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An Empirical Examination of Platform Development Process and Governance Practices: Longitudinal Case Study and Agent-Based Simulation

Takahiro Inada

1. Introduction

Recent advances in information technology (IT) have led to the rapid growth of platform businesses such as Google, Apple, Facebook, and Amazon in the United States, and Rakuten and Mercari in Japan. A platform business is defined as a business that provides a place for two or more sides (i.e., participant groups), such as sellers and buyers, to interact and transact (Parker, van Alstyne, & Choudary, 2016). The skills, ideas, and physical assets owned by the participating individuals and companies are provided on the platform, and platform companies create value by connecting both the supply and demand sides (McIntyre & Srinivasan, 2017; Zhao, von Delft, Morgan-Thomas, & Buck, 2020).

There are also many entrepreneurs around the world working on launching the next Uber or Airbnb. For example, about 30 of the 100 companies on the list of Y Combinator, a well-known accelerator for startups, use the term “platform.” In contrast, several platform companies are listed in the biggest and costliest startup failures compiled by CBInsights (2021). For example, Aiwujiwu, a unicorn online property-listing platform in China, reportedly ceased normal operations as of the end of January 2019. The company had raised about \$300M in total from famous investors like GGV Capital and Temasek Holdings. As you can see, there are great opportunities and challenges in the platform business.

Prior research has identified two types of platforms: innovation (technology)

platforms and transaction platforms (Cusumano, Gawer, & Yoffie, 2019; Shi, Li, & Chumnumpan, 2020). Technology platforms, by companies such as Intel and Apple, provide a technological core for third-party innovators (i.e., companies or individuals with expertise) to develop complementary products and services. In contrast, Amazon, Rakuten, and Alibaba are examples of transaction platforms. Social networks, such as Facebook, Twitter, LinkedIn, Instagram, and Tinder, are also considered transaction platforms because they encourage exchanging information among users who would have had difficulty connecting otherwise (Cusumano et al., 2019). These platform companies provide a multi-sided online marketplace to exchange goods, services, and information, highlighting the indirect network effects between interdependent groups of customers (e.g., buyers and sellers) (Kyprianou, 2018). This study focuses on the transaction platform.

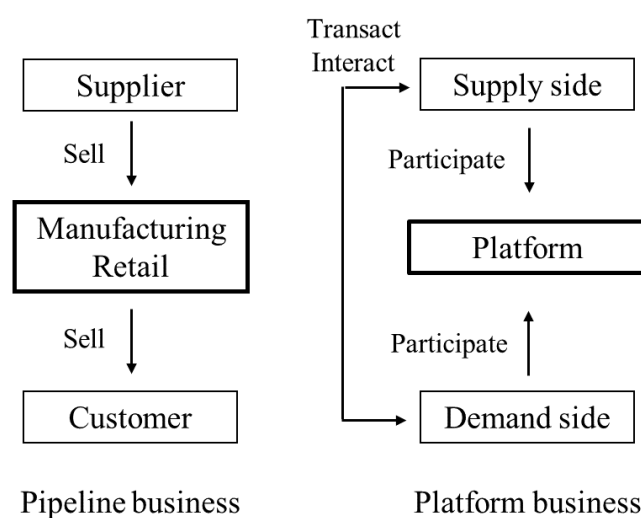


Figure 1 Comparison of pipeline and platform business

This type of platform business is contrasted with the traditional pipeline business (left side of Figure 1) (Hagiu, 2014; Parker et al., 2016). In the value chain model,

companies are considered to transform inputs into products and services by managing activities (e.g., marketing, distribution, customer service) within the company (Kyprianou, 2018). It is a model in which the linear value flow of purchasing, production, and sales, as seen in traditional manufacturing (e.g., GE and Toyota), is controlled within the company (Stabell & Fjeldstad, 1998; Zhao et al., 2020). Retailing can also be considered a pipeline business in that it purchases and sells, and online pipelines such as e-commerce (e.g., Amazon) are rising (Parker et al., 2016). Hagiú & Wright (2015) conducted a model analysis on the difference between retail and platform businesses, and the critical difference is whether the intermediary company (e.g., supermarket) or the seller (e.g., farmer) is the entity that markets the product or service.

Platform business research has mostly focused on the chicken-and-egg problem of attracting participants on both sides (McIntyre & Srinivasan, 2017). In a platform business, there is a network effect between sides (i.e., an indirect network effect) that increases the number of buyers as the number of sellers increases and vice versa. However, there are no participants on either side in the early stage of the launch; companies thus face challenges of how to attract them. Scholars have examined firms' actions to deal with this challenge, which include pricing strategies (Caillaud & Jullien, 2003; Clements & Ohashi, 2005), marketing strategies (Parker et al., 2016), and decisions about platform quality (Zhu & Iansiti, 2012). I will discuss these in detail in Chapter 2.

Besides, platform participants are characterized by their ability to perform activities (e.g., production, sales) spontaneously under certain constraints (Hagiú & Wright, 2015; Jacobides, Cennamo, & Gawer, 2018). They are not hierarchically controlled like employees in an organization embedded in a supply network. Given these characteristics, it becomes an essential task for the platform companies to attract

participants and provide adequate governance to encourage spontaneous activities (Boudreau & Hagiu, 2009; Cusumano et al., 2019; Reischauer & Mair, 2018). For example, Mari Matsunaga, involved in developing the i-Mode platform by NTT DoCoMo, as discussed by Gawer and Cusumano (2002), says, “Information should be updated daily and constantly evolve. If not, users will get bored. That’s a big difference from buying a TV or a refrigerator” (Matsunaga, 2000, p. 99). Boudreau and Hagiu (2009) introduced the town management of Roppongi Hills in Japan as an excellent example of platform governance and pointed out the importance of active management of platforms. What these cases have in common is the importance of active governance of the platform.

Chapter 1 has discussed the growing interest in platform business. As mentioned above, there has been a lot of discussion on how to attract participants to the platform (solving the chicken-and-egg problem). In addition, as shown in Table 1, other essential parts of the platform development process are (1) opportunity identification and (3) governance of participants (Cusumano et al., 2019). Overall, this dissertation clarifies the dynamics of platform companies’ growth by using novel methods: longitudinal case study and ABS. It goes beyond the question of "how to attract participants" in previous studies to answer the unanswered questions of "how to identify participants to attract" and "how to manage participants once attracted" from the perspective of entrepreneurship and strategic management.

Table 1 Platform development process and the position of this dissertation

	(1) Identifying opportunities	(2) Gathering participants	(3) Managing participants
Decision	What kind of participants will the platform attract? Which market side will the platform serve?	How can the platform attract more users and complementors?	What kinds of behaviors will the platform encourage? Who can connect and innovate on the platform?
	Chapter 3		Chapter 4
Keywords	Platform development process Opportunity identification Manga industry Multi-wave interviews Mountain climbing		Peer-to-peer transaction platform Platform governance Agent-based simulation Dynamic governance Chapter 5 Peer-to-peer transaction platform Platform openness Platform competition Comparative case study Agent-based simulation

2. Previous research and the gaps in the literature

The previous discussion about platform business is summarized in Table 2. In this study, I examine the strategies of platform companies from the perspective of strategic management.

Table 2 Previous literature and limitations

(Prepared by the author based on McIntyre & Srinivasan (2017))

Research perspectives	Key concepts	Limitations
IO economics	Indirect network effect Pricing	Limited examination of platform companies' strategies to manipulate network effects Examination of the relative strength and structure of the network is needed Few examination of strategies for managing the relationship between complementors and platform companies
Strategic management	Inter-platform competition Entry strategy Platform quality/feature	The impact of firm-level strategies (such as entry timing and platform quality) remains largely unresolved Limited attention to heterogeneity in complementors (ability, motivation) to support specific platforms and its competitive outcomes Few exploration of specific firm strategies that foster the emergence and persistence of platforms over time
Technology management	Innovation ecosystem Interface/architecture Platform openness	Lack of empirical studies that test how platform designs impact complementors decision and success of the platform rather than case studies and conceptual theorizing Relatively little understanding of platform dynamics and their evolution

First, in Chapter 3, I contribute to the limitations of the IO economics perspective, namely companies' strategies to manipulate network effects, by focusing on the opportunity identification process by a platform startup. In addition, the openness of platforms is discussed in Chapter 4 and 5. The openness of platforms has been discussed from a technology management perspective, mainly concerning technology (innovation) platforms. Chapters 4 and 5 will examine a different type of platform, the peer-to-peer (P2P) transaction platform. This type of platform calls for more nuanced management of openness. Using a case study and agent-based simulation (ABS), I demonstrate the impact of different types of openness on the performance of platform companies and the inter-platform competition.

3. Exploring the entry point for growth steps: Real-time tracking of a platform

development process

Such platform businesses have unconventional structural features, and their development process is considered unique (Kyprianou, 2018; Stabell & Fjeldstad, 1998). In previous research on platform development, a method called the two-stage strategy was effective in addressing the “chicken-egg problem” of attracting participants on both the supply and demand sides (Evans, 2009). In other words, the idea is to gather participants on one side first and then gather participants on the other side through indirect network effects. Platform startups provide services focused on either supply or demand side to attract participants and grow their business. However, previous studies have paid insufficient attention to the early stages of the platform development process because they have focused their analysis on already established and successful platforms (Kyprianou, 2018; Shi, Li, & Chumnumpan, 2020; Zhao et al., 2020). More specifically, they have assumed that the platform would be developed according to a blueprint that clearly stated which segment of participants, on either the demand or supply side, should be primarily approached. (Dattée et al., 2018). As a result, there has been much discussion about measures to attract specific participants, such as pricing (Caillaud & Jullien, 2003; Clements & Ohashi, 2005) and platform quality (Tellis et al., 2009; Zhu & Iansiti, 2012). However, the process by which entrepreneurs identify and exploit opportunities is not linear (Dimov, 2007; Vogel, 2017) and involves learning under uncertainty and trial and error (Kirtley & O’Mahony, 2020; Ott et al., 2017). Especially, the reason that platform startups (e.g., OpenTable and Retty or Rakuten and Amazon), despite being in the same industry, started approaching different market sides (i.e., the supply side for the former and the demand side for the latter), has not been thoroughly examined.

Based on the above, this study follows Company V, a startup that provides a

platform to connect manga (cartoon) artists with readers and companies, and clarifies the process of identifying the market side and segment to focus on. This study focuses on the early stage of the platform development process, which has not been sufficiently clarified so far. In addition to previous model analyses, empirical estimations, or conceptual studies, detailed case studies can be effective in building new theories that reveal a richer picture of the process of platform evolution (Khanagha et al., 2020; Logue & Grimes, 2019). This study conducted real-time, continuous interviews that have the advantage of accurately capturing the dynamic changes of startups in the early stages (Anderson, 2016; McMullen & Dimov, 2013).

By tracking the growth process of Company V, three phases were observed. First, the company aimed to gather participants on both the supply and demand sides—junior manga artists and companies—gradually. However, the pace of attracting manga artists was slow, and the company shifted its resources to focus on the demand side, readers (second phase), and the supply side, above mid-career manga artists (third phase). Through this process, Company V has succeeded in attracting manga artists to its platform. Thus, this study reveals that in the early stages of platform development, it is important to not only attract participants but also identify the market side and segment to focus on. This sheds light on the process of identifying and capturing opportunities in the platform business, which previous studies have not sufficiently examined. Previous entrepreneurship studies assumed a conventional pipeline business and supposed that the primary task for founders was to scan the environment and identify the product-market arena that would give the company a competitive advantage (Alvarez & Barney, 2007; Kuratko & Audretsch, 2009). This process can be likened to an ocean exploration to find the “blue ocean” (Kim & Mauborgne, 2005). In contrast, this study revealed that platform

development process is likened to climbing a mountain with two sides, demand and supply. The major challenge is to decide which side to climb from first, and then to identify the segment to focus on (the “trailhead”) to start the growth steps. This new analytical perspective on identifying opportunities in the platform business, mountain climbing, contributes to a new research direction of platform business. It suggests that the growth process differs significantly from firm to firm, even when developing platforms in the same industry, such as the manga industry and the retail and restaurant industries (see for instance Rakuten and Amazon). In particular, the order in which entrepreneurs take the growth steps or, in other words, how they climb the mountain, will lead to platform startups developing a unique position and gaining a competitive advantage.

Moreover, Company V learned about the structure of the manga industry by leveraging its network of manga artists and established companies. In addition, the company had relationships with more than 300 manga artists since its inception and was able to collect feedback on its services to attract these artists. This study suggests the effectiveness of using existing networks as a “foothold” to identify the entry point (trailhead) for growth steps. Prior entrepreneurship research has pointed out the importance of learning about consumers and markets by using networks to identify opportunities (Ott et al., 2017; Ozgen & Baron, 2007; Perry-Smith & Mannucci, 2017). Entrepreneurs have to choose one of several possible strategies to pursue without knowing the value of alternative strategies (Gans, Stern, & Wu, 2019). As this study reiterates, in a two-sided market, there are supply and demand sides, and the startup must choose not only the market segment, but also the market side to focus on. It also needs to capture the market in a step-by-step process. Therefore, compared to the conventional pipeline business, the selection burden on entrepreneurs will be more significant in the

platform business. This study suggests that the network of a startup can be a foothold to help narrow down the choices when selecting the market side and segment to focus on. By identifying the network resources of the founding team and leveraging them to acquire the market side and segment, the startup can concentrate its scarce resources and succeed in reaching the summit more quickly.

4. The effectiveness of dynamic governance in peer-to-peer platforms: An agent-based approach¹

This study focuses specifically on peer-to-peer (P2P) platforms where individuals conduct transactions. In this context, the variability of the quality of the value units supplied and of participants' behavior is so large that governance through technical specifications and formal rules alone might be insufficient. More active intervention by the platformer is essential for guaranteeing the minimum quality of the value units (Kyprianou 2018). The debate on platform governance has also focused on how open platforms should be (e.g., Boudreau 2010; Parker and Van Alstyne 2018). In line with this trend, this study also converges on participation constraints in platform governance. However, prior research has mostly included conceptual discussions, and empirical research on platform governance practices is in its infancy (Chen et al., 2021; Jacobides et al., 2018). While some scholars have conducted pioneering case studies in recent years (Kyprianou 2018; Reischauer and Mair 2018), they do not reveal the desired level of participation constraints, the timing of changing constraints, and the impact of

¹ This chapter has been published as Inada, T., & Inamizu, N. (2021). The Effectiveness of Dynamic Governance in Peer-to-peer Platforms: Agent-Based Approach. MMRC Discussion Paper, 540, 1-27.

governance practices on platform performance.

To fill these gaps, I set up the following question: *In a P2P platform where participants move back and forth between the supply and demand sides, how should platformers set the desired (1) level of participation constraints, and (2) timing for changing the constraints to maximize their performance?* I use agent-based simulation (ABS) to answer this question, in line with Davis et al.'s (2007) roadmap for simulation research. ABS is a novel method complementary to the mathematical models and case studies used in previous research about platform business, allowing us to replicate various scenarios. With P2P transaction platforms in mind—primarily services such as Facebook, Medium (Hatena Blog and note in Japan), Instagram, and Cookpad (a recipe platform founded in Japan and operating in many countries)—I modeled the situation where participants interact with each other while moving back and forth between the supply and demand sides. I then examined the impact of various governance scenarios (i.e., open, closed, and dynamic) with different levels of participation constraints and different timings for changing the constraints on three outcomes: quantity, quality, and diversity of participants. The results showed that the number of participating agents was the largest in the open case (quantity), in average utility and score in the closed case (quality), and in score variance in the dynamic case (diversity of participants).

In addition, this study examined revenue structures with varying weights on the three outcomes to identify governance that maximizes the platformer's performance. As a result, in both the billing models I created, the dynamic case with a good balance of the three outcomes showed high performance. This result is both significant and unique, as it shows that while most scholars have discussed only focusing on the level of participation constraints—such as open or closed—the timing of changing the constraints can be

another useful direction for platform governance research. Another contribution is the study's outlining of challenges, based on the simulation results, in using governance to maximize performance, which are (1) obtaining the attributes (or scores) of the participants and (2) implementing the mechanism for executing governance. This results from unraveling the complex reality of the impact of platform governance on participants through modeling using ABS. In summary, this study demonstrates the effectiveness of dynamic governance in P2P transaction platforms and opens up new directions for the future.

5. Platform governance in the face of changing user attributes: Competition between incumbent and entrant blog platforms²

Platform participants are characterized by their ability to voluntarily engage in activities (e.g., production, sales) under certain constraints (Hagiu & Wright, 2015; Jacobides, Cennamo, & Gawer, 2018). Therefore, platform companies need to not only attract participants but also provide appropriate governance to encourage their spontaneous activities (Boudreau & Hagiu, 2009; Cusumano, Gawer, & Yoffie, 2019; Reischauer & Mair, 2018). Many studies have examined participation constraints in such platform governance, especially the management of openness (Chen, Pereira, & Patel, 2021; Kretschmer et al., 2020). By opening access to the platform, companies can attract more complementary products and users and leverage the network effect to promote growth (Boudreau, 2010; Parker & van Alstyne, 2018b). For example, in the smartphone

² This chapter has been published as Inada, T., & Inamizu, N. (2021). Platform Governance in the Face of Changing User Attributes: The Case of Competition between Incumbent and Entrant Blog Platforms. MMRC Discussion Paper, 547, 1-26.

market, Google needed to be more open because it entered later than Apple. Apple owned and tightly controlled its iOS operating system, but Google made Android open-source and freely available to any third-party developers (i.e., companies or individuals with expertise), allowing it to successfully enter the market (Parker et al., 2016). By increasing openness to participation in this way, entrant platforms can gain a competitive advantage.

Related discussions have focused primarily on analyzing technology platforms that encourage the development of complementary products and services by providing access for third-party developers (companies or individuals). In contrast, peer-to-peer (P2P) transaction platforms, where supply- and demand-side participants are individuals, are expected to require more nuanced openness management. Such platforms covered in this study include social networking sites (e.g., Facebook, Instagram) and blogging platforms (e.g., Medium). Technology platforms use “platform gatekeeping” to control what (complementary goods) or who (complementors) is allowed platform access by setting prescribed acceptance criteria (Tiwana, 2013). However, in P2P transaction platforms, the quality of the value units supplied and participants’ behavior vary widely and may not be sufficiently controlled by technical specifications and formal rules alone, which makes active intervention by platform companies more important (Kyprianou, 2018). If the platform is too open, poor quality content or problematic participant behavior may lead to user defection (Reischauer & Mair, 2018; West, 2003). Thus, careful management of openness is essential for P2P transaction platforms to gain a competitive advantage. However, there is a lack of empirical investigation on the key question of what kind of openness gives P2P transaction platform companies a competitive advantage?

To help fill this gap, this study analyzes a Japanese case in which an entrant blogging platform company (Note) successfully competed with an incumbent company

(Hatena Blog). A detailed comparative case study revealed that Note had high openness and Hatena Blog had low openness. This phenomenon of successful entry by a low-openness company cannot be explained by the argument made by previous studies that high openness leads to competitive advantage (Boudreau, 2010; Parker & van Alstyne, 2018b). To understand the mechanism of such a deviant case, I used agent-based simulation (ABS) to examine several scenarios that replicated the strategies of both companies.

I first modeled and simulated a platform with low openness (closed), but it did not adequately explain the entrant platform's growth in a changing environment. I then introduced the concept of "type" by considering the heterogeneity of user attributes. Although Note appears to be less open, the case study revealed that it actually distinguishes between Type A (blogging for short-term page views and revenue as an "affiliator") and Type C (wanting to hone their skills as long-term "creators") participants, applying low openness to the former and high openness to the latter. When I modeled this finding and ran simulations, I confirmed that as the major users change (increasing the proportion of Type C), the entrant company grows significantly in a short period. Thus, I revealed that an entrant P2P transaction platform company can gain a competitive advantage by using multiple openness strategies depending on the user segment rather than applying a single openness strategy to all users.

I also observed that Hatena Blog did not change its openness strategy to respond to changes in user composition and examined the reasons for this. Since it applied high openness to all users, it could capture not only traditional Type A users but also growing Type C users to some extent. Our simulation results confirmed that participants' utility temporarily decreased due to environmental changes but increased again after some time.

Conversely, Note was more active in incorporating Type C users. As their percentage increased, the increase in participants' utility was much greater than that of Hatena Blog, which is why Hatena Blog allowed Note to enter the market. However, it can be argued that Hatena Blog has been overtaken by Note but has maintained a certain user base and participant utility. In other words, a uniform openness strategy may be resilient to changes in user attributes (environmental changes). If a differentiated openness strategy is adopted, the decision on how to apply openness to existing and new users must be re-determined as new users with new attributes appear. Thus, it is necessary to continuously respond to changes in user composition to maintain competitive advantage. On the other hand, if a uniform openness strategy is adopted, the company will be able to maintain a certain scale and survive without being affected by environmental changes, such as changes in user composition, and in some cases will be able to regain its strength. This is a new finding regarding the traditional openness strategy, which does not distinguish between user types. This study contributes to the literature on platform governance and inter-platform competition. Previous studies have assumed head-to-head inter-platform competition, that is, competing for users with the same attributes (Zhu & Iansiti, 2012), and that platform companies would apply the same openness strategy to all users (Boudreau, 2010; Parker & van Alstyne, 2018b; Tiwana, 2013). By choosing the optimal openness level without considering user diversity, the company was supposed to achieve a competitive advantage. In contrast, this study reveals that entrant firms may gain a competitive advantage as user composition changes by using different levels of openness for different user types in P2P transaction platforms. However, from a longer-term perspective, platform companies that adopt a single openness strategy can survive without being greatly affected by environmental changes and regain their market presence in some cases.

This is a novel finding for the conventional openness strategy. This study's significant contribution is the detailed elucidation of the relationship between environmental changes, platform openness strategies, and competitive advantage through a combination of a case study and ABS.

6. Conclusion

6.1. Summary and implications

There are three main findings in this dissertation. First, this study argues that, in the early stages of platform development, it is critical to not only attract participants, but also identify the market side and segment to initially focus on. This study suggests that platform startup entrepreneurs are not doing “ocean exploration” but “mountain climbing,” and that it is essential to identify the “trailhead” that serves as the entry point for growth steps. This study also suggests that the network of the startup company can be a “foothold” to help narrow down the choices. By identifying the network resources of the founding team and leveraging them to acquire the market side and segment, the startup can concentrate its scarce resources and succeed in scaling up more quickly. Second, by using ABS to examine the impact of governance scenarios (open, closed, and dynamic), I found that platform companies performed best with dynamic governance, which has a better balance of outcomes. The results point to a new research direction that focuses not only on the level of participation constraints but also on the timing of changing constraints. Third, I clarified that the entrant can outperform the incumbent by using different openness for different users (i.e., multiple openness strategy) as user composition changed. I also found a uniform openness strategy can lead to long-term survival despite environment changes.

The contributions to the literature throughout this dissertation can be summarized as follows. First, prior research has tended to downplay the importance of firms' attempts to strategically manipulate network effects because they are generally assumed to be exogenous and constant within an industry (McIntyre and Subramaniam, 2009). Chapter 3 of this dissertation addresses this gap by investigating the early stages of the platform development process. Based on a retrospective view, previous research assumed that the platform would be developed according to a given blueprint. However, I revealed the process of trial and error of the entrepreneur by tracking it in real-time. By using a new methodology of longitudinal case studies based on real-time, multi-wave interviews, I was able to examine the dynamics of platform evolution, which has been lacking in the previous literature. Consequently, a new concept of "mountain climbing" was proposed. This new analytical perspective of the opportunity identification process in the platform business differs from that of the conventional pipeline business (i.e., ocean exploration) and contributes to new research directions. It suggests that the growth process differs significantly from firm to firm, even when developing platforms in the same industry, such as manga, retail, and restaurants. In particular, the order in which the growth steps are taken, or how the mountain is climbed, will lead platform startups to build a unique position and gain a competitive advantage. Analyzing established or nascent platform companies from the perspective of how they climb the mountain will add further depth to the study of platform development process.

In addition, prior research, especially from a technology management perspective, has focused on the openness of platforms and has accumulated conceptual arguments based mainly on case studies. However, they have not been able to empirically analyze its impact on complementors' decisions and the performance of platform

companies. To address this limitation, in Chapters 4 and 5 of this dissertation, I use ABS to replicate various openness strategies of platform companies and clarify the overtime impact on their participants. Chapter 4 shows the effectiveness of dynamic governance, which changes openness flexibly by observing the trends of participants, as opposed to static governance where platform companies maintain a certain level of openness, which previous research has assumed. Furthermore, Chapter 5 clarifies the mechanism by which latecomers succeeded in entering the market by adopting a multiple openness strategy that considers the heterogeneity of platform participants and uses different openness for users with different attributes. As shown in Table 10, previous studies assumed that the capabilities and motivations of platform participants are the same. In contrast, this dissertation contributes to previous studies by showing the importance of taking into account their heterogeneity.

Overall, this dissertation clarifies the dynamics of platform companies' growth by using novel methods: longitudinal case study and ABS. It goes beyond the question of "how to attract participants" in previous studies to answer the unanswered questions of "how to identify participants to attract" and "how to manage participants once attracted" from the perspective of entrepreneurial or managerial strategies (see Table 3 for the summary).

Table 3 Summary of contributions of this dissertation

Previous limitations	Chapters	Contributions
Limited examination of platform companies' strategies to manipulate network effects	Ch3	Observed in real-time how a platform startup manage network effects and introduced a new concept (i.e., mountain climbing) to understand platform development process
Limited attention to heterogeneity in complementors (ability, motivation) to support specific platforms and its competitive outcomes	Ch5	Considered heterogeneity of participants (i.e., affiliator and creator type) and revealed the effectiveness of using multiple openness for them
Lack of empirical studies that test how platform designs impact complementors decision and success of the platform rather than case studies and conceptual theorizing	Ch4,5	Empirically tested how platform openness strategy (i.e., dynamic and multiple openness) impact the success of platform companies
Relatively little understanding of platform dynamics and their evolution	Ch3,4,5	Fostered the understanding of platform dynamics over time by adopting a novel method (i.e., longitudinal case study and ABS)

6.2. Limitation and future research

This dissertation has room for improvement in three main areas: extension of the time period covered, further generalization of the findings, and improvement of the ABS model. First, Chapter 3 analyzes on the founding process from the establishment to the third year, and does not capture the whole picture of entrepreneurial actions and decisions in platform development in longer-term. For example, Company V successfully attracts manga artists to its platform, but monetization by connecting them with the demand side remains a challenge. Further follow-up research is required to shed light on how entrepreneurs overcome these challenges through trial and error. Additionally, I analyzed competition among blogging platforms in a 10-year span, from 2011, when Hatena Blog was launched. However, other blogging platforms such as Livedoor Blog and Ameba Blog have existed in Japan since around 2003. Thus, the long-term success or failure of openness strategies could be further clarified by going farther back in time. I analyzed a case in which governance practices that responded to environmental changes could facilitate a startup's market entry. I believe more insight can be gained by analyzing cases in which incumbent platforms, for example, have maintained their long-term dominance

through dynamic changes in governance practices.

Second, further generalization of the findings is also needed. Although it is significant to clarify the platform development process in the manga industry, an industry that has not been studied before, the sample size is limited to one company. In addition, the mountain climbing model needs to be more generalized, to not only the manga, retail, and restaurant industries shown as examples. Based on the findings of this study, quantitative data analysis is to be conducted to clarify the more general platform development process. One direction is to use archival data of platform startups to clarify the differences in patterns among companies and their reasons more systematically, especially which side and segment to start the growth step from. Extending the analytical perspective presented in this study will help in deepening the understanding of the platform development process. In addition, although Chapter 4 and 5 focused on P2P transaction platforms (such as blogging platforms), the results may be applicable to technology platforms, as well. For example, companies such as Apple and Nintendo are considered closed platforms that impose relatively strict restrictions on third-party developers. Based on the differentiated openness strategy concept, these platform companies may have different levels of restrictions for different categories of apps and games. In other words, they may allow more open participation for app developers in certain categories. In fact, Rietveld, Schilling, and Bellavitis' (2019) analysis of the video game industry revealed platform companies engage in selective promotion that rewards successful complements and points out less appreciated complements. Thus, examining the concept of differentiated openness presented in this study in other settings would be useful.

Last but not at least, extending the ABS model in this dissertation will further

capture the reality of the platform business. First, the model of this study assumes that participants' attributes are unidimensional. However, transaction decisions on the platform are often based on various attributes, and extending the model to multiple dimensions is more desirable from the perspective of reproducing reality. Second, this research focused on participation constraints based on the level of development of real-world services and theories. However, incorporating behavioral constraints are becoming necessary as well. This is because a P2P video platform, such as TikTok, which has seen rapid growth in the number of users in recent years, has very high accuracy in its recommendation functions and can intervene in participants' interactions. In this study, I set a rule that one agent randomly selects another agent from the surroundings. However, the effect on the outcome of adding a rule that, for example, selects those with higher scores would be worth considering. Third, there is room for development in the rule that participants leave the platform when their utility falls below a threshold. For example, in Chapter 5, independent incumbent and entrant platforms were created for simplicity. However, in a situation where similar platforms compete, participants may switch from Platform X to Platform Y. In other words, the utility expected to be gained by joining Platform Y could be incorporated as a threshold for Platform X to represent the participant's decision to compare two or more platforms.