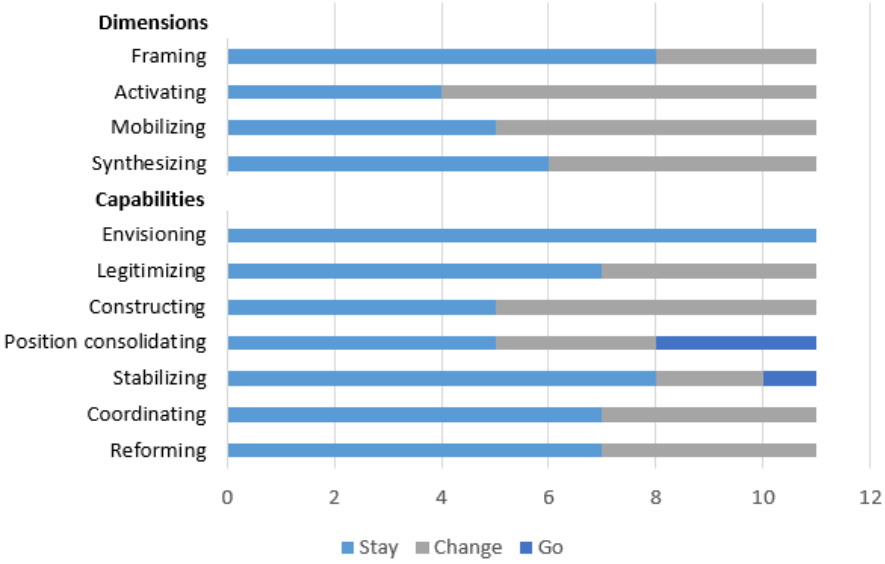

Figure 6.1: The Voting Results of Delphi Round 1

Moreover, it was recognized that the focus of certain capabilities needed to be adjusted, necessitating the adoption of alternative practices. Firstly, significant alterations were made to the capability 'Position Consolidation'. Experts observed that this capability was more of a result or outcome of the previous capabilities, rather than an independent orchestration process. Consequently, the capability was modified to shift its focus more specifically on the direct practices that influence the producers. Moreover, the capability 'Reforming' was found to place excessive emphasis on innovation rather than encompassing a more holistic perspective that includes managing the various stages and aspects of the platform's IT lifecycle. Consequently, additional practices were included, leading to an adjustment of both the definition and the maturity descriptions, to overall better align with its intended focus of overseeing the complete platform's IT lifecycle.

Furthermore, it was noted that the names of several capabilities were deemed incorrect or not appropriately defined. The capability previously referred to as 'Legitimizing' and 'Stabilizing' were perceived to have a negative connotation, primarily focused on protection and being reactive rather than encompassing a more positive and proactive connotation. Consequently, the capabilities were renamed to 'Positioning' and 'Rewarding' respectively to better reflect their intended purpose. Similarly, the capability previously labeled as 'Position Consolidating' was found to be aesthetically inconsistent with the other capabilities within the framework. To ensure uniformity and coherence, the capability was renamed to 'Consolidating'.

Finally, small alterations were made to specific maturity descriptions. For instance, in the case of the capability 'Constructing', an expert noted that heterogeneity of the producers was not always a requirement as described in level three. As a result, this aspect was removed from the maturity descriptions to reflect a more accurate representation of reality.

6.3 Refinements of the Second Round

In the second round of the study, the focus was exclusively on the capabilities and maturity descriptions, omitting the maturity levels and dimensions as a consensus had already been reached in the previous round. For a detailed explanation of the survey and an example of its layout, refer to Appendix F.3.1. Figure 6.2 presents a summary of the voting results from the second Delphi round,

while a comprehensive overview of the results and suggested changes can be found in Appendix F.3.2 and Appendix F.3.3, respectively. This section offers an overview of the refinements made to the maturity model based on the feedback received during the second round.

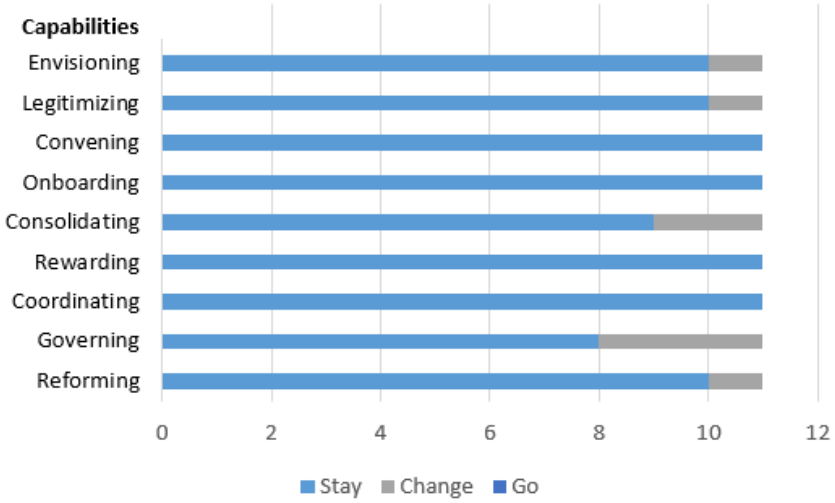

Figure 6.2: The Voting Results of Delphi Round 2

Firstly, it was noted that the names of several capabilities were deemed incorrect or not appropriately defined. The capability previously referred to as 'Consolidating' was perceived to have a negative connotation, primarily focused on protection and being reactive rather than encompassing a more positive and proactive connotation. Consequently, the capability was renamed to 'Reinforcing' to better reflect its intended purpose.

Moreover, several changes were made to various definitions of the capabilities. Mainly for the capability 'Governing', experts found that using the term 'control' was incorrect in this context as it implies a direct relationship between the platform owner and the producers. Hence, the term was changed to 'govern'. Additionally, for the capability 'Reforming', it was advised to replace 'platforms structure, functionality and components' with 'platforms architecture' as an overarching term.

Finally, several changes were made to various maturity descriptions. For instance, in the case of the capability Consolidating, an expert highlighted that additional services did not necessarily need to result from information flows as originally indicated. As a result, this aspect was altered in the maturity descriptions to reflect a more accurate representation of reality.

6.4 Refinements of the Third Round

In the third and final round of the Delphi process, a shift towards a more affirmative approach was adopted. Building upon the consensus established in the second round concerning the majority of the model's components and the incorporation of only minor adjustments, it was concluded that the model had attained an overall adequate level of consensus. Consequently, the experts were requested to evaluate their agreement with the proposed model and offer any further comments, if needed. None of the experts expressed disagreement with the model, and there were no requests for modifications.

Chapter 7

The Final Maturity Model: MM-DPEO

The subsequent chapter presents the Maturity Model for Digital Platform Ecosystem Orchestration (MM-DPEO) in its final form. Firstly, an overview of the essential model information of the model is provided using the design principles as proposed by Pöppelbuß & Röglinger (2011). The subsequent sections delve into the components of the maturity model, focusing on the maturity levels, the dimensions, and the capabilities with their corresponding maturity descriptions, respectively. Lastly, the application procedure of the MM-DPEO is provided. An complete overview of the MM-DPEO can be found in G.

7.1 Scope and Basic Model Information

The present thesis utilizes the design principles as proposed by Pöppelbuß & Röglinger (2011) as a template for documenting the established maturity model (see Appendix B for a detailed description of the design principles). In Table 7.1, an overview is provided to illustrate how the design principles are realized in the Maturity Model for Digital Platform Ecosystem Orchestration (the MM-DPEO).

The primary objective of the MM-DPEO is to assist platform owners with assessing and developing their capabilities for orchestrating producers within their digital platform ecosystems. Hence, the application domain is a digital platform ecosystem, specifically examining a platform as an interconnected network where actors engage in value co-creation, exchange, and consumption through a platform. The target audience of the model consists of platform owners operating within digital platform ecosystems, and the elements under investigation are their orchestration capabilities. Overall, the model consists of four dimensions and nine distinct orchestration capabilities, each with its manifestations through different practices. The model is designed as a matrix, employing scoring at various maturity levels and weighting individual scores for each capability. Hence, the maturity model allows for self-assessment of the current level of maturity in orchestration capabilities for descriptive purposes and provides a roadmap for enhancing the maturity of these capabilities for prescriptive purposes. The distinguishing features of this model, in comparison to similar maturity models found in academic and grey literature, include its specific focus on digital platform ecosystems, and its strategic perspective on orchestration.

The development process of the maturity model follows an iterative design process, combining conceptualization based on existing literature with refinements and enhancements through the insights of domain experts. The conceptualization of the maturity model focuses on conceptualizing the dimensions, capabilities, maturity levels, and maturity descriptions. The maturity levels are grounded in the capability lifecycle theory (Helfat & Peteraf, 2003), resulting in four theoretically

deduced levels that evaluate the maturity of the capabilities and exhibit a logical progression. Subsequently, refinements and enhancements were achieved through a Delphi study consisting of three rounds with eleven domain experts. Additionally, the model underwent initial empirical evaluation through interviews conducted with practitioners focused on understandability, ease of use, usefulness, and applicability (to be discussed in Chapter 8).

Table 7.1: Basic Information of the MM-DPEO

	Design principles	**Realization in this model**
Basic information	(a) Application domain	- Digital platform ecosystems
	(b) Purpose	- Descriptive and partly prescriptive purposes
	(c) Target group	- Platform owners
	(d) The elements under investigation	- Orchestration capabilities
	(e) Differentiation from related maturity models	- industry broad - focuses on the elements Orchestration capabilities due to the strategic perspective - focuses on digital platform ecosystems
	(f) Design process and extent of empirical validation	- Iterative development by conceptualization through literature and refinement through a Delphi study - Initial empirical validation (demonstrations and semi-structured interviews)
Central maturity constructs	(a) Maturity and dimensions of maturity	- Capability maturity
	(b) Maturity levels and maturation paths	- Theoretically deduced maturity levels - Staged maturation
	(c) Available levels of granularity of maturation	- 1 level, no hierarchies
	(d) Underpinning theoretical foundations with respect to evolution and change	- Dynamic resource-based view: capabilities lifecycles (Helfat & Peteraf, 2003)

7.2 The Maturity Levels

The maturity model uses four maturity levels to characterize the maturity of each capability. They range from initial to leading and represent maturity characteristics. The maturity levels are as follows:

- **Level 1 - Initial stage**: The capability is characterized by its nascent state. Hence, there are limited practices and a lack of clear understanding of the purpose and scope of the practices.
- **Level 2 - Development stage**: The capability is characterized by basic practices, which have not reached a state of complete formalization or extensive implementation.
- **Level 3 - Advanced stage**: The capability is characterized by a stable and well-founded state, where practices are formal, well-established and effectively utilized to achieve desired outcomes.
- **Level 4 - Leading stage**: The capability is characterized by continuous adaptation and innovation of the practices, ensuring its sustained relevance and effectiveness in achieving the desired outcomes.

7.3 The Dimensions

The structure of the MM-DPEO consists of four dimensions and nine capabilities. Figure 7.1 presents the visual representation of the dimensions of the MM-DPEO. The model incorporates four dimensions: 'Framing', 'Activating', 'Synthesizing', and 'Mobilizing'. Firstly, the dimension 'Framing' reflects the influencing and altering of the perception of the existing and prospective producers to join or stay joined. Secondly, the dimension 'Activating' reflects the structuring of the ecosystem to prepare for value co-creation. Thirdly, the dimension 'Synthesizing' reflects the organizing and controlling of producers, including creating conditions for interaction while minimizing obstacles to cooperation. Fourthly, the dimension 'Mobilizing' reflects the building of commitment and retaining the producers in the ecosystem.

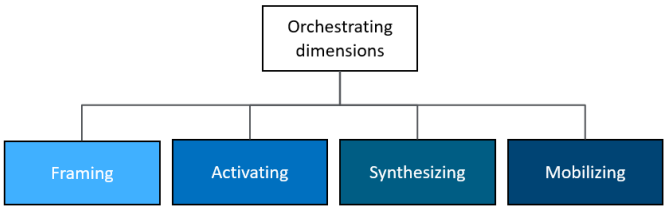

Figure 7.1: The Dimensions of the MM-DPEO

7.4 The Capabilities and their Maturity Descriptions

The MM-DPEO comprises nine capabilities, each representing an essential orchestration capability of the platform owner required for effectively orchestrating the producers within the digital platform ecosystem. The nine capabilities for orchestrating digital platform ecosystems are as follows: 'Envisioning', 'Positioning', 'Convening', 'Onboarding', 'Coordinating', 'Governing' 'Reforming', 'Reinforcing', and 'Rewarding'. An overview of the capabilities and their corresponding dimensions can be seen in Figure 7.2. Each capability is accompanied with comprehensive maturity descriptions detailing the corresponding maturity characteristics that align with each maturity level. Platform owners can score the capabilities at different levels and weigh the individual scores into an average maturity score per dimension. The subsequent sections will provide a detailed exploration of each capability and its maturity descriptions.

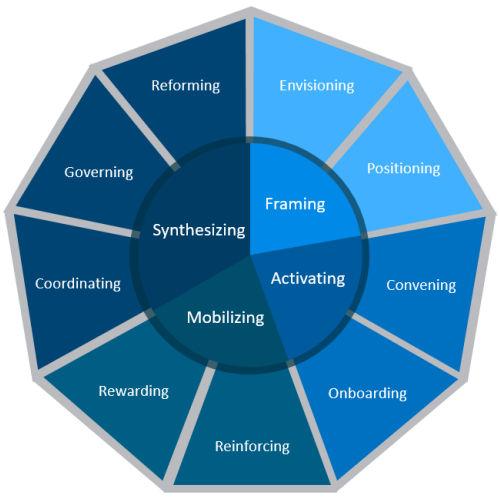

Figure 7.2: Overview of the Dimensions and Capabilities of the MM-DPEO

7.4.1 The Capabilities of the Dimension 'Framing'

In the dimension 'Framing', the MM-DPEO allocates two capabilities, namely 'Envisioning' and 'Positioning'. Both of these capabilities are centered around the ability to influence and alter the perception of existing and potential producers.

7.4.1.1 The Capability 'Envisioning'

The capability 'Envisioning' is the ability to envision and strategize the potential value proposition of the platform. The maturity descriptions pertain to the practices: envisioning, strategizing, roadmapping, and navigating. Table 7.2 provides the maturity descriptions of this capability.

Table 7.2: The Maturity Descriptions of the Capability 'Envisioning'

Maturity Level	Maturity Description
Level 1 - Initial stage	A formalized vision does not exist or is limited and informal. Consequently, minimal or no practices are in place to strive towards a potential future of the platform. The primary focus is on understanding the platform's basic features and functionalities and its direct benefits without considering how it could collaboratively build and enhance the value proposition.
Level 2 - Development stage	A vision is defined, but includes limited adherence and anticipation of the potential value producers can bring. There are strategizing, roadmapping, and navigation efforts of the potential value proposition of the platform but these are not fully formalized and maintained.
Level 3 - Advanced stage	The platform's vision is well-defined and maintained with formalized practices. The envisioning extends beyond the value of the core platform, recognizing the potential value contribution from the producers. The vision serves as a unifying force, guiding actions, and inspiring collective effort of the producers. Strategizing, roadmapping, and navigating efforts are well executed and based on a deep understanding of the envisioned value proposition of the platform.
Level 4 - Leading stage	Comprehensive practices are in place whereby the platform's vision is actively created and regularly reviewed, refined, and adapted to changing circumstances and emerging opportunities. Strategizing, roadmapping, and navigating efforts are continuously refined and enhanced to adapt and evolve with the new understanding of the platform's potential value proposition.

7.4.1.2 The Capability 'Positioning'

The capability 'Positioning' is the ability to advocate and validate the value proposition of the platform to both the existing and prospective producers. The maturity descriptions refer to the practice of developing metrics and communication channels and are represented in Table 7.3.

Table 7.3: The Maturity Descriptions of the Capability 'Positioning'

Maturity Level	Maturity Description
Level 1 - Initial stage	There are minimal or no practices focused on advocating and validating the value of the platform to producers, and there is a limited understanding of the importance of these efforts.
Level 2 - Development stage	Basic metrics and communication channels to advocate and validate the value of the platform have been developed and implemented. The platform's value is mainly communicated in terms of tangible product attributes and does not accurately represent the complexity and intangibility of the platform's ecosystem.
Level 3 - Advanced stage	There are well-defined, valid, accurate metrics and effective communication channels to diffuse a compelling interpretation of the value proposition of the platform to both participating and potential producers. The practices are comprehensive, tailored, and target a wide range of participating and potential producers.
Level 4 - Leading stage	The comprehensive metrics and communication channels to advocate and validate the platform's value proposition are continuously adapted and improved based on a clear understanding of the needs of the producers. There is a continuous outlook for identifying new ways to reach the target audience with a focus on proactively providing them with pertinent, tailored information about the value of the platform.

7.4.2 The Capabilities of the Dimension 'Activating'

In the dimension 'Activating', the MM-DPEO assigns two capabilities, namely 'Convening' and 'Onboarding'. These capabilities revolve around the structuring of the digital platform ecosystem to facilitate value co-creation.

7.4.2.1 The Capability 'Convening'

The capability 'Convening' is the ability to identify and select producers. The maturity descriptions refer to the practice of developing processes, mechanisms, and policies required for identifying producers. Table 7.4 provides the maturity descriptions of the capability 'Convening'.

Table 7.4: The Maturity Descriptions of the Capability 'Convening'

Maturity Level	Maturity Description
Level 1 - Initial stage	Identification of producers is initiated on an as needed basis without a clear understanding of how new producers can enhance the platform's value proposition. No formal practices on identification exist.
Level 2 - Development stage	Basic processes, mechanisms, and policies to identify potential producers have been implemented. There is a beginning understanding of the different capabilities of different producers and how they could contribute to the value proposition of the platform.
Level 3 - Advanced stage	Formal, well-established processes, mechanisms, and policies are in place to identify producers. The focus is on accurately assessing their pertinent capabilities, ensuring an adequate number of producers, and identifying those who can provide the highest value contributions to maximize collaboration benefits.
Level 4 - Leading stage	Comprehensive, formal practices for identifying producers are continuously refined and enhanced to adapt and evolve with the dynamic and diverse ecosystem.

7.4.2.2 The Capability 'Onboarding'

The capability 'Onboarding' is the ability to integrate producers on the platform. The maturity descriptions refer to the practice of developing processes, mechanisms, and policies for integrating producers on the platform. Table 7.5 provides the maturity descriptions of the capability 'Onboarding'.

Table 7.5: The Maturity Descriptions of the Capability 'Onboarding'

Maturity Level	Maturity Description
Level 1 - Initial stage	There are minimal or no practices for integrating new producers on the platform. Integration of producers occurs on an as needed basis without a clear understanding of the producers role in the platform's value proposition.
Level 2 - Development stage	The integration of selected producers is supported by basic processes, mechanisms, and policies; however, these practices are not yet fully formalized or consistently maintained.
Level 3 - Advanced stage	Formal processes, mechanisms, and policies to integrate producers are implemented and well-coordinated. The focus is on ensuring producers are effectively and efficiently integrated into their suitable roles.
Level 4 - Leading stage	The practices for integrating producers are extensive and undergo ongoing adaptation and improvement. The focus is on identifying innovative approaches to integrate producers more efficiently and effectively on the platform.

7.4.3 The Capabilities of the Dimension 'Mobilizing'

Within the dimension 'Mobilizing', the MM-DPEO assigns two capabilities, namely 'Reinforcing' and 'Rewarding'. These capabilities are centered around building commitment among producers and promoting their retention within the digital platform ecosystem.

7.4.3.1 The Capability 'Reinforcing'

The capability 'Reinforcing' is the ability to consolidate and reinforce the platforms ecosystem position. Specifically, this pertains to the indispensable position the platform should have within the ecosystem. The maturity descriptions refer to the practice of developing processes, mechanisms, and policies to leverage the information flows and network effects. Table 7.6 provides the maturity descriptions of the capability 'Reinforcing'.

Table 7.6: The Maturity Descriptions of the Capability 'Reinforcing'

Maturity Level	Maturity Description
Level 1 - Initial stage	There are minimal or no practices focused on consolidating and reinforcing the platform's ecosystem position and there is limited understanding of the importance of these efforts.
Level 2 - Development stage	Basic mechanisms, processes and policies for consolidating and reinforcing the platform's ecosystem position exist. There is a recognition of how to leverage the information flows, the network effects and the advantage of providing additional services
Level 3 - Advanced stage	Well-established processes and mechanisms have been implemented to consolidate and reinforce the platform's role in the ecosystem. This entails well-established processes and mechanisms that actively leverage the information flows to provide additional services to the producers. Additionally, well-established processes to leverage the platform's credibility and interest in the platform to establish favorable cooperation terms with both existing and new producers.
Level 4 - Leading stage	Comprehensive practices focused on continuously consolidating and reinforcing the platform's position in the ecosystem exist. These practices are regularly reviewed, refined, and adapted to changing circumstances and emerging opportunities

7.4.3.2 The Capability 'Rewarding'

The capability 'Rewarding' is the ability to foster and maintain stable relations with the producers in the ecosystem. The maturity descriptions refer to the practice of developing an incentive structure consisting of direct incentives, indirect incentives, standards, and expectations. Table 7.7 provides the maturity descriptions of the capability 'Rewarding'.

Table 7.7: The Maturity Descriptions of the Capability 'Rewarding'

Maturity Level	Maturity Description
Level 1 - Initial stage	The interactions are primarily transactional and basic incentives are provided, with limited emphasis on mutual growth or collaborative value creation.
Level 2 - Development stage	A basic incentive structure for collaborations has been implemented. Direct incentives (e.g., monetary rewards), indirect incentives (e.g., software tools and information), standards, and expectations are provided with the aim of fostering stable relationships. The incentive plan is functional based (i.e., based on performance metrics) and focused on promoting immediate or short-term collaborations.
Level 3 - Advanced stage	A clear, formal incentive structure (direct incentives, indirect incentives, standards, and expectations) fostering mutual understanding and commitment has been defined and implemented. The incentive plan is subjective-based and long-term oriented. The focus is on compensating and motivating the producers to contribute in their most valuable way, by ensuring the incentives promote high-quality complements, balance cooperation and competition, and align with the long-term goals and motivation of the producers.
Level 4 - Leading stage	The comprehensive incentive structure is continuously adapted and improved. The engagement of producers is actively monitored and assessed to identify potential risks or challenges that may lead them to allocate their time or earn income elsewhere. Based on this assessment, the incentives are proactively refined and enhanced to ensure that these surpass these alternative opportunities.

7.4.4 The Capabilities of the Dimension 'Synthesizing'

In the dimension 'Synthesizing', the MM-DPEO assigns three capabilities: 'Coordinating', 'Governing', and 'Reforming'. These capabilities focus on organizing and controlling the producers within the digital platform ecosystem while minimizing obstacles to collaboration.

7.4.4.1 The Capability 'Coordinating'

The capability 'Coordinating' is the ability to facilitate and enable the activities of the producers on the platform. The maturity descriptions refer to the practices of developing and provisioning software tools, such as APIs or SDKs, as well as communication channels, like interactive forms, to the producers. Table 7.8 provides the maturity descriptions for the capability 'Coordinating'.

Table 7.8: The Maturity Descriptions of the Capability 'Coordinating'

Maturity Level	Maturity Description
Level 1 - Initial stage	Minimal or no formal practices are in place for enabling producers to engage with the platform and other actors within the ecosystem. The allocation of resources and knowledge to the demand of the producers occurs on an as-needs basis.
Level 2 - Development stage	Basic software tools (e.g., APIs and SDKs) and communication channels (e.g., documentation, interactive forms) supporting producers and their (development of) services have been implemented.
Level 3 - Advanced stage	Formal well-established software tools and effective and transparent communication channels have been developed and are actively provided to producers. There is a deep understanding of producer's individual short and long-term needs, and there are actively coordinated practices (provision of resources and information) to meet these. The focus is on ensuring alignment and supporting their innovation advances.
Level 4 - Leading stage	Comprehensive practices to coordinate and support producers are continuously improved based on a clear understanding of the evolving short and long-term needs of the producers. The focus is on identifying and fostering dynamic and novel ways to collaboratively create value.

7.4.4.2 The Capability 'Governing'

The capability 'Governing' is the ability to govern the producers and their activities on the platform. The maturity descriptions encompass the practice of developing the processes, mechanisms, and policies for governing the producers. Table 7.9 provides the maturity descriptions of the capability 'Governing'.

Table 7.9: The Maturity Descriptions of the Capability 'Governing'

Maturity Level	Maturity Description
Level 1 - Initial stage	Minimal or no formal practices are in place to govern the producers activity on the platform. The governance of the producers occurs ad hoc and lacks a clear strategic direction.
Level 2 - Development stage	Basic processes, mechanisms and policies are implemented, focusing on governing the producers. This includes processes focused on compliance, security, accountability and ethics. Efforts are made to align the practices with industry standards and regulatory requirements.
Level 3 - Advanced stage	Well-established, formalized and integrated processes, mechanisms, and policies are implemented to govern the producers. The practices efficiently and effectively ensure the appropriate use of the platform by the producers, and focus on compliance, security, accountability and ethics. Moreover, they emphasize transparency and fairness.
Level 4 - Leading stage	There is continuous innovation and adaptation of the practices to effectively and efficiently govern the activities of the producers on the platform. The practices are regularly reviewed and proactively improved based on anticipated and emerging risks, ensuring the platform is used appropriately.

7.4.4.3 The Capability 'Reforming'

The capability 'Reforming' is the ability to maintain and reconfigure the platform's architecture. The maturity descriptions pertain to the practice of developing processes, mechanisms, and policies that are centered around the development, deployment, maintenance, and enhancement of the platform's architecture. The platform's architecture encompasses the platforms structure, functionality, and underlying components. Table 7.10 provides the maturity descriptions of the capability 'Reforming'.

Table 7.10: The Maturity Descriptions of the Capability 'Reforming'

Maturity Level	Maturity Description
Level 1 - Initial stage	Development and maintenance of the platform's architecture are conducted on an ad hoc basis without a clear understanding of the producer's needs. No formal practices for maintaining and modifying the platforms architecture are defined or deployed.
Level 2 - Development stage	Basic processes, mechanisms, and policies to support the development, deployment, maintenance, and improvement of the platform's architecture are defined and deployed. The main focus is on maintaining the status quo around the original technical architecture, limiting the amending of new resources and routines, and flexibility to potential new value coming from the ecosystem
Level 3 - Advanced stage	Well-established formal processes, mechanisms, and policies are defined and deployed to support the development, deployment, maintenance, and improvement of the platform's architecture. These practices aim to ensure scalability, compatibility, adaptability, interoperability, and modularity of the platform.
Level 4 - Leading stage	Comprehensive formal practices are defined and deployed to maintain and innovate the platform's architecture. The practices are continuously refined and improved. The focus is on fostering a culture of continuous, flexible, and proactive maintenance and improvement to ensure the platform's architecture continuously and proactively meets the producers needs.

7.5 Practical Application of the MM-DPEO

Prior to using the maturity model, the user of the model should be informed regarding certain concepts. This section provides a description of the assessment protocol for the application of the MM-DPEO. Specifically, to apply the MM-DPEO, it is necessary to consider (1) a multidisciplinary approach, (2) the timing of assessments, (3) the data collection, (4) the interpretation of the results, and (5) the communication of the results (Proença & Borbinha, 2018; Stoiber et al., 2023). Consequently, in this section, these elements will be further elaborated on.

Firstly, to ensure a reliable assessment of the maturity model, it is recommended to follow a comprehensive multidisciplinary approach. The participants should possess different expertise and knowledge related to the orchestration efforts of the platform owner in the digital platform ecosystem. This approach acknowledges that individual judgments may vary based on participants' experiences and professional expertise (Kahneman et al., 1982). Moreover, conducting a facilitated workshop is recommended to consolidate the diverse results of the participants. This approach encourages the participants to discuss the factors influencing their judgments and potential deviations from their colleagues' perspectives, fostering a shared understanding and more robust evaluation, while also facilitating the interpretation and engagement with the resulting scores (Maier et al., 2011; Fraser et al., 2002). Overall, the emphasis should be on a discursive process, characterized by active discussions and deliberations, contributing to a robust assessment of the orchestration capabilities' maturity.

Secondly, it is crucial that the assessments are done continuously as capabilities and practices are liable to change, either due to improvements, creation, or deterioration (Loasby, 1998). Hence, the adoption of a structured and continuous maturity assessment routine is recommended for the effective development and maintenance of knowledge about the orchestration capabilities (Stoiber

et al., 2023). Additionally, it is advised that the assessments should coincide with significant changes within the organization or the ecosystem, as this ensures timely evaluations that capture relevant developments.

Thirdly, achieving a comprehensive understanding of the maturity of the orchestration capabilities necessitates the consideration of a diverse array of data sources. This entails encompassing both internal data sources, such as platform usage metrics and transactional data, as well as external sources, like market research reports and producers perspectives. Specifically, it is crucial to incorporate the perspectives of the producers regarding the performance of the capabilities in the assessment.

Fourthly, interpreting the assessment results requires a systematic analysis, considering the collected data in relation to the capabilities and maturity descriptions of the MM-DPEO. The assessment provides insights into the platform owners current state, highlighting the orchestration capabilities in which the platform owner excels and unveiling capabilities that require improvement. Moreover, by identifying the gap between the current and desired states, the assessment can help prioritize improvements in orchestration capabilities. The assessment team should consider strategic objectives, priorities, and the costs associated with achieving higher maturity levels to prioritize improvement areas. Overall, the focus should be on gaining actionable insights.

Finally, effectively presenting the final assessment results is vital to drive improvements in the orchestration of the digital platform ecosystem. The assessment report should provide a concise summary of the current orchestration maturity level, emphasizing key findings, and should provide actionable recommendations for improvement. Visual representations, especially spider-web-representation but also ladder or profile representations, can be employed to effectively illustrate the assessment results (De Bruin et al., 2005; Lurie & Mason, 2007). Engaging relevant stakeholders, including senior executives and actors in the digital platform ecosystem, during the presentation of the results fosters understanding, alignment, and commitment to the improvement initiatives.

Overall, by assembling a diverse assessment team, conducting regular evaluations, considering multiple data sources, interpreting results in alignment with strategic objectives, and presenting findings in an actionable manner, platform owners can effectively leverage this model to assess and drive improvements in their orchestration capabilities and consequently improve their orchestration performance.

Chapter 8

Evaluation and Demonstration

This chapter delves into the evaluation of the MM-DPEO. Given that the evaluation was conducted through semi-structured interviews, the first section provides a detailed presentation of the interview protocol used in this study, offering a comprehensive explanation of the key focus areas and the structured approach employed during the interviews. Subsequently, the following section presents and discusses the insights gained from the interviews.

8.1 The Interview protocol

In the present thesis, the semi-structured interview method is selected as the data collection method to evaluate the MM-DPEO. Semi-structured interviews involve using predetermined questions while allowing for interaction, versatility, and flexibility during the interview process (Kallio et al., 2016). Hence, this method is effective in examining individuals' perceptions and opinions concerning intricate matters (Boyce & Neale, 2006; Kallio et al., 2016). Given that the evaluation of the MM-DPEO can be regarded as a complex issue, this methodological approach is well-suited for capturing the nuanced insights of the participants in relation to the maturity model. The overall process for conducting the interviews adhered to the established guidelines identified by Boyce & Neale (2006) (appendix H.1). Moreover, the methodological rigor of the conducted interviews is ensured through careful process design, encompassing three key aspects: (1) defining the interview scope, (2) identifying and selecting the participants, and (3) designing the interview guide (Boyce & Neale, 2006; Kallio et al., 2016). In the following paragraphs, each of these design principles will be further elaborated upon.

The overall objective of the evaluation is to assess the established maturity model's effectiveness in addressing the identified problem (Becker et al., 2009). To ensure a systematic and targeted evaluation, specific evaluation criteria were chosen (Prat et al., 2015). These criteria encompass 'Understandability', 'Ease of use', 'Usefulness', and 'Applicability'. The first three criteria were adapted from Salah et al. (2014)'s framework on evaluation criteria for maturity models and further refined using the artifact evaluation taxonomy proposed by Prat et al. (2015). The later criterion, 'Applicability', was adapted from the general maturity model development literature and stems from the need to evaluate the maturity model in a practical setting to ascertain its real-world relevance and usefulness (De Bruin et al., 2005; Pöppelbuß & Röglinger, 2011). Table 8.1 provides an overview of these criteria, along with their respective definitions.

The selection of the participants followed a purpose sampling approach (Etikan et al., 2016), with the objective of including a diverse group of participants with varied perspectives and expertise in the field of digital platform ecosystems. Specifically, practitioners actively engaged in orchestrating digital platform ecosystems were selected as they have valuable knowledge and insights on orchestration derived from real-world experiences. Overall, the selection process resulted in

the inclusion of four practitioners, each occupying distinct roles related to orchestration, working across different types of platforms, and possessing varying levels of experience (refer to Appendix H.2 for details).

Table 8.1: The Evaluation Criteria in Evaluating the MM-DPEO

Evaluation criteria	**Definition**
Understandability	The degree to which the model can be comprehended, both at a global level and at the detailed level of the elements and relationships inside the artifact (Prat et al., 2015).
Ease of use	The degree to which the use of the model by individuals is free of effort (Prat et al., 2015).
Usefulness	The degree to which the model positively impacts the task performance of individuals (Prat et al., 2015).
Applicability	The degree to which it is practically feasible to apply the model, focusing on the feasibility of the maturity assessment process (De Bruin et al., 2005; Pöppelbuß & Röglinger, 2011)

To ensure the methodological rigor of the interviews, an interview guide was developed following the steps outlined by Kallio et al. (2016). The guide consists of six sections, each designed to serve a specific purpose in the evaluation process. The first section focused on gathering background information about the participant, establishing a contextual understanding of their perspectives and experiences. The second section provided background information on the research itself. It introduced the interviewer, presented the topic of the thesis, and clarified the overall goal of the interview. The third section of the interview delved into the participant's views on digital platform ecosystem orchestration, specifically exploring their ideas and insights regarding the capabilities involved. The fourth section involved a demonstration of the MM-DPEO, where the maturity model was introduced, and its main components were described. Additionally, one or two capabilities with their respective maturity descriptions were discussed in detail. The fifth section centered around the evaluation of the MM-DPEO based on the criteria 'Understandability', 'Ease of use', and 'Usefulness'. Open-ended questions were utilized to capture qualitative insights from the participants, allowing for a nuanced understanding of their perspectives and evaluations. Finally, the sixth section centered around the evaluation criterion 'Applicability'. To assess the applicability of the model, a self-assessment was conducted, whereby the participant actively completed the MM-DPEO for their respective company under the guidance of the interviewer. For a complete overview of the interview guide, refer to Appendix H.3.

It is important to note that due to constraints in time and resources, section six, the evaluation concerning the criterion of 'Applicability', was not included in all interviews. Specifically, the self-assessment component was executed solely with Interviewee 3. While this limited participation in the self-assessment represents a constraint in data collection, the self-assessment conducted by Interviewee 3 still offers valuable insights into the maturity model's applicability.

Finally, it is worth noting several methodological aspects of the interviews. Firstly, the interviews were conducted remotely, enabling flexibility and convenience for both the interviewer and interviewees. Additionally, the interviews were recorded, ensuring accurate data analysis. Moreover, to ensure effective communication, the interview questions were translated into Dutch, catering to the linguistic needs of the Dutch participants. Furthermore, the duration of the interviews typically lasted between 30 minutes to an hour with the exception of the interview that included the self-assessment which took approximately two hours.

8.2 Evalution Insights

The conducted interviews have yielded valuable insights into the MM-DPEO. Even though, it is essential to exercise caution in generalizing from the limited number of interviews, the findings related to 'Understandability', 'Ease of use', 'Usefulness', and 'Applicability' suggests that the MM-DPEO shows potential for fulfilling its intended purpose. Moreover, the evaluation findings provide valuable insights for the improvement of the MM-DPEO, suggesting opportunities to enhance its ease of use, understandability, and usefulness to better cater to the needs of practitioners operating within digital platform ecosystems. The subsequent sections will present the findings and delve into the insights gained from the interviews, organized according to each specific evaluation criterion.

8.2.1 Insights from the Evaluation on 'Understandability'

The participants showed a favorable perception of the understandability of the MM-DPEO, finding the maturity model understandable and straightforward, with intuitive concepts. Interviewee 2 expressed, '*I think if you have basic knowledge and experience in the area of digital platform ecosystems, it is very understandable*'.

However, some participants raised concerns regarding the conceptual nature of the model and its use of standardized terminology. They pointed out that as the terminology and discussed concepts are very conceptual it might introduce confusion and hinder the user's ability to grasp the precise meanings of certain terms. Moreover, Interviewee 1 stated, *'For instance, in my company, we have customers and sellers that form our platform network. Surrounding it, we have start-ups developing tools for the sellers, and we refer to this whole setup as our ecosystem. However, I am aware that many other companies use the term "ecosystem" to describe different things related to sellers. This diversity in terminology can create confusion, so having a clear example can be beneficial to ensure proper understanding and communication'.*

Additionally, one participant expressed a cautionary note concerning the model, stating that the dimensions could potentially give the perception that the capabilities must be followed in a logical progression when improving them. Interviewee 2 emphasized, '*Because the dimensions are represented in a logical order, it feels like you should follow this structure, while I know that this is not necessarily required*'. The need to consider this was reinforced as another participant expressed uncertainty about whether the capabilities should be optimized in a specific order.

Overall the finding suggests that the model is understandable. However, to further ensure understandability it is important to provide clear explanations and clarifications on how to use the maturity model and interpret its results accurately, to prevent any potential misconceptions or misinterpretations. Moreover, ensuring the users understand the terminology is also essential.

8.2.2 Insights from the Evaluation on 'Ease of use'

Participants expressed overall satisfaction with the ease of use of the MM-DPEO. They appreciated the model's overall structure, as well as the categorization and allocation of the maturity levels, dimensions, and capabilities. They found these components to be presented in a clear and logical manner, making it easy to discern distinctive areas within the maturity model.

The maturity descriptions were not always expected to be easy to use. Specifically, some interviewees mentioned difficulties in distinguishing between some maturity descriptions. As Interviewee 4 remarked, '*It would be helpful if there were more explicit guidelines or examples provided for each maturity description. This would allow me to better assess and interpret the information*'. Similarly, another participant expressed difficulty in distinguishing the intended meanings of the terms 'basic practices', 'well-established practices', and 'comprehensive practices'.

Moreover, participants found that the maturity descriptions contained a substantial amount of text, which, in turn, reduced its ease of use. Interviewee 1 expressed, *'I think if the information would be provided in bullet points, it would be easier to assess and apply'.*

To conclude, The findings suggest that while the MM-DPEO was generally considered easy to use, the inclusion of more examples, additional elaboration, or a potential adjustment to the presentation format of the maturity descriptions, could further enhance its ease of use.

8.2.3 Insights from the Evaluation on 'Usefulness'

The assessment of the MM-DPEO's usefulness demonstrated generally positive perceptions among the practitioners, although to a slightly lesser extent compared to the other evaluation criteria. In general, the participants acknowledged the model's value in assessing whether and how the capabilities were incorporated into their orchestration endeavors. Interviewee 2 stated, '*I think it will provide a good overview of where we are as a platform and also highlight things we might not yet have considered*'.

However, practitioners expressed reservations about its effectiveness in providing actionable guidance for improving the orchestration capabilities (its prescriptive purpose). Interviewee 4 remarked, *'I am not sure if it would help me with planning for improvements, as it does not include, for example, best practices for higher levels. Therefore, I think that it does not give sufficient information on what I should do to improve the capabilities.'*

Furthermore, the practitioners working in platforms in later lifecycle phases conveyed their perception that the model's usefulness diminished. They expressed a preference for a lower level of abstraction concerning the platform's capabilities, one that would more effectively cater to their specific information requirements. Additionally, the participants anticipated that the maturity model would prove more advantageous in start-up platforms, given their likely limited knowledge about orchestration capabilities. Interviewee 2 stated, *'I think it is especially helpful for start-up platforms that are still figuring out how to effectively orchestrate their ecosystems.'* This assertion was supported by the participant working in a start-up platform, as they reported a high level of usefulness associated with the MM-DPEO.

Overall, the findings suggest that the model is especially useful for platform owners in their initial lifecycle phase. To further improve the model's usefulness in fulfilling its prescriptive purpose and improve the usefulness for platform owners in later lifecycle phases, there is a need for more actionable guidance either by incorporating sub-capabilities or offering more detailed maturity descriptions.

8.2.4 Insights from the Evaluation on 'Applicability'

As previously indicated, the evaluation criterion 'Applicability', was examined through a self-assessment conducted with one of the participants. The self-assessment allowed the MM-DPEO to be implemented in a real-world organization, gaining valuable insights regarding the practical feasibility of the MM-DPEO's maturity assessment processes. The subsequent sections will provide additional information about the case company (PlatformCo) that undertook the self-assessment, followed by an elaboration on the process and the obtained findings and insights.

8.2.4.1 The case company: PlatformCo

PlatformCo is an emerging start-up platform that has undergone four years of development, with becoming operational in Indonesia during the last two years. Positioned as a digital service platform in the academic industry, PlatformCo offers comprehensive education and research solutions

for its members. Specifically, PlatformCo centers around three fundamental pillars: facilitating communication and collaboration, delivering high-quality education, and supporting research endeavors. In terms of collaboration, PlatformCo facilitates connections and interactions among students, teachers, scientists, and staff members from diverse universities and research centers, fostering a dynamic environment for knowledge exchange and collaboration. For the educational pillar, PlatformCo accomadates for the provision and utilization of education modules. As for the research aspect, the platform equips academia with tools to create, disseminate, and publish journals, articles, or joint research proposals. At present, PlatformCo is primarily focused on establishing and enhancing its collaborative and educational pillars, with plans to incorporate support for research endeavors in the future. Moreover, as the platform becomes increasingly operational, PlatformCo is actively exploring how to successfully coordinate and promote their members that contribute content (e.g., place posts and create educational modules). In other words, how to better orchestrate its producers on the digital platform ecosystems.

8.2.4.2 The Self-Assessment process of PlatformCo

The findings of the assessment of PlatformCo's orchestration maturity are summarized in Figure 8.1. Overall, PlatformCo's maturity assessment underscores its commitment to the orchestration of its digital platform ecosystem while also highlighting areas for further development. In table 8.2, the participant's provided scores, along with their corresponding elaborations, are presented.

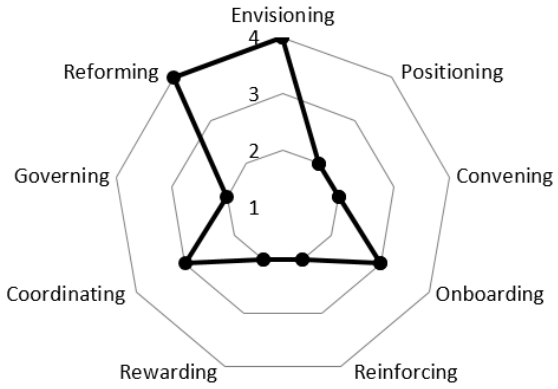

Figure 8.1: The Results of the maturity assessment of PlatformCo

Table 8.2: XX

Capability	Score	Elaboration
Envisioning	4	PlatformCo has comprehensive practices where the platforms vision is actively created and regularly reviewed. The participant noted that PlatformCo maintains a well-defined vision that undergoes constant refinement and improvement. Moreover, the participant stated that their roadmap and strategy are continuously updated to align with the evolving vision.
Positioning	2	PlatformCo currently lacks adequate implementation of metrics and communication channels to advocate for and validate the value of the platform. The participant noticed that there are limited mechanisms in place to measure and demonstrate the platform's value. However, they are expected to make improvements, as the participant expressed, *'After launching the mobile version of the platform, the plan is to focus on increasing visibility'.*

Capability	**Score**	**Elaboration**
Convening	2	PlatformCo has basic processes, mechanisms and policies to identify potential producers. The participant found that PlatformCo had considered to some extent which producers to identify. However, this was mainly in the context of their broader strategy to launch the platform first in Indonesia. Hence, the process of identifying which specific producers would bring the most value is still undergoing research and consideration.
Onboarding	3	PlatformCo has formal processes, mechanisms, and policies to integrate producers. The participant stated, *'Our onboarding process is almost completely autonomous, and we ensure that everyone can easily join the platform'.*
Reinforcing	2	PlatformCo has basic processes for consolidating and reinforcing the platforms ecosystem position. The participants stated that PlatformCo recognizes the importance of network effects and the potential benefits of leveraging the information flow. However, they also noted that PlatformCo has not yet been able to actively develop practices that effectively harness these aspects.
Rewarding	2	PlatformCo currently lacks a well-developed and implemented incentive system. The platform's primary focus seems to be on promoting immediate or short-term collaborations. As the participant noted, *'We just started doing competitive events with prizes to encourage people to join and stay on the platform. This allowed us to attract a large user base, but we still observed that many users would eventually disengage from the platform'.*
Coordinating	3	PlatformCo has formal well-established software tools and effective and transparent communication channels. The participant emphasized that they have collaborated closely with producers, actively seeking and understanding their needs. In response, PlatformCo provides the necessary tools and communication channels to fulfill the identified requirements effectively.
Governing	2	PlatformCo has governance practices in place. However, the participant noticed that there has not been a specific focus on governing the behavior of producers yet. Nonetheless, some initial guidelines have been developed, albeit in a limited capacity.
Reforming	4	PlatformCo has formal practices in place to maintain and innovate the platforms architecture. The participant observed that PlatformCo demonstrates a proactive commitment to the development of the platform. Given that PlatformCo is still in the start-up phase, they are actively working on developing various IT elements of their platform, such as the mobile platform. The participant mentioned, *'Lately, developing the platform UX (user experience) and UI (user interface) has become very important for us, and we have been actively innovating to meet the needs of our producers'.*

Overall, the findings demonstrated that the MM-DPEO can effectively capture and evaluate various capabilities of platform orchestration, aligning well with the challenges and growth patterns observed in a platform owner. Moreover, the participant found that it offered a structured and systematic approach to assess the platform owner's current state and its potential for growth and development. Hence, the assessment suggests that the model can be an useful tool for platform owners to evaluate their orchestration maturity.

Chapter 9

Conclusion and Discussion

More and more firms seek to integrate digital platforms into their business models. However, it remains difficult for platform owners to successfully orchestrate a digital platform ecosystem. Specifically, platform owners seem to have inadequate capabilities to cope with the challenges of orchestrating digital platform ecosystems. Moreover, although a considerable amount of scholarly research on orchestrating digital platform ecosystems exists, only a few first steps have been taken to identify the capabilities platform owners require to successfully orchestrate a digital platform ecosystem. Accordingly, the aim of this paper was to design a maturity model that would help platform owners assess the current state of their orchestration capabilities and provide a roadmap to improve their maturity related to these capabilities to overall improve the orchestration of their digital platform ecosystems.

Consequently, the present thesis developed a maturity model for orchestrating digital platform ecosystems - the MM-DPEO. The development and evaluation processes of the maturity model are meticulously presented in a series of distinct steps. During step one, which centers around problem identification, the problem landscape was identified, and the necessity for designing the model was substantiated. In step two, an in-depth comparison of existing maturity models was conducted, further solidifying the rationale for creating a novel maturity model. Step three focused on formulating an effective development strategy, wherein a comprehensive plan was devised to design the novel maturity model. Subsequently, step four encompassed the iterative model development, characterized by two rounds of design. During the initial iteration, the maturity model was conceptually constructed, drawing upon relevant literature and theoretical frameworks. The subsequent iteration involves the refinement and enhancement of the model through a rigorous Delphi study, which engaged eleven domain experts in three rounds of iterative feedback and consensus-building. The fifth and final step involved evaluating the maturity model with practitioners in the field of digital platform ecosystems. Four semi-structured interviews were conducted, focusing on the MM-DPEO's understandability, ease of use, usefulness, and applicability.

Based on the rigorous model development process and the perceived usefulness of the model by the intended users, there can be concluded that this study provides a comprehensive maturity model to assess and improve the orchestration capabilities of a platform owner. In the remainder of this chapter, the contributions of this research to academic literature and the contributions to practice will be discussed. Additionally, the limitations and future research opportunities will be highlighted.

9.1 Contributions to Academic Literature

This research contributes to the scholarly discourse surrounding the orchestration of digital platform ecosystems. Specifically, the key contributions of this research are threefold. Firstly, the

present thesis contributes to the understanding of orchestrating digital platform ecosystems by shifting the focus from an IT perspective to a Strategy perspective. Existing literature on platform orchestration primarily examines observable processes, mechanisms, and practices related to the platform's IT aspects, such as platform architecture and governance structures (Cennamo et al., 2018; Halckenhaeusser et al., 2020; Tiwana et al., 2010; Tiwana, 2013; Song et al., 2015). By adopting a strategy perspective, the present thesis broadens the scope of orchestration to encompass other means through which platform owners orchestrate digital platform ecosystems. Moreover, the present thesis offers insights into the broader strategic reasoning on the orchestration practices employed within these ecosystems.

Secondly, the present thesis presents a maturity model for digital platform ecosystem orchestration. By synthesizing state-of-the-art literature and insights from multiple domain experts, this paper identifies orchestration as a multilevel construct comprising of nine distinct capabilities, each with its manifestations through different practices. By providing the present maturity model, an analytical approach and lens are provided through which digital platform ecosystem orchestration capabilities can be assessed and improved.

Thirdly, the present thesis contributes to the literature on maturity model development by shedding light on the process and methods involved in constructing maturity models. Through a comprehensive overview of a maturity model development process, the paper offers valuable insights into potential practices of the development process. This contribution is crucial as there is a notable void in the literature, where limited practical guidance exists on effectively conceptualizing maturity models (Becker et al., 2009; De Bruin et al., 2005). By providing these insights, this thesis enhances the knowledge on maturity model development, offering researchers and practitioners an example of a concrete process for constructing robust and meaningful maturity models.

Overall, the present thesis has advanced the field by contributing to the literature on digital platforms, digital platform ecosystem orchestration, and to the development of maturity models.

9.2 Contributions to Practice

This research was led by the practical problem that most platform owners still lack the capabilities to successfully orchestrate digital platform ecosystems. This is troubling because orchestrating capabilities are closely associated with the ability of a firm to retain its competitive advantage and ensure long-term survival (Teece, 2017). To help platform owners - i.e., practitioners - successfully orchestrate digital platform ecosystems, this thesis makes several contributions.

Firstly, the MM-DPEO supports platform owners in determining whether the capabilities to engage in orchestration are present. Specifically, the present thesis highlights the importance of nine capabilities for orchestrating digital platform ecosystems: 'Envisioning', 'Positioning', 'Convening', 'Onboarding', 'Reinforcing', 'Rewarding', 'Coordinating', 'Governing', and 'Reforming'. The thesis attempts to create awareness among platform owners that successfully orchestrating digital platform ecosystems requires these capabilities.

Secondly, the MM-DPEO can be used by platform owners to assess the current situation, develop and prioritize improvements, and control the progress of implementation regarding the orchestration capabilities (Röglinger et al., 2012). Platform owners can use the MM-DPEO to map the maturity of their orchestration capabilities. The assessment represents the current situation and unveils the areas of orchestration capabilities in which the organization excels and which areas leave room for improvement. Moreover, the MM-DPEO can be used to create a roadmap for platform owners to improve the maturity of their orchestration capabilities. It also enables them to monitor and evaluate the progress made toward achieving those improvements.

9.3 Limitations and Directions for Future Research

Overall, this thesis provides novel insight into how platform owners orchestrate digital platform ecosystems. Nevertheless, this thesis also has certain limitations, some of which offer fruitful opportunities for further research. One primary limitation is the abstract and conceptual nature of the maturity model. Even though, due to its abstract and conceptual nature, the maturity model can be applied across diverse domains and contexts, a limitation arises in that it may not adequately address the unique or crucial information needs specific to particular contexts or domains (e.g., De Reuver et al., 2018; Kauschinger et al., 2022). Moreover, as identified in the evaluation, the usefulness, ease of use, and understandability of the model may be limited within real-world organizations. To overcome this limitation, future research efforts should focus on tailoring the model to specific contexts or domains. Moreover, it is recommended to provide additional information either through the addition of sub-capabilities or more actionable descriptions (e.g., best practices, examples). By delving into these aspects, additional valuable insights can be gained into the underlying practices of orchestration capabilities, facilitating the development of a more detailed and actionable framework. This, in turn, would provide organizations with more relevant and actionable guidance, increasing the model's understandability, ease of use, usefulness and applicability.

Secondly, the present thesis is subject to several limitations with respect to the methods employed in its design and evaluation. Firstly, a limitation arises from the use of the constant comparison technique to conceptualize the capabilities. This technique may pose challenges in replicating the results and introduce potential biases due to subjective interpretations. Additionally, the use of the Delphi study in this research introduces another potential limitation. As the Delphi study employed required experts to complete time-consuming surveys, there is a potential for rushed decision-making which could compromise the reliability of the outcomes. Furthermore, it remains uncertain whether the convergence of group judgments enhances the accuracy of the decisions, thus questioning the validity of the study (Powell, 2003). Finally, another limitation relates to the need for further validation. The research design relied on a limited number of interviews and conducted assessments, potentially not fully capturing the full range of perspectives. To overall enhance the robustness and generalizability of the findings of this thesis, future research endeavors should aim to address these limitations by considering additional design steps to corroborate the findings.

Thirdly, an area that requires further investigation is the extent to which increased maturity of the orchestration capabilities genuinely leads to enhanced orchestration performance. Although the model implies a correlation between the maturity of the orchestration capabilities and performance, additional research is necessary to validate this relationship rigorously. Specifically, it is essential to conduct empirical studies and real-world experiments to ascertain the accuracy and reliability of this correlation in various domains and contexts.

In conclusion, the development of the Maturity Model for Digital Platform Ecosystem Orchestration (the MM-DPEO) offers a valuable framing and conceptualization that facilitates further theorization on the topic of digital platform ecosystem orchestration. Moreover, we hope that this model can be utilized as a conceptual toolkit to conduct accurate maturity assessments of orchestration in digital platform ecosystems.

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Appendix A

The Structure of a Maturity Model

Figure A.1 provides an illustrative depiction of the structure of a maturity model. It delineates the interrelationships between the four key components: the maturity levels, the elements, the dimensions, and the maturity descriptions. Notably, the presented representation adopts a maturity grid format, which will also be employed in the present thesis. However, alternative representations, such as a maturity ladder, can also be employed as a structure.

Dimensions	Elements	Maturity Levels			
		Level 1	Level 2	...	Level n
Dimension 1	Element 1	Maturity Description E1/L1	Maturity Description E1/L2	...	Maturity Description E1/Ln
	Element 2	...	...	...	...
Dimension 2	Element 3	...	...	...	...
	Element 4	...	...	...	...
	Element 5	...	...	...	...
...	...	...	...	...	...
Dimension n	Element n	...	...	...	Maturity Description En/Ln

Figure A.1: The Structure of a Maturity Model

Appendix B

The Design Principles of a Maturity Model

This appendix discusses the design principles for developing maturity models as identified by Pöppelbuß & Röglinger (2011). Table B.1 provides a comprehensive overview of the key principles encompassing their names and explanation.

Table B.1: The Design Principles for Maturity Models as Identified by Pöppelbuß & Röglinger (2011)

	Design principles	**Explanation**
Basic Information	(a) Application domain	The application domain together with prerequisites of applicability - must be specified and documented.
	(b) Purpose of use	The purpose of use must be documented. Typically, the following application-specific purposes of use are distinguished; Descriptive, prescriptive, and comparative.
	(c) Target group	The target group must be documented. The target group comprises the people who apply the maturity model and those to whom results are reported.
	(d) Class of elements under investigation	The model should specify clearly the class of elements under investigation and whether these are software systems, people, processes, or organizational capabilities.
	(e) Differentiation from related maturity models	The need for the development of the maturity model must be substantiated by a comparison with existing models.
	(f) Design process and extent of empirical evaluation	The maturity model must be developed and evaluated iteratively. Moreover, the design process has to be clearly documented and communicated.
Central maturity constructs	(a) Maturity and dimension of maturity	What maturity means in relation to the class of elements and application domain under investigation must be clearly defined.
	(b) Maturity levels and maturation paths	Each level has to be identified by a concise descriptor and description. Moreover, the rationale behind maturation needs to be disclosed by means of the logical relationship between successive levels.
	(c) Available levels of granularity of maturation	The different degrees of detail at which the process of maturation can be measured or assessed needs to be specified.
	(d) Underpinning theoretical foundations with respect to evolution and change	The underpinning theoretical foundations of evolution and change with respect to the class of entities under investigation needs to be specified.

Appendix C

Supplementary Details of the Multivocal Literature Review

The following appendix provides a detailed explanation of the multivocal literature review conducted on papers discussing maturity models in related domains. The sections cover an overview of the identified papers, an analysis of the key findings regarding their characteristics, and the filled-in data extraction template, respectively.

C.1 The Identified Papers

Table C.1 presents an overview of the identified papers in the multivocal literature review, listing the authors and titles of each paper.

Table C.1: The Identified Papers on Existing Maturity Models

#	Authors	Title
1	Deale et al. (2019)	Towards a maturity model for technology platforms in the south African healthcare context
2	Ehrensperger et al. (2021)	Toward a maturity model for digital business ecosystems from an IT perspective.
3	Jansen (2020)	A focus area maturity model for software ecosystem governance.
4	Workspan (2022)	Ecosystem maturity model - how businesses evolve to become world-class partner ecosystems

C.2 General Findings

The profile analysis of the four papers revealed that the majority were from academic literature, with only one from grey literature. Among the academic papers, two were presented at conferences and one was published in a journal. The majority of the papers had received few citations, except for one with over 50 citations. It should be noted that no citation information was available for the paper from grey literature.

C.3 Extraction template for maturity model comparison

To facilitate the systematic comparison of the maturity models, an extraction template was employed to organize the information from the various papers. The template was structured based on the design principles as identified by Pöppelbuß & Röglinger (2011) (refer to Appendix B for an elaboration on the design principles). Table C.3 presents an overview of the completed template.

Table C.2: The Extracted Content from the Identified Papers on Maturity Models

	The software ecosystem governance maturity model (Jansen, 2020)	**Maturity model for Digital Business Ecosystems (Ehrensperger et al., 2021)**	**Maturity model for technology platforms (Deale et al., 2019)**	**Ecosystem maturity model (Workspan, 2022)**	**Maturity model for digital platform ecosystem orchestration (This thesis)**
C1: Application domain	Software ecosystems	Digital business ecosystems	Technology Platforms in the healthcare context	Ecosystems	Digital platform ecosystems
C2: Purpose of use	Descriptive and predictive purpose.	Descriptive and predictive purpose	Descriptive and predictive purpose	Descriptive and predictive purpose	Descriptive and predictive purpose
C3: Target group	Leaders in software ecosystems	Not specified	Platform owners	Ecosystem-led organizations	Platform owners
C4: Class of elements under investigation	governance practices (IT-focused)	IT elements	Technology platform management practices	Ecosystem management practices	Orchestration capabilities
C5: Differentiation from related maturity models	Absence comparison with existing MMs. The necessity for the maturity model is explained.	Investigated existing maturity models and concluded no maturity models in the domain of digital business ecosystems exist. Included, substantial evidence for development of new model.	Conducted a review of frameworks focused on technology platform management	Absence comparison with existing maturity model. The necessity for a maturity model is explained in limited detail.	Comparison with maturity models in network, ecosystem, and platform domains
C6: Design process and extent of empirical validation	Development based on literature studies and evaluation in two rounds	Iterative development based on interviews and literature and evaluation through demonstration	Iterative development based on existing framework and evaluation through interviews and case study	Absence of a development process and no evaluation nor validation of the maturity model.	Iterative development and empirical validation

Appendix D

The Procedure Model for Developing Maturity Models

The procedure model by Becker et al. (2009) is used as a basis for the development steps taken in this research. An overview of how the procedure model of Becker et al. (2009) translates into the procedure model in the present thesis can be seen in Figure D.1. To reduce the complexity of the model by Becker et al. (2009) and to align the procedure process with the structure of the present thesis, three process steps (the conception of transfer and evaluation, the implementation of transfer media, and the evaluation) are merged into one, the evaluation step.

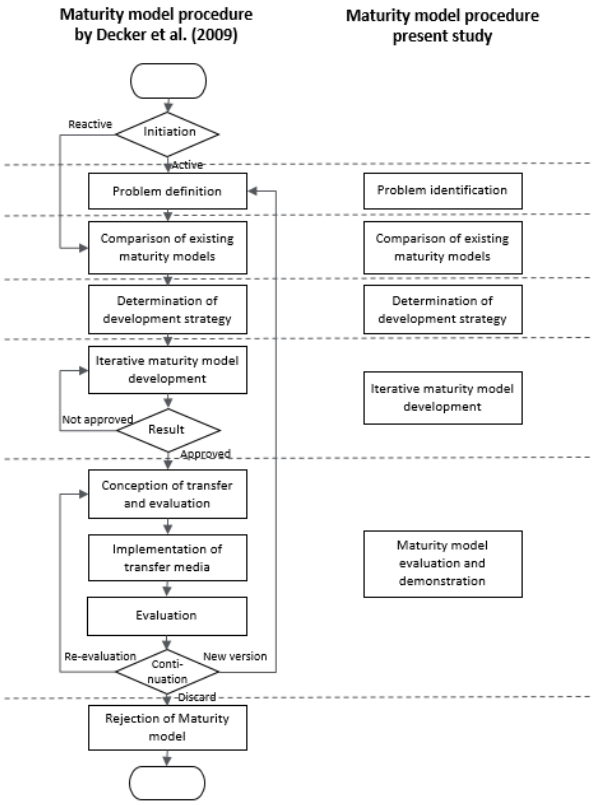


Figure D.1: The Procedure Models for Maturity Model Development by Becker et al. (2009) and Present Thesis

Appendix E

Supplementary Details of the Systematic Literature Review

The subsequent appendix provides a more detailed elaboration of the systematic literature review. It begins with an overview of the papers identified during the systematic literature review. Following that, an analysis of the overarching findings regarding the characteristics of the identified papers is discussed. Lastly, the completed data extraction template is included.

E.1 The Identified Papers

Table E.1 presents an overview of the identified papers in the Systematic Literature Review, listing the authors and titles of each paper. The papers are arranged in alphabetical order to facilitate easy reference and navigation.

Table E.1: The Included Papers on Orchestration Capabilities

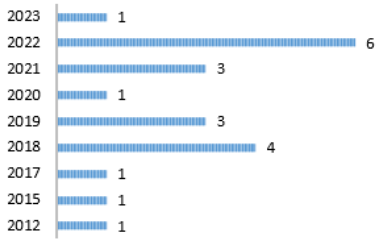
#	**Authors**	**Title**
1	Blaschke et al. (2018)	Capabilities for Digital Platform Survival: Insights from a Business-to-Business Digital Platform
2	Blasco-Arcas et al. (2020)	Organizing actor engagement: a platform perspective
3	Cenamor et al. (2019)	How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity
4	Deng et al. (2022)	A Profit Framework Model for Digital Platforms Based on Value Sharing and Resource Complementarity
5	Engert et al. (2022)	The Engagement of Complementors and the Role of Platform Boundary Resources in eCommerce Platform Ecosystems
6	Foss et al. (2023)	Ecosystem leadership as a dynamic capability
7	Hahn et al. (2018)	Leverage Once, Earn Repeatedly-Capabilities for Creating and Appropriating Value in Cloud Platform Ecosystems
8	Hein et al. (2019)	The influence of digital affordances and generativity on digital platform leadership
9	Helfat & Raubitschek (2018)	Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems
10	Jimenez & Valogianni (2022)	Uncovering the processes of IT value cocreation in digitial platform ecosystems
11	Jovanovic et al. (2022)	Co-evolution of platform architecture, platform services, and platform governance: Expanding the platform value of industrial digital platforms
12	Laczko et al. (2019)	The role of a central actor in increasing platform stickiness and stakeholder profitability: Bridging the gap between value creation and value capture in the sharing economy
13	Nordin et al. (2018)	Network management in emergent high-tech business contexts: Critical capabilities and activities

#	Authors	Title
14	Perks et al. (2017)	Network orchestration for value platform development
15	Pikkarainen et al. (2022)	Resource integration capabilities to enable platform complementarity in healthcare service ecosystem co-creation
16	Scholten & Scholten (2012)	Platform-based Innovation Management: Directing External Innovational Efforts in Platform Ecosystems
17	Schreieck et al. (2021)	Capabilities for value co-creation and value capture in emergent platform ecosystems: A longitudinal case study of SAPs cloud platform
18	Siaw & Sarpong (2021)	Dynamic exchange capabilities for value co-creation in ecosystems
19	Sun & Zhang (2022)	How can dynamic capabilities make sense in avoiding value co-creation traps?
20	Tan et al. (2015)	The role of IS capabilities in the development of multi-sided platforms: The digital ecosystem strategy of alibaba.com
21	Tian et al. (2021)	Developing and leveraging platforms in a traditional industry: An orchestration and co-creation perspective

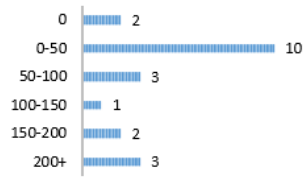
E.2 General Findings

An analysis was conducted on the profile of the 21 papers obtained through the systematic literature review. The majority of the included papers were disseminated through journals, particularly the journals Industrial Marketing Management and the Journal of Business Research, as depicted in Figure E.1a. Furthermore, an examination of the publication years of the studies reveals the studies spanned from 2012 to 2023, with a noticeable increase in the number of publications in recent years (Figure E.1b). Even though their recent publication, the majority of the papers have garnered multiple citations, indicating their impact and recognition within the research community (Figure E.1c). Lastly, multiple methodological approaches were employed by the studies, with case studies being the most prevalent technique (Figure E.1d). These case studies often involved multiple companies, multiple interviews, and the utilization of archival data.

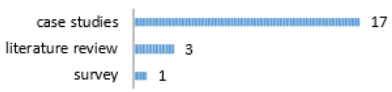
(a) Journal or Conference of Publication



(b) Year of Publications



(c) Number of Citations



(d) Adopted Techniques

Figure E.1: Profile of identified papers

E.3 Extraction template on Orchestration Capabilities

To facilitate systematic data extraction, an extraction template was employed to organize the information from the various papers. The template provides the paper's perspective on digital platform orchestration, the identified orchestration capabilities, and the identified practices. Table E.2 presents an overview of the completed template, providing a summary of the information extracted from the papers. It is important to note that the table offers a condensed representation of the extraction template, as the original template included more detailed descriptions of the identified capabilities and practices, such as the definitions for each capability and a complete list of the practices.

Table E.2: Summary of Extracted Content from the Papers on Orchestration Capabilities

Reference	**Viewpoint on orchestration**	**Capabilities**	**Practices**
Blaschke et al. (2018)	The paper investigates capabilities that ensure efficient and effective value co-creation processes among the digital platforms constituent actors	Four capabilities: system orchestration, system reformation, ecosystem preservation, ecosystem diversification	Multiple practices. For example, partner management, institutional arrangements, (e.g. rules, conventions, standards, norms), etc.
Blasco-Arcas et al. (2020)	The paper investigates organizing modes of engagement in complex business settings from a platform perspective.	Three organizing modes: orchestrating, facilitating, stimulating	Multiple practices for the organizing modes. For example, Learning through interactions between employees and clients, etc.
Cenamor et al. (2019)	The paper investigates how SME scan enhance performance trough digital platforms.	Two main capabilities: Platform Capability, Network Capability	Multiple practices for the capabilities identified. For example, Platform integration, Platform reconfiguration, Internal communication, etc.
Deng et al. (2022)	The paper investigates the antecedents of digital platforms' profitability	Three profit mechanisms: Strategic flexibility, Symbiotic synergy capability, Digital capability	Included multiple practices, for example, aggregation ability, digital link capability, digital chain precipitation ability.
Engert et al. (2022)	The paper investigates the platform's role in facilitating and channeling complementor engagement.	Focuses on the overall capability of engagement	Multiple practices identified. For example, technical integration, legal compliance, etc.
Foss et al. (2023)	The paper investigates Ecosystem Leadership from a dynamic capability perspective.	Identifies Ecosystem Leadership consisting of six microfoundations. This includes facilitating the formation of a shared vision, inducing others to make ecosystem-specific investments, etc.	Indirect practices identified. For example for a shared vision leaders, ability to adopt a wide lens.
Hahn et al. (2018)	The paper investigates IT capabilities that enable value creation and appropriation mechanisms	Two types of capabilities: Dyadic IT customization capabilities, Network IT standardization capabilities	Multiple practices identified. For example, transforming and integrating products, onboarding and integrating existing solutions of customers onto the platform, etc.
Hein et al. (2019)	The paper investigates how to provision of affordances and the interaction of producers leads to success.	Two mechanisms: Provision of boundary resources, Provision of digital affordances	Identified practices include: patent use, complementor autonomy, knowledge sharing, technological openness, cognitive distance.

Reference	Viewpoint on orchestration	Capabilities	Practices
Helfat & Raubitschek (2018)	The paper investigates the ways in which dynamic capabilities underpin value creation and value capture by platform leaders.	Three types of dynamic capabilities: Innovation capabilities, Scanning and sensing capabilities, Integrative capabilities	For each of the dynamic capabilities multiple practices are identified. For example, for innovation capabilities, routines for assigning software developers with expertise.
Jimenez & Valogianni (2022)	The paper investigates the process of IT value cocreation in digital platform ecosystems.	Multiple capabilities identified: Co-envision, Platform and partner selection, Co-enable, Vertical and horizontal orchestration, Co-integrate modularity, Co-sharing resources, Co-market and co-sell, Co-govern	Limited to no practices identified.
Jovanovic et al. (2022)	The paper investigates the gradual development of platform architecture, platform services, and platform governance	Three capabilities: Platform architecture, Platform services, Platform governance	The study investigates practices in relationship to the platform lifecycle. For example, for platform architecture, this first entailed product data collection, next analytics utilization and finally artificial intelligence enablement.
Laczko et al. (2019)	The paper develops a framework that connect the value creatin and value appropriation by the central actor in a platform.	Two high-order capabilities: Platform stickiness, Stakeholder profitability	Multiple practices for the capabilities identified. This includes, breath of stakeholder value, access to knowledge, stakeholder emporement, platform control, etc.
Nordin et al. (2018)	The paper investigates network management in emerging high-tech business field. The focal firm's leader seen as a core orchestrating actor.	Three capabilities: Context handling, Network construction, Network position consolidation	Multiple practices identified. For example, related to context handling, visioning, roadmapping, communicating/ evangelizing, navigating.
Perks et al. (2017)	The paper investigates how lead firms mobilize network relationships to support and build novel value platform	Four orchestration mechanisms defined: Envisioning the potential value for participants, Inducing innovativeness: supporting innovativeness for value creation, Legitimizing the value platform, Adjusting internal structures and routines	Multiple practices for each mechanism identified. For example, defining network roles, freely sharing knowledge, the retention of knowledge, etc.
Pikkarainen et al. (2022)	The paper investigates the resource complementarity in service ecosystems.	One capability identified: Resource integration capability	Multiple practices identified related to knowledge and skills, technology and solutions, data and motivation.
Scholten & Scholten (2012)	The paper explores and categorizes control mechanisms platform owners have implemented to steer external innovation efforts. Additionally, it identifies primary tasks of innovation management.	Primary tasks of innovation management: Formulate strategy, Stimulate and seed external innovation efforts, Control access to platform technology, Rule development of complementary applications, Source complementary applications, Encourage optimization of complements, Enable consumer-driven composite solution, Deliver composite solution	No additional practices identified.

Reference	Viewpoint on orchestration	Capabilities	Practices
Schreieck et al. (2021)	The paper investigates capabilities that are crucial to establish platform ecosystems and how they contribute to value co-creation and value capture.	Five capabilities identified: Cloud based platformization, Open IT landscape management, Ecosystem orchestration, Platform evangelism, Platform co-selling	Multiple practices identified. For example, for cloud-based platformization, seizing control of the code of the ERP core, connecting modular third-party applications, etc.
Siaw & Sarpong (2021)	The paper investigates the processes thorugh which firms co-create and co-capture value in ecosystems.	Three high level capabilities: Relationship building, Resource integration, Dynamic exchange capabilities	For each capability, multiple practices identified. For example, for dynamic exchange capabilities, innovation licensing, market position management, etc.
Sun & Zhang (2022)	The paper explores how dynamic capabilities play a role in avoiding value co-creation traps and generating new value co-creation behaviors.	Three dynamic capabilities: Resource integration capability, Technology integration capability, Network capability	Multiple practices identified. For example, for resource integration capability, customer data resource sharing, the integration of supply chain resources, etc.
Tan et al. (2015)	The paper investigates the IS capabilities of the platform owner and how they can influence and co-evolve with the development of the platform.	Three capabilities identified: Outside-in IS capabilities, Inside-out IS capabilities, Spanning IS capabilities	Multiple practices for each of the capabilities identified. For example, for outside-in IS capabilities, external relationship management and market responsiveness.
Tian et al. (2021)	The paper investigates how lead actors efforts ensure co-evolution of the platform and the platform actors contributions to value co-creation.	Three capabilities: Targeting capability, Legitimizing and envisioning capability, Expertise building capability	Multiple practices identified. For example, practices related to targeting capability, include evaluate the platform's potential benefits, redefine each platform member's position in the value chain, select partners that can add most value to the entire network, etc.

Appendix F

Supplementary Details of the Delphi Study

The following appendix provides additional details on the Delphi study. Firstly, an overview of the experts involved in the study is provided. Subsequently, the first and second rounds of the Delphi study are elaborated upon. It is important to note that the third round of the Delphi Study is not further elaborated upon as it did not involve a survey or any modifications.

F.1 The Delphi study Participants

Table F.1 presents an overview of the composition of the participants (i.e., the Delphi panel). The selection of participants followed a purposive sampling approach, where individuals were chosen based on specific characteristics (Etikan et al., 2016). Specifically, the participants were selected based on their knowledge and experience in the field of digital platform ecosystems. Furthermore, to ensure a diverse range of perspectives and experiences, the panel included individuals from various backgrounds, encompassing consultants, academics, and industry experts.

Table F.1: The Delphi panel profile

	Function	**Type**	**Years of expertise**
Expert 1	Business consultant & researcher	Academic	4
Expert 2	Enterprise Architect	Consultancy	6
Expert 3	Junior Researcher (PhD)	Academic	10
Expert 4	Product Manager	Industry	5
Expert 5	Consultant	Consultancy	4
Expert 6	Junior Researcher (PhD)	Academic	3
Expert 7	Senior manager	Consultancy	2
Expert 8	Chapter Lead	Industry	5
Expert 9	Partner program manager	Industry	4
Expert 10	Head of Partner & Ecosystem Development	Industry	7
Expert 11	Doctor/ professor	Academic	6

F.2 The Delphi Round 1

This section will provide an elaboration on the first round of the Delphi study. It begins by offering additional information regarding the survey utilized, encompassing its design and pertinent parameters. Following this, the voting results obtained from the participating experts are presented. Lastly, the suggestions put forth by the experts are elaborated upon, encompassing the rationale behind each suggestion and the corresponding responses undertaken.

F.2.1 The Survey design

The survey utilized in the first round was structured into four distinct sections. The first section served as an introductory overview, providing general information and an overarching framework of the dimensions and capabilities. The framework presented the names and definitions associated with each dimension and capability, as well as information on how each capability was allocated to a specific dimension. By providing this framework, the survey ensured that experts had a solid understanding of the model. Moreover, this enabled the experts to consider the broader context of the model when responding to questions related to each dimension or capability.

In the second section, the focus was placed on the dimensions. Experts were asked to indicate their agreement or disagreement with each dimension, name, and definition. To collect both quantitative and qualitative data, the section employed a combination of multiple-choice questions and open-ended questions. In the multiple-choice format, experts were required to choose between three options: endorsing the dimension as is (indicated as stay), suggesting changes to the dimension (indicated as change), or recommending the elimination of the dimension (indicated as go). If changes or elimination were suggested, experts were prompted to provide further elaborations and explanations. An example question related to a specific dimension is presented in Figure F.1.

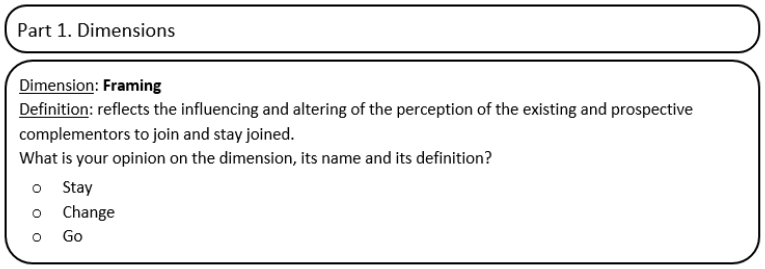


Figure F.1: Example of the Questions on the dimensions

In the third section of the survey, the focus was on each capability, including its maturity descriptions and its position within the model. Similar to the second section, experts were presented with a multiple-choice format to indicate their agreement or disagreement with each capability. In cases where changes or elimination were suggested, experts were prompted to provide detailed elaborations. An example of the questions pertaining to the capability 'Envisioning', its maturity descriptions, and its position within the framework is illustrated in Figure F.2.

The final section of the survey aimed to gather general information and insights regarding possible larger additions to the model. It encompassed experts' overall agreement with the capabilities, dimensions, and maturity levels previously discussed. Additionally, this section provided an opportunity for experts to express their opinions and suggestions by indicating any additional elements they believed should be considered. By including this final section, the survey allowed experts to contribute additional insights and potentially enrich the model with new dimensions, capabilities, or maturity levels.

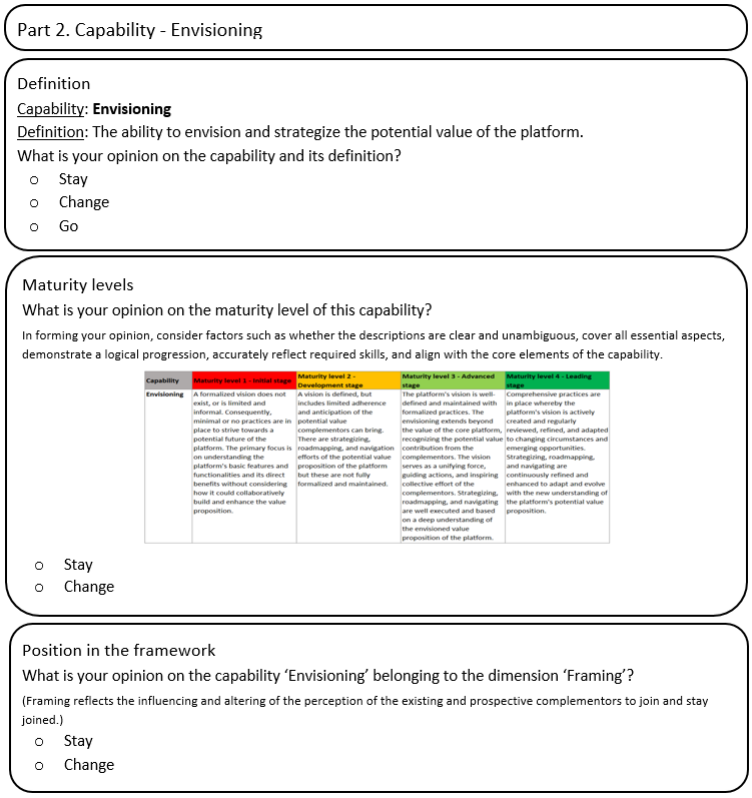


Figure F.2: Example of the Questions on the capabilities

F.2.2 The Voting Results

The detailed voting results of the first Delphi round regarding the capabilities are summarized in Table F.2. The table provides a detailed breakdown of the voting results on the capabilities, the maturity descriptions, and the allocation of the capability to its corresponding dimension.

Table F.2: The Expert Voting Results on the Capability's Name, Definition, Maturity Descriptions, and Allocation in Delphi Round 1

capability	**Name and definition**			**Maturity descriptions**		**Allocation**	
	Stay	**Change**	**Go**	**Stay**	**Change**	**Stay**	**Change**
Envisioning	11	0	0	11	0	11	0
Legitimizing	7	4	0	10	1	11	0
Constructing	5	6	0	9	2	10	1
Position consolidating	5	3	3	8	3	9	2
Stabilizing	8	2	1	9	2	9	2
Coordinating	7	4	0	6	5	11	0
Reforming	7	4	0	8	3	10	1

F.2.3 The Suggested Changes

Table F.3 offers an overview of the suggested changes, classified into three sections (separated by the dotted line): changes related to dimensions, changes related to capabilities, and changes regarding the general model. Each change entry includes the experts responsible for the suggestion, the proposed modification, the rationale behind it, and whether it has been implemented in the model. Comments pertaining to spelling or minor linguistic adjustments were not included in the table but were adhered to.

It should be noted that considerable feedback was received regarding the dimensions, with suggestions indicating a need for modifications. However, through additional interviews with the experts, a consensus was reached in favor of retaining the existing dimensions, considering that they were derived from relevant literature. Hence, it was decided to maintain the names and division as originally defined, recognizing the value of consistency and alignment with established research in the field.

Table F.3: The Suggested Changes in Delphi Round 1

Experts	Suggested change	Rationale	Answer
1, 2, 10	Change name and definition Framing	Experts perceived the name as ambiguous and found it to overlap to much with other dimensions	Rejected; As this name and distinction came from literature, it was decided to keep the division unchanged
1, 2, 4, 7, 8, 9, 10	Change name and definition Activating	Experts perceived the name as ambiguous and found it to overlap to much with other dimensions	Rejected; as this name and distinction came from literature, it was decided to keep the division unchanged
1, 2, 4, 7, 8, 9	Change name and definition Synthesizing	Experts perceived the name as ambiguous and found it to overlap to much with other dimensions	Rejected; as this name and distinction came from literature, it was decided to keep the division unchanged
1, 2, 4, 7, 8	Change name and definition mobilizing	Experts perceived the name as ambiguous and found it to overlap to much with other dimensions	Rejected; as this name and distinction came from literature, it was decided to keep the division unchanged
3, 4	Change name legitimizing	Expert founds that it should have a more positive connotation	Accepted; name was changed to Positioning
4, 11	Change definition legitimizing	Expert found that it should include new value propositions besides existing value propositions	Accepted; maturity descriptions included this.
1, 2, 3, 5, 10, 11	Change constructing	Experts found that the capability described two different processes in one capability hence adviced to divide it into two capabilities.	Accepted; constructing was divided into Convening and Onboarding
9	Change maturity desriptions Constructing	Expert found that in the third level, the focus on heterogeneity is not always the case.	Accepted; heterogeneity was removed.
1	Change position Constructing	Expert found the part of the capability focused on finding new producers belonged to framing phase and effectively onboarding should be in the Activating phase.	Rejected; capability is changed
2, 4, 8	Change name Position consolidating	Experts found it not aesthetically pleasing that it did not match the other capabilities.	Accapted; changed the name to Consolidating
3, 5, 11	Remove Position consolidation	Experts found that this capability was more the result of the previous capabilities and hence should not be in this model.	Partly accepted; capability and maturity descriptions were changed
1, 2	Change position Position Consolidation	The expert found that this capability dealt with future plans and therefore should move to the Framing dimension	Rejected; Capability altered

Experts	Suggested change	Rationale	Answer
2, 7, 9	Change maturity descriptions Position consolidation	Experts found that the levels should be more focused on capturing opportunities and more related to producers.	Accepted; maturity descriptions were changed.
2, 3	Change name Stabilizing	Experts found that the name sounded defensive and did not match the dimension Activating.	Accepted; the name was changed to Rewarding
11	Remove capability Stabilizing	Expert found that the value proposition in itself should say something about the incentive structure and hence no additional capability was needed.	Rejected; incentive structure extends the scope of the value proposition and needs considerable attention to be included in the model.
4, 8	Change position Stabilizing	Expert found that it is not logical to combine mobilizing with stabilizing as these name clash	Rejected; name change to better match the combination
7, 10	Change definition Coordinating	Experts found that the definition was ambiguous as it included the words mobilize and activate while these are also dimensions	Accepted; the definition was altered.
2, 9	Change maturity descriptions of Coordination	Experts found that it should focus more on platform assurance, operational excellence, and governance.	Partly accepted; the capability was divided to separately add governing
2, 5	Change Reforming	Experts found it only focused on innovation while it should focus on lifecycle management as a whole	Accepted; the definition and maturity descriptions were changed
8	Change maturity descriptions Reforming	Expert found that there should be a clearer distinguishment between what is offered on the supply side itself and the lifecycle of the value offerings.	Rejected; as the model focused only on the effect on producers.
11	Change maturity descriptions reforming	Expert found that level 4 includes being a forerunner which can only be achieved by a few.	Accepted; maturity descriptions was altered.
3	Change name Reforming	Experts found the name unambiguous as the maturity descriptions only focused on innovating.	Rejected; the maturity descriptions were changed
2	Change position Reforming	Expert found the capability be more technical in nature, whereas synthesizing was interpreted as more on the organizational level.	Rejected; maturity descriptions altered to make it more organizational
1, 2, 4, 8, 11	Change maturity descriptions	The experts found the maturity descriptions quite verbose. It was recommended to use bulleted lists or more concrete examples	Rejected; these changes are outside the scope of this research.
1, 3, 4	Change maturity descriptions	Experts found that it was not clear what the difference is between basic and well-established	Rejected; these changes are outside the scope of this research.
7	Change maturity descriptions	Expert found that there should be clearer focused on people, skills, or tools in each description to make it more actionable	Rejected; these changes are outside the scope of this research.

F.2.4 Overview Results

For the revised version after the second Delphi round, refer to the attached Excel document.

F.3 The Delphi Round 2

This section will provide an elaboration on the second round of the Delphi study. It begins by offering additional information regarding the survey utilized, encompassing its design and pertinent parameters. Following this, the voting results obtained from the experts are presented. Lastly, the suggestions put forth by the experts are elaborated upon, encompassing the rationale behind each suggestion and the corresponding responses undertaken.

F.3.1 The Survey design

In the second round, the survey followed a similar structure to the first round but consisted instead of three sections. Specifically, this round did not discuss the dimensions or the position of the capabilities, as these aspects remained unchanged from the previous round. Like the previous survey, the first section provided an introductory overview, offering general information and an overarching framework of the dimensions and capabilities. The second section specifically focused on each capability, including its maturity descriptions. Experts used a multiple-choice format to express their agreement or disagreement with each capability, and were encouraged to provide detailed elaborations for suggested changes. The final section of the survey aimed to gather general information and insights, particularly focusing on potential larger additions to the framework.

F.3.2 The Voting Results

The voting results of the second Delphi round are summarized in Table F.4. Specifically, the table provides a breakdown of the voting results regarding the name and definition of the capabilities and their maturity descriptions.

Table F.4: The Expert Voting Results on the Capability's Name, Definition, and Maturity Descriptions in Delphi Round 2

Capability	**Name and definition**			**Maturity descriptions**	
	Stay	**Change**	**Go**	**Stay**	**Change**
Envisioning	10	1	0	11	0
Positioning	10	1	0	10	1
Convening	11	0	0	11	0
Onboarding	11	0	0	8	3
Consolidating	9	2	0	8	3
Rewarding	11	0	0	10	1
Coordinating	11	0	0	10	1
Governing	8	3	0	6	5
Reforming	10	1	0	10	1

F.3.3 The Suggested Changes

Table F.5 offers an overview of the suggested changes in Delphi round 2. Each change entry includes the experts responsible for the suggestion, the proposed modification, the rationale behind it, and whether it has been implemented in the model. Comments pertaining to spelling or minor linguistic adjustments were not included in the table but were adhered to.

F.3.4 Overview Results

For the revised version after the first Delphi round, refer to the attached Excel document.

Table F.5: The Suggested Changes in Delphi Round 2

Experts	Suggested change	Rationale	Answer
2	Change definition Envisioining	Expert found that the definition focus was only on the current trajectory and to little focus on new value propositions	Rejected; this is implicitly implied
8	Change name Posisitioning	Expert recommended the term Marketing	Rejected; there is sufficient consensus
7	Change maturity descriptions of Positioning	Expert stated that level 4 is not accurate as there is not always a need for increased positioning practices.	Rejected; this is not implied by the model
2, 4	Change maturity descriptions of Onboarding	Experts found that the focus was mostly on action outwards, should consider facilitating the outwards-in action as well.	Rejected; lower level abstraction. Hence out of the scope
11	Change maturity descriptions of Onboarding	Expert stated that level 4 is not accurate as there is not necessarily a need to explore new types of producers.	Accepted; focused more on continuous change of the practices when need for new types of producers is established.
3, 10	Change name Consolidating	Experts found that the name should be more inspiring	Accepted; the name was changed to Reinforcing
1, 2	Change maturity descriptions Consolidating	Experts found the second level to be ambiguous.	Accepted; maturity descriptions altered to make clearer what is implied.
5	Change maturity descriptions Consolidating	Expert found that also additional services could be added that not only result from the information flows	Accepted; the maturity descriptions were altered
8	Change maturity descriptions of Rewarding	Expert found that the capability should also consider culture, governance, and rules of engagement	Rejected; this is implied in the capability or result of the incentive structure.
2	Change maturity descriptions Coordinating	Expert found that ensuring alignment should be part of the capability Governing	Rejected; both focus on alignment
7	Change maturity descriptions Governing	Expert found that ethics should be added to the maturity descriptions.	Accepted; ethics was added
1, 10, 11	Change definition and maturity descriptions Governing	Experts found that the term control was incorrect in this context as it implies a direct relationship.	Accepted; the term control changed to govern
9	Change maturity descriptions Governing	Expert found that it should be made more explicit that processes and people should are required to take action in case of misconduct.	Rejected; implied and lower level of abstraction
8	Change capability Reforming	Expert found the capability to technical focused while the other capabilities are more social and focus more explicit on the producers.	Rejected; indirect relationship to orchestration of producers.
5	Change maturity description Reforming	Expert adviced to combine platforms structure, functionality and components to platforms architecture as a overarching term	Accepted; description of Reforming altered.

Appendix G

The MM-DPEO

In the MM-DPEO, there are nine capabilities, each representing an orchestration capability that is necessary to orchestrate the producers in the digital platform ecosystem. Each capability is linked to a corresponding dimension. An overview of the capabilities and their corresponding dimensions can be seen in Figure G.1. Moreover, each capability is accompanied by comprehensive maturity descriptions detailing the corresponding maturity characteristics that align with each maturity level. Platform owners can score the capabilities at different levels and weigh the individual scores into an average maturity score per dimension. Table G.2 provides an overview of the complete MM-DPEO.

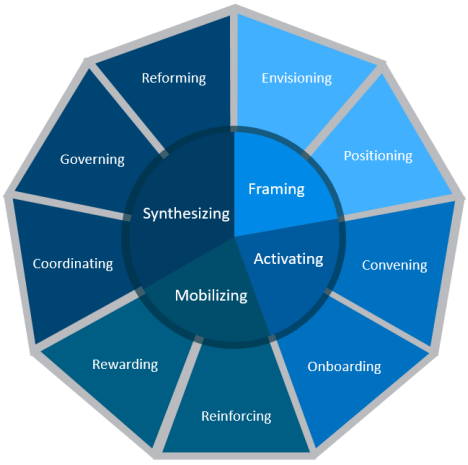


Figure G.1: Overview of the Dimensions and Capabilities of the MM-DPEO

Table G.1: The Final Practices of the MM-DPEO

Dimension	**Capability**	**Practice(s)**
Framing	Envisioning	Envisioning, Strategizing, Road-mapping and Navigating
	Positioning	Developing metrics and communication channels
Activating	Convening	Developing processes, mechanisms, and policies
	Onboarding	Developing processes, mechanisms, and policies
Mobilizing	Reinforcing	developing processes, mechanisms and policies
	Rewarding	Developing an incentive structure
Synthesizing	Coordinating	Developing and provisioning software tools and communication channels
	Governing	Developing processes, mechanisms, and policies
	Reforming	Developing processes, mechanisms, and policies

Table G.2: The Complete MM-DPEO

Dimension	Definition	Capability	Definition	Maturity Level 1 - Initial stage	Maturity Level 2 - Development stage	Maturity Level 3 - Advanced stage	Maturity Level 4 - Leading stage
Framing	Reflects the influencing and altering of the perception of the existing and prospective producers to join and stay joined	**Envisioning**	The ability to envision and strategize the potential value proposition of the platform.	A formalized vision does not exist or is limited and informal. Consequently, minimal or no practices are in place to strive towards a potential future of the platform. The primary focus is on understanding the platform's basic features and functionalities and its direct benefits without considering how it could collaboratively build and enhance the value proposition.	A vision is defined, but includes limited adherence and anticipation of the potential value producers can bring. There are strategizing, roadmapping, and navigation efforts of the potential value proposition of the platform but these are not fully formalized and maintained.	The platform's vision is well-defined and maintained with formalized practices. The envisioning extends beyond the value of the core platform, recognizing the potential value contribution from the producers. The vision serves as a unifying force, guiding actions, and inspiring collective effort of the producers. Strategizing, roadmapping, and navigating efforts are well executed and based on a deep understanding of the envisioned value proposition of the platform.	Comprehensive practices are in place whereby the platform's vision is actively created and regularly reviewed, refined, and adapted to changing circumstances and emerging opportunities. Strategizing, roadmapping, and navigating efforts are continuously refined and enhanced to adapt and evolve with the new understanding of the platform's potential value proposition.
		Positioning	The ability to advocate and validate the value proposition of the platform to both the existing and prospective producers.	There are minimal or no practices focused on advocating and validating the value of the platform to producers, and there is a limited understanding of the importance of these efforts.	Basic metrics and communication channels to advocate and validate the value of the platform have been developed and implemented. The platform's value is mainly communicated in terms of tangible product attributes and does not accurately represent the complexity and intangibility of the platform's ecosystem.	There are well-defined, valid, accurate metrics and effective communication channels to diffuse a compelling interpretation of the value proposition of the platform to both participating and potential producers. The practices are comprehensive, tailored, and target a wide range of participating and potential producers.	The comprehensive metrics and communication channels to advocate and validate the platform's value proposition are continuously adapted and improved based on a clear understanding of the needs of the producers. There is a continuous outlook for identifying new ways to reach the target audience with a focus on proactively providing them with pertinent, tailored information about the value of the platform.

Dimension	Definition	Capability	Definition	Maturity Level 1 - Initial stage	Maturity Level 2 - Development stage	Maturity Level 3 - Advanced stage	Maturity Level 4 - Leading stage
Activating	Reflects the structuring of the ecosystem to prepare for value co-creation	**Convening**	The ability to identify and select producers.	Identification of producers is initiated on an as needed basis without a clear understanding of how new producers can enhance the platform's value proposition. No formal practices on identification exist.	Basic processes, mechanisms, and policies to identify potential producers have been implemented. There is a beginning understanding of the different capabilities of different producers and how they could contribute to the value proposition of the platform.	Formal, well-established processes, mechanisms, and policies are in place to identify producers. The focus is on accurately assessing their pertinent capabilities, ensuring an adequate number of producers, and identifying those who can provide the highest value contributions to maximize collaboration benefits.	Comprehensive, formal practices for identifying producers are continuously refined and enhanced to adapt and evolve with the dynamic and diverse ecosystem.
		Onboarding	The ability to integrate producers on the platform.	There are minimal or no practices for integrating new producers on the platform. Integration of producers occurs on an as needed basis without a clear understanding of the producers role in the platform's value proposition.	The integration of selected producers is supported by basic processes, mechanisms, and policies; however, these practices are not yet fully formalized or consistently maintained.	Formal processes, mechanisms, and policies to integrate producers are implemented and well-coordinated. The focus is on ensuring producers are effectively and efficiently integrated into their suitable roles.	The practices for integrating producers are extensive and undergo ongoing adaptation and improvement. The focus is on identifying innovative approaches to integrate producers more efficiently and effectively on the platform.

Dimension	Definition	Capability	Definition	Maturity Level 1 - Initial stage	Maturity Level 2 - Development stage	Maturity Level 3 - Advanced stage	Maturity Level 4 - Leading stage
Mobilizing	Reflects the building of commitment and retaining the producers in the ecosystem.	**Reinforcing**	The ability to consolidate and reinforce the platform's ecosystem position.	There are minimal or no practices focused on consolidating and reinforcing the platform's ecosystem position and there is limited understanding of the importance of these efforts.	Basic mechanisms, processes and policies for consolidating and reinforcing the platform's ecosystem position exist. There is a recognition of how to leverage the information flows, the network effects and the advantage of providing additional services.	Well-established processes and mechanisms have been implemented to consolidate and reinforce the platform's role in the ecosystem. This entails well-established processes and mechanisms that actively leverage the information flows to provide additional services to the producers. Additionally, well-established processes to leverage the platform's credibility and interest in the platform to establish favorable cooperation terms with both existing and new producers.	Comprehensive practices focused on continuously consolidating and reinforcing the platform's position in the ecosystem exist. These practices are regularly reviewed, refined, and adapted to changing circumstances and emerging opportunities.
		Rewarding	The ability to foster and maintain stable relations with the producers in the ecosystem.	The interactions are primarily transactional and basic incentives are provided, with limited emphasis on mutual growth or collaborative value creation.	A basic incentive structure for collaborations has been implemented. Direct incentives (e.g., monetary rewards), indirect incentives (e.g., software tools and information), standards, and expectations are provided with the aim of fostering stable relationships. The incentive plan is functional based (i.e., based on performance metrics) and focused on promoting immediate or short-term collaborations.	A clear, formal incentive structure (direct incentives, indirect incentives, standards, and expectations) fostering mutual understanding and commitment has been defined and implemented. The incentive plan is subjective-based and long-term oriented. The focus is on compensating and motivating the producers to contribute in their most valuable way, by ensuring the incentives promote high-quality complements, balance cooperation and competition, and align with the long-term goals and motivation of the producers.	The comprehensive incentive structure is continuously adapted and improved. The engagement of producers is actively monitored and assessed to identify potential risks or challenges that may lead them to allocate their time or earn income elsewhere. Based on this assessment, the incentives are proactively refined and enhanced to ensure that these surpass these alternative opportunities.

Dimension	Definition	Capability	Definition	Maturity Level 1 - Initial stage	Maturity Level 2 - Development stage	Maturity Level 3 - Advanced stage	Maturity Level 4 - Leading stage
Synthesizing	Reflects the organizing and controlling of producers, including creating conditions for interaction while minimizing obstacles to cooperation	**Coordinating**	The ability to facilitate and enable the activities of the producers on the platform	Minimal or no formal practices are in place for enabling producers to engage with the platform and other actors within the ecosystem. The allocation of resources and knowledge to the demand of the producers occurs on an as-needs basis.	Basic software tools (e.g., APIs and SDKs) and communication channels (e.g., documentation, interactive forms) supporting producers and their (development of) services have been implemented.	Formal well-established software tools and effective and transparent communication channels have been developed and are actively provided to producers. There is a deep understanding of producer's individual short and long-term needs, and there are actively coordinated practices (provision of resources and information) to meet these. The focus is on ensuring alignment and supporting their innovation advances.	Comprehensive practices to coordinate and support producers are continuously improved based on a clear understanding of the evolving short and long-term needs of the producers. The focus is on identifying and fostering dynamic and novel ways to collaboratively create value.
		Governing	The ability to govern the producers and their activities on the platform	Minimal or no formal practices are in place to govern the producers activity on the platform. The governance of the producers occurs ad hoc and lacks a clear strategic direction.	Basic processes, mechanisms and policies are implemented, focusing on governing the producers. This includes processes focused on compliance, security, accountability, and ethics. Efforts are made to align the practices with industry standards and regulatory requirements.	Well-established, formalized, and integrated processes, mechanisms, and policies are implemented to govern the producers. The practices efficiently and effectively ensure the appropriate use of the platform by the producers and focus on compliance, security, accountability, and ethics. Moreover, they emphasize transparency and fairness.	There is continuous innovation and adaptation of the practices to effectively and efficiently govern the activities of the producers on the platform. The practices are regularly reviewed and proactively improved based on anticipated and emerging risks, ensuring the platform is used appropriately.

Dimension	Definition	Capability	Definition	Maturity Level 1 - Initial stage	Maturity Level 2 - Development stage	Maturity Level 3 - Advanced stage	Maturity Level 4 - Leading stage
synthesizing	Reflects the organizing and controlling of producers, including creating conditions for interaction while minimizing obstacles to cooperation	**Reforming**	The ability to maintain and reconfigure the platform's architecture.	Development and maintenance of the platform's architecture are conducted on an ad hoc basis without a clear understanding of the producer's needs. No formal practices for maintaining and modifying the platforms architecture are defined or deployed.	Basic processes, mechanisms, and policies to support the development, deployment, maintenance, and improvement of the platforms architecture are defined and deployed. The main focus is on maintaining the status quo around the original technical architecture, limiting the amending of new resources and routines, and flexibility to potential new value coming from the ecosystem.	Well-established formal processes, mechanisms, and policies are defined and deployed to support the development, deployment, maintenance, and improvement of the platforms architecture. These practices aim to ensure scalability, compatibility, adaptability, interoperability, and modularity of the platform.	Comprehensive formal practices are defined and deployed to maintain and innovate the platform's architecture. The practices are continuously refined and improved. The focus is on fostering a culture of continuous, flexible and proactive maintenance and improvement to ensure the platforms architecture continuously and proactively meets the producers needs.

Appendix H

Supplementary Details of the Interviews

The following appendix provides supplementary information pertaining to the conducted interviews. The first section provides an overview of the overall interview process, explaining the steps followed. Following that, an overview of the interview participants is presented, providing details about their roles, affiliations, and years of expertise in orchestrating digital platform ecosystems. Finally, a detailed overview of the employed interview guide is provided, shedding light on its structure, content, and the specific questions posed during the interviews.

H.1 The Interview Process

The interview process adhered to the interview steps outlined by Boyce & Neale (2006). These steps encompassed the following:

1. **Plan** - Identify the appropriate participants for the study based on their relevance to the research topic, and determine the specific information needed from each participant.
2. **Develop instruments** - Create the interview guide and accompanying instructions that will be utilized during the interviews to ensure consistency and structure.
3. **Collect data** - Arrange interview sessions with the selected participants and conduct the interviews according to the established protocols.
4. **Analyze data** - Review and analyze the collected data, extracting meaningful insights and identifying patterns or themes.
5. **Disseminate findings** - Communicate and share the research findings, drawing upon the insights obtained from the interviews, to contribute to the existing knowledge base in the field.

H.2 The Interview Participants

Table H.1 presents an overview of the interview participants. Overall, the participants occupy distinct roles related to orchestration, work across different types of platforms, and possess varying levels of experience,

Table H.1: The interviewees profile

	Function	**Company**	**Years of experience**
Interviewee 1	Head of Partner & Ecosystem development	Bol.com	5
Interviewee 2	General Manager, Head of Services Innovation	Philips Hue	9
Interviewee 3	Co-founder of platform start-up	XDemia	4
Interviewee 4	Head of platform	IDeal	6

H.3 The Interview Guide

To achieve maximum trustworthiness of the interviews, the framework by Kallio et al. (2016) was used to rigourously develop a semi-structured interview guide. The first step involved assessing the suitability of employing a semi-structured interview as the data collection method, as provided in Chapter 4. Following this, the framework states that it is important that the interviewer gains a deep understanding about the subject matter. As the maturity model has been developed by the interviewer, this was deemed as sufficient. Next, a preliminary interview guide, which serves as the framework for conducting the interviews, was formulated. The guide was further refined through pilot testing, which was conducted through internal feedback. The finalized interview guide is presented below. It should be noted that as the interviews were semi-structured, a flexible approach was maintained, allowing for both predetermined questions and the exploration of emerging themes or follow-up questions during the interview process.

1. Participant Background:
    - Name
    - Organization and function
    - Time active in the field
2. Interviewer and research introduction
    - Introduction of the interviewer and explanation of the background of the present research
    - Explain primary goal: Evaluate the MM-DPEO based on the evaluation criteria
    - Length of interview: 30 to 60 minutes
3. Background
    - Let the participant explain their views on digital platform ecosystem orchestration, specifically their ideas and insights regarding the capabilities required for successful orchestration.
4. Introduction and demonstration of the MM-DPEO
    - Introduce the MM-DPEO, including the dimensions, capabilities, maturity levels and maturity descriptions.
5. Evaluation criteria ‘Understandability’, ‘Ease of Use’, ‘Usefulness’
    - What do you think about the Understandability of the maturity model? With understandability, we mean the degree to which the model can be comprehended, both at a global level and at the detailed level of the elements and relationships inside the model.
    - What do you think about the Ease of use? With ease of use, we mean the degree to which the use of the model by individuals is free of effort.

- What do you think about the Usefulness of the model? With usefulness, we mean the degree to which the model positively impacts the task performance of individuals.

6. Evaluation criterion 'Applicability'

- If time and resources allow it, conduct a guided self-assessment using the MM-DPEO