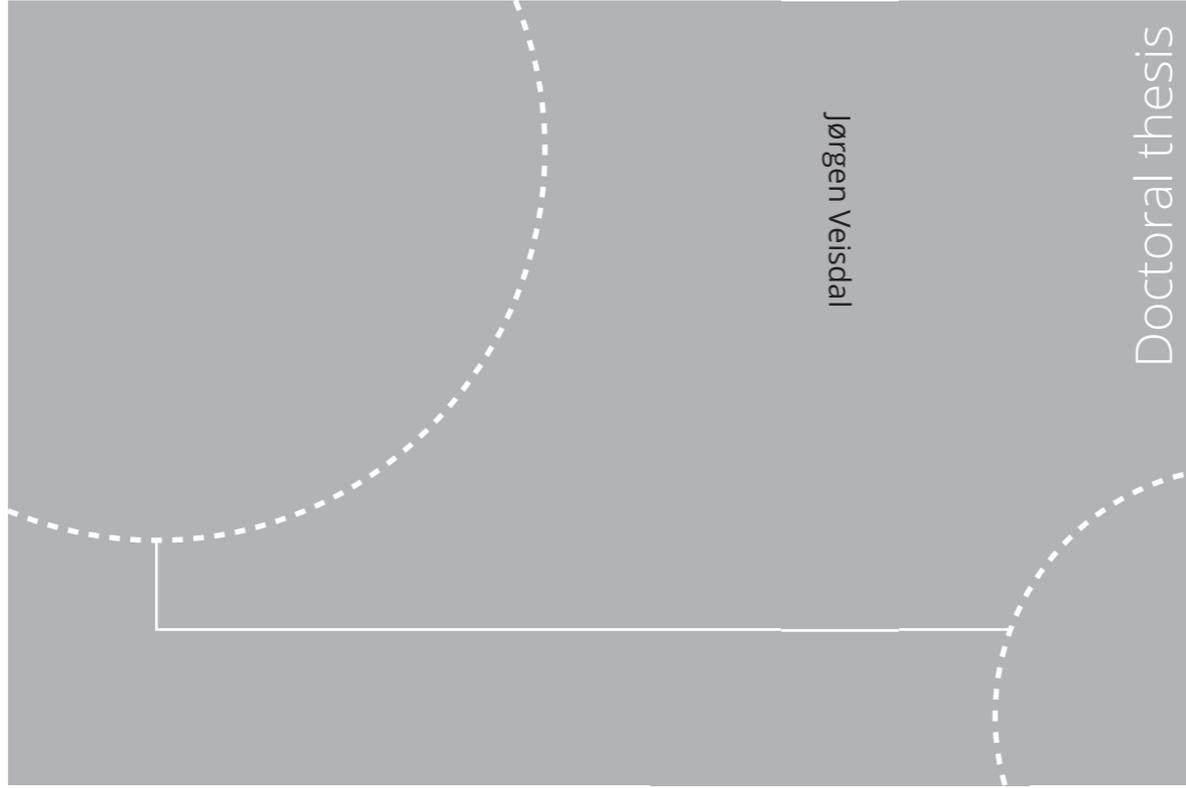


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Jørgen Veisdal

Entry Strategies for Platform Firms in Two-Sided Markets

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NTNU
Norwegian University of
Science and Technology
Thesis for the degree of
Philosophiae Doctor
Faculty of Economics and Management
Department of Industrial Economics
and Technology Management

Jørgen Veisdal

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Thesis for the degree of Philosophiae Doctor

Trondheim, February 2021

Norwegian University of Science and Technology
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Dedicated to my brother Julian



Abstract

This dissertation explores the dynamics of entry for firms attempting to establish platforms in two-sided markets characterized by a presence of network effects. As of the writing of this cover essay, seven of the world's ten largest firms (by market capitalization) operate such platforms, whose main market function may be summarized as 'the facilitation of interactions and transactions between providers on one side and buyers or users on the other'. Well-known examples include Microsoft's Windows operating system, Facebook's social network, Google's search engine, Apple's iOS and App Store, Airbnb's marketplace for rental properties, eBay's auction site and Uber's ride-hailing service. As a function of their role as intermediaries, such platform firms are thought to derive increased marginal benefits relative to their size, sometimes referred to as 'demand-side economies of scale'. This because adopters are generally assumed to prefer to affiliate with platforms with large numbers of other adopters with whom they may interact and/or transact. As such, winner-take-all scenarios are not uncommon in two-sided markets, as the establishment of an installed base of adopters is thought to work against competitive entry. Extant research addressing the topic has emphasized the role of the 'chicken-and-egg' problem, optimal pricing strategies for maximizing direct and indirect network effects, incumbent advantages, "lock out" and the role of expectations for adoption.

In this dissertation, the topic is investigated via exploratory, qualitative case studies of eleven established platform firms. Emphasis is hence placed on providing an empirical grounding for extant theoretical predictions in addition to nascent theoretical development. In particular, the question of *how* platform firms may successfully enter two-sided markets is addressed, based both on case study findings, a deductive study and a conceptual model. The research question guiding the investigation has been:

How can managers of platform firms strategize to successfully enter two-sided

markets?

The dissertation proceeds by introducing the relevant phenomenon and briefly outlining the scope of nascent theoretical developments. The disjoint nature of extant research is emphasized, in particular with regards to methodological approaches and herein, the dangers of over-reliance on theoretical deduction in the absence of empirical verification. Two related streams of platform research are presented. The primary literature is within the field of industrial organization and emerged as the result of economists' interest in network externalities and multi-product pricing. Based in neoclassical economics, studies in this stream approach the topic of entry in two-sided markets using formal equilibrium models. Although technically rigorous, the implications of the findings from such studies are often of limited value for managers, as they represent an idealized world with perfect information, rationality and homogeneity among platform participants. In response, a secondary stream of literature within strategic management has attempted to elaborate on economists' market-level studies by approaching platform entry from the perspective of managers of platform firms and their strategic considerations. Although nascent, such studies have helped bridge the gap between economists' formalized models and the 'real world' platform firms operate in.

As a whole, the dissertation pursues both theoretical and methodological objectives. The theoretical objective has been to address the research question through a mixed methodology consisting of case studies, a deductive quantitative study and a conceptual study. The methodological objective has been to argue the case for increased emphasis on empirical research, as well as to highlight the constructive role of inductive and abudctive studies for future theory building. A priority across all four studies has been to highlight the implications of the findings for both managers and further research. The dissertation thus contributes both to the nascent stream of platform strategy research (within the strategic management literature) and to the more general stream of research on platforms in two-sided markets.

The dissertation consists of four research papers and this cover essay. The key

contributions of the dissertation (as they relate to theory) are summarized in the cover essay and regard the dynamics of entry and, in particular, the so-called 'chicken-and-egg' problem. Overall, the dissertation argues that successful platform entry is enabled by both contextual and firm-specific factors. In the first study, it was found that ten established platform firms pursued a variety of entry strategies distinguishable by strategic, temporal and relational factors. In common, it was found that both a demand for market-level changes and technology factors—both in the absence of prior adoption—in several cases was sufficient to motivate adoption by both providers and buyers/users. Similarly, in the fourth study it was found that first-party participation itself can be sufficient to permit entry. Viewed together, these findings imply that adopters to platforms in two-sided markets are heterogeneous in their motivations regarding the questions of 'why' and 'when' to adopt. This finding is in conflict with most of extant platform research which assumes homogeneity in platform adopters' motivations, emphasizing 'level of participation' as the only factor influencing adoption decisions among providers and buyers/users. In the third paper, a conceptual model of platform adoption is developed which relaxes the assumption by allowing for adoption motivated by technology factors. The result is a model showing how successful entry may be achieved as a consequence of heterogeneity in adopters' 'level of innovativeness'.

A related finding from the same studies was that adopters also differed in the information they possessed about the level of participation. The implication being that even if the assumption that adopters are homogeneous in their motivations is correct, differing levels of information about 'level of participation' may also permit entry. However, as was found in the second study, consumers' perceived value of first- and third-party participation can also differ significantly. This is in line with established research within marketing, but thus far has yet to be studied in the two-sided market context. Reviewing the findings in terms of their relationship with the overall research question, three key propositions are presented:

1. Proposition A: The level of demand for a platform may alone be sufficient to motivate adoption;

-
2. Proposition B: Technology factors may alone be sufficient to motivate adoption;
 3. Proposition C: First-party participation may alone be sufficient to motivate adoption;

Key managerial implications of these propositions are that managers should 1. Look for markets in which the demand for new solutions is high, 2. Seek out technology factors which are likely to generate significant interest from so-called 'innovative adopters', and 3. Formulate a first-party entry strategy which is both a substitute of and complementary to third-party participation.

Findings summarized in the three propositions A-C further motivate two additional propositions with implications for research:

1. Proposition D: Platform adopters are heterogeneous in their motivations;
2. Proposition E: Platform adopters are heterogeneous in the information they possess;

Together, propositions D–E support the conclusion of the dissertation which, while not in perfect alignment with extant research, has important implications for both research and practice. Namely, it is proposed that the so-called 'chicken-and-egg' problem emphasized in extant research may in a sense be a 'red herring', which although theoretically interesting may also be a "mirage" which, when studied as an empirical phenomenon is of limited value for managers. The implications of the claim for the two objectives of the dissertation are thus that 1. Entry dynamics in two-sided markets are much more similar to traditional entry dynamics than previously thought and 2. Theoretical deduction in the absence of empirical verification may lead to the discovery of seemingly interesting phenomena which, when studied empirically may have limited applicability in the 'real world' platform managers operate in.

Acknowledgements

The truth is that I can in no way claim full ownership for the work that has gone into this dissertation, which technically has been four years in the making but in actual fact has been brewing since the day I was born. Indeed, from that moment on I have been fortunate enough to be supported by two wonderful parents whose distinct interests and abilities—engineering, literature and art—I am an obvious genetic benefactor of. Thank you Ring and Bodil Veisdal for providing me with the safe, stable and privileged upbringing that has enabled me to grow up to graduate as a 'doctor of philosophy'. I would never have made it here without your support. I also want to thank my siblings Maria and Julian, whose presence in my upbringing surely provided a youngster with a tendency towards the extremes with necessary balance and support. Thank you.

As I see it, my intellectual life began during my time in Fredrikstad and Milano in the period 2009–12. During these 'prime years', I "*without knowing it, learned in solitude what is essential—that which no master can really teach*" (Grothendieck 1986). However difficult it was, I am grateful for these years and indebted to the people who provided me with support and encouragement in my endeavors during this time. In particular, my best friends Elisabeth and Stian as well as Assistant Professor Wenke Fossen at Østfold University College, Giovanna Castiglioni at Politecnico di Milano and Professor Alexander Ulanovskii at the University of Stavanger. Without your help, it is very likely that I would never have reached this milestone.

Not long after leaving Fredrikstad, my life was interrupted by a year of illness. In this period, I am sad to say, I spent a fair amount of time thinking about whether or not my life would prematurely end. Thankfully, it did not turn out that way. In no small part, for this I am indebted to Dr. Lars Karlsen of Stavanger University Hospital. Thank you for everything.

The next three years I spent at NTNU. There, from 2013–15, for the first time in my life I was finally part of a group of people with similar goals and aspirations. Owed

largely to the graduate program I was part of, the NTNU School of Entrepreneurship, there I was able to develop both as a thinker and a doer. What had been mere ideas and dreams in Fredrikstad quickly grew into reality in Trondheim. I met my future co-founder Patrick and was able to attend the University of California at Berkeley, live in San Francisco and for the first time in my life, work as an intern at a technology company, under Mr. Joseph Aranda. I also came to start my own technology company, Moon, during this time alongside my brother Julian, Vegard Theriault and Tord Åsnes, and work as a designer for Mr. Borgar Ljosland. Thank you, each and every one of you, for taking part in these precious years.

As I hope is apparent from my writing, I am immensely happy with my decision to contact my former thesis advisor Professor Øystein Widding about returning to NTNU in 2016. For letting me have my own room at CERN in 2013, for supporting Moon's application for grants in 2014, for inviting me to lecture at the School of Entrepreneurship in 2015 and for supporting my Ph.D. prospectus in 2016, I am immensely grateful for all your help. Thank you for giving me the space and creative freedom I need to flourish.

Thinking back, it actually took me the better part of a year before I actually began the research that culminated in this dissertation. This, I believe, for two reasons. Firstly, I had not yet met my future office mate Karolina Lesniak. A long lost sister, she helped me narrow my efforts and through her presence in our office, provided structure and boundaries to a life which at that point sorely needed it. Thank you for keeping me grounded. You give meaning to the phrase *"the essence of the independent mind lies not in what it thinks, but in how it thinks"* (Hitchens 2001). Secondly, I had not yet begun teaching. Unexpectedly, teaching swiftly became one of my favorite responsibilities at NTNU. Both in lecturing my course TIØ4851 and in supervising graduate student theses, I have found immense satisfaction and purpose from teaching. As such, thank you to each and every one of "my" graduate students whom I had the pleasure of working with over the last four years. Thank you also to my fellow Ph.D. students Alexandra, Dag Håkon, Torgeir, Gunn-Berit, Puck, Ann Elida, Mohammad, Ben, Erik, Sigrid, Fanny and Linn, and indeed the entire faculty

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I am only here because of you. You are the reason I am. You are all my reasons.

Norwegian University of Science and Technology

Trondheim, November 24th 2020

Jørgen Veisdal

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Part I

Cover Essay

1 Introduction

In 2020, eight of the world's ten largest corporations by market capitalization operated digital platforms in two and/or multi-sided markets dominated by so-called "network effects" (PwC, 2020). According to a 2018 McKinsey research report, by 2025 more than 30% of global revenues—some \$60 trillion—could be mediated by such platform firms¹.

The main market function of platforms in two- and multi-sided markets has previously been described as *'the facilitation of interactions and transactions between producers of goods on one side and buyers or users on the other'* (Hagiu 2006, Boudreau 2010). Functioning as intermediaries between different groups of participants—such as providers and users/buyers—platform firms generate value primarily by offering services which enable compatibility and interaction between participants with interdependent demands (Hagiu & Wright 2015). Well-known examples include providers of *technologies standards* (such as VHS, Blu-ray and WiFi), *operating systems* (such as Windows, iOS and Oculus), *marketplaces* (such as eBay, Airbnb and Foodora), *matchmaking services* (such as Tinder and Uber/Lyft), *payment services* (such as VISA/Mastercard and Vipps) and *social networks* (such as Facebook, Twitter, Snapchat and TikTok).

Platform firms may be distinguished from "traditional" vertically integrated firms in that they offer two- or multi-dimensional value propositions (Lanning & Michaels 1988) and that such value propositions are contingent on the size and quality of

¹The January 2018 report is entitled 'Digital/McKinsey: Insights - "Winning in Digital Ecosystems"' and is available at <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/mckinsey-digital-insights/digital-mckinsey-insights-number-3>

the network of participants they are able to attract (Eisenmann 2006, Farrell & Saloner 1985, Katz & Shapiro 1986). As a consequence, platform businesses are often characterized by increasing cost advantages relative to scale, so-called 'demand-side economies of scale' (Shapiro & Varian 1999), as the fundamental assumption of platform-mediated networks is that participants place higher value on affiliating with platforms with a larger number of other participants who have similar or complementary demands (Cennamo & Santalo 2013). The traditional 'razor blade model' wherein a firm sells one good below marginal cost (razor) in order to maintain sales of a complementary good (razor blades) in two-sided markets thus may look as follows:

1. The platform firm attracts one group of participants (group A) by charging at or below marginal cost;
2. The platform firm leverages the participation of members of group A to charge above marginal cost to members of group B, who are looking to interact and/or transact with participants from group A;

As such, two-sided markets may be characterized by a presence of both 1. Network externalities which may be internalized by an intermediary (Rochet & Tirole 2003) and 2. Multi-product pricing strategies where the intermediary service may be sold at or below marginal cost to one side of the market in order to maximize the network effects experienced by the other (Parker & Van Alstyne 2005). Winner-take-all outcomes are thus thought possible in platform-mediated markets if a firm is able to attract a significant number of participants and so "tip the market" in its favor (Eisenmann et al. 2006, Katz & Shapiro 1994, Shapiro & Varian 1999, Caillaud & Jullien 2003). Once established, incumbent platforms are thought to be especially difficult to displace, as indirect network effects emanating from an established installed base are thought to work against competitive entry (Eisenmann et al. 2011, Schilling 2002).

As platform firms continue to proliferate in the economy, firms see themselves increasingly organized around business ecosystems with organizations and users co-

creating value (Iansiti & Levien 2004, Teece 2017, Adner 2017, Jacobides et al. 2018). Even as the prevalence and relative impact of platform-mediated networks continue to grow, the literature on how firms are able to successfully enter and establish platforms in two- and multi-sided markets remains disjoint (McIntyre & Srinivasan 2017). This in large part due to the inherited methodological and philosophical differences between the scientific methods of neoclassical economics and general social science theory. Emanating from the theoretical debates over network externalities (Farrell & Saloner 1985, Katz & Shapiro 1985) and multi-product pricing (Baumol & Panzar 1982) in the 1980s and 1990s, the literature on platform-mediated networks has since the early 2000's received significant attention from both market-level economists in the tradition of industrial organization (IO) as well as from firm-level researchers in the strategic management (SM) tradition (McIntyre & Srinivasan 2017). Regarding the topic of entry, researchers in industrial organization have thus far emphasized the importance of *compatibility* on the output decisions of producers (Katz & Shapiro 1985) and *lock-in* (Farrell & Saloner 1985, Liebowitz & Margolis 1995), *expectations* (Hagi 2006, Hagi & Spulber 2013), *openness* (Boudreau 2010, West 2003) as well as the optimal *pricing strategies* firm should adopt in order to maximize network effects (Caillaud & Jullien 2003, Armstrong 2006, Rochet & Tirole 2003, 2006, Hagi 2006). Critiques of such highly formal studies have been that they often assume that positive network effects (leading to successful entry and winner-take-all strategies) are *exogenous* (McIntyre & Subramaniam 2009), *dichotomous* (Afuah 2013, McIntyre & Subramaniam 2009, Suarez 2005) and purely *quantitative* in nature (Tellis et al. 2009). It is therefor often argued that studies emerging from the tradition of industrial organization generally provide limited insight into how firms strategize in order to successfully enter two- and multi-sided markets (Gawer 2014, McIntyre & Srinivasan 2017).

Attempting to fill these gaps and extend the purely economic perspectives on network externalities, scholars in the strategic management (SM) tradition have attempted to move from market-level structural explanations of competitive outcomes to firm-level factors. As Sheremata (2004) writes, *'the field of economics focuses on the*

determinative characteristics of markets, whereas strategic management focuses on choice within those constraints'. In particular, strategic management scholars have investigated the strategic initiatives by which platform firms manipulate network effects to obtain sustainable competitive advantages (Fuentelsaz et al. 2015b, Sun & Tse 2009, Shankar & Bayus 2003). This has been done through studying topics such as *entry timing* (Eisenmann et al. 2006, Schilling 2002), *incumbent advantages* (Schilling 2002) and the role of *platform quality* (Tellis et al. 2009, Afuah 2013, Zhu & Iansiti 2012).

Given the origin and disjoint nature of extant research, in this dissertation it is argued that the field of platform research lacks a solid foundation in empirical research. That is, it is argued that although extant research has produced many theoretical predictions about how managers of platform firms go about entering two- and multi-sided markets, the field has yet to establish a firm empirical grounding from which to base such claims (McIntyre & Srinivasan 2017, Kyprianou 2018). To quote pioneering social psychologist Solomon Asch "*The temptation [has arisen] to allow techniques called scientific to govern thinking and to dictate the range of interest*" (Asch 1987).

That is, although the neoclassical models of industrial organization are pervasive in extant research, many of the predictions originating from such models have yet to be shown to manifest in 'the real world'. Despite being more-or-less unanimously accepted as important areas of research, for instance, serious studies have yet put emphasis on showing that predicted theoretical phenomena such as the "celebrated" (Rochet & Tirole 2003) 'chicken-and-egg' problem (Caillaud & Jullien 2003, Spulber 2010) is in fact an obstacle to entry in two-sided markets. Overall, two main reasons for this discrepancy (between theoretical and empirical progress) stand out:

1. There has not yet been enough compelling empirical observations available to be able to prove or disprove the predictions of extant theoretical research; or
2. The theoretical models and their associated hypotheses do not represent accurate depictions of reality;

In either case, one might argue, the field of research on platform entry in two-sided markets does not yet display the level of maturity required to be able to make definite prescriptive recommendations for managers (McIntyre & Srinivasan 2017, Kyprianou 2018, McIntyre et al. 2020). To again quote Asch (1987): *'Before we inquire into origins and functional relations, it is necessary to know the thing we are trying to explain'*.

As such, this dissertation argues that in order to make meaningful progress towards a mature theoretical understanding of platform entry in two-sided markets, it is first necessary to take two steps back and develop an empirical grounding from which to formulate hypotheses, which only then may later be tested. In this dissertation, this endeavor is initiated largely according to the tradition of case-based research inspired by Eisenhardt (1989). Famously, such 'bottom-up' research uses inductive and abductive methods of reasoning (in contrast to the deductive model of the 'traditional' scientific method) in order to construct concepts and hypotheses. The goal of the investigations has been to capture the richness of observations without being limited by a theory (Ridder 2017). As such, the 'no theory first' case study design was emphasized (Eisenhardt 1989). In such investigations, research questions may stem from a research gap and tentative constructs or variables guide the investigations, without assuming that there are relationships between the constructs or variables (Ridder 2017). The overall research question guiding the exploration has been:

How can managers of platform firms strategize to successfully enter two-sided markets?

Although positioned at the nexus between industrial organization and strategic management literature, the dissertation as a whole contributes primarily to nascent strategic management research on entry strategies for platform firms in two-sided markets. Herein, the dissertation strides towards making contributions by way of:

- *Inductively*, developing an empirical grounding for future theory-building

research on entry strategies for platform firms in two-sided markets;

- *Deductively*, contributing to the testing of existing theoretical predictions on the efficacy of first-party content strategies; and
- *Conceptually*, challenging the assumptions of the theoretical phenomenon known as the 'chicken-and-egg' problem and proposing a more grounded theoretical basis from which future research on the topic may be conducted;

The overall research question is addressed in this cover essay and four attached research papers which each shed light on different aspects of the phenomenon of platform entry in two-sided markets. Three of the papers address firm-level perspectives, while one (paper 2) addresses a consumer-level perspective. By their nature, the firm-level analyses hope to capture relevant observations which illuminate the empirical perspective of how firms strategize to successfully enter two-sided markets. The consumer-level study, by contrast, contributes nuances to extant theoretical research suggesting that first-party participation may be conducive to successful entry.

The primary focus of the studies are the *management of expectations among suppliers* and the *governance of supply* (paper 1), *consumer perceptions of first-party participation* (paper 2), *adoption decisions* and the *role of innovators* (paper 3) and the role of *organizational ambidexterity* (paper 4) for platform firms in two-sided markets. The first, second and fourth papers in particular contribute to the purpose of providing empirical grounding for future theory-building research. The first and fourth paper in particular employ ampliative approaches² towards devising grounded hypotheses for future research based on a multi-case study (paper 1) and a longitudinal single-case study (paper 4), respectively. The second paper employs a deductive, quantitative approach towards testing predictions from extant research in a new, two-sided market context. Based on the findings of these studies, the third paper and this cover essay employ conceptual approaches for the purposes of

²Ampliative arguments (such as inductive and abductive) aim to "extend" or "add to that which is already known"

challenging extant assumptions regarding the 'main obstacle to entry' in two-sided markets, the 'chicken-and-egg' problem. In particular, the third paper develops a conceptual model of platform adoption based on the diffusion model developed by Bass (1969).

The four research papers presented in the second part of the dissertation are standalone works. They were written for the purpose of publication in peer-reviewed international research journals. The first paper was published in volume 30, issue 3 of the Springer academic journal *Electronic Markets*. The second and third paper have been submitted for publication, while the fourth is being prepared for submission.

Title	Research Question	Level of Analysis	Literature/ Theory	Research Design
<i>1. The Dynamics of Entry for Digital Platforms in Two-Sided Markets: A Multi-Case Study</i>	How do managers of nascent digital platforms in two-sided markets strategize to recruit early suppliers?	Firm	<ul style="list-style-type: none"> • Expectations • Platform Governance 	Qualitative, abductive
<i>2. Value Perceptions of First-Party Content on Two-Sided Markets</i>	How do consumers perceive the value of first-party content as compared to equivalent third-party alternatives?	Consumer	<ul style="list-style-type: none"> • Private Label Goods • First-Party Content 	Quantitative, deductive
<i>3. The Role of Innovators in Two-Sided Markets</i>	How does the introduction of innovators influence early adoption to platforms in two-sided markets?	Firm	<ul style="list-style-type: none"> • New Product Adoption • Diffusion of Innovations 	Conceptual
<i>4. From Product to Platform: A Case Study of Popton</i>	What are the enabling factors for managers to successfully leverage an existing value proposition to permit entry in a two-sided market?	Firm	<ul style="list-style-type: none"> • Ambidexterity Theory 	Qualitative, inductive
<i>Dissertation</i>	How can managers of platform firms strategize to successfully enter two-sided markets?	Firm	<ul style="list-style-type: none"> • Network Externalities • Two-Sided Markets • Entry Strategies 	Mixed Method

Table 1.1: *Summary of research papers*

1.1 Outline of Dissertation

This dissertation consists of two parts. Part I constitutes this cover essay in which the context of the dissertation is presented, including theoretical, empirical, methodological considerations. Part I also outlines the overall, summarized findings of the dissertation, as well as their implications for managers, policy makers and further research. Part II contains four independent research papers which each address separate research questions related to the overall topic of entry dynamics for platform firms in two-sided markets.

Part I proceeds as follows. Following this introductory chapter, the main theoretical framework of the dissertation is presented in Chapter 2. This includes reviews of the relevant literature from the contexts of economics (herein industrial organization) and management (herein strategic management), in addition to an integrated conceptual framework which is later employed in the analysis of the key findings of the research. Chapter 3 presents the methodological foundation of the dissertation, including discussions of motivations and objectives, philosophy of science, influences and positions, research design, data collection and inherent limitations. Chapter 4 consists of summaries of the methodologies, key contributions and relevance of each research paper included in Part II. Finally, in Chapter 5 the key findings, theoretical developments, limitations and implications of the dissertation are provided.

2 Theoretical Framework

This chapter aims to first arrive at a definition of the term 'platform' before developing the theoretical context in which most of extant research on entry strategies for platforms in two-sided markets has and is being conducted. This context consists primarily of two streams of research, which the dissertation is informed by and contributes to. They are, respectively:

- *Industrial organization*, specifically research on network externalities and two-sided markets
- *Strategic management*, specifically research on platform strategies

The main thrust of platform research regards platform economics, a topic advanced primarily by researchers within the tradition of industrial organization. Originating from early research on network externalities and multi-product pricing, this stream has arguably been the most influential in the development of the field thus far, and so constitutes a large part of the extant theoretical context. In its presentation, emphasis will first be placed on introducing the origins and traditions of the field. The purpose of this first section is to familiarize the reader with the landscape of concepts, terminology and history that underlie this part of extant research. Secondly, a literature review will be presented which summarizes the main findings of the field as they relate to the overall research question of the dissertation. Finally, an overview of limitations and gaps in the extant literature, in addition to a table of selected papers is provided.

Complementing this 'mainstream' theoretical context, is a related stream of research on platform strategies within strategic management research. This stream in a sense aims to 'bridge the gap' between extant theoretical developments within industrial organization and the realities platform managers face in 'the real world'. Following a brief introduction of the field, a similar literature review from this stream will be presented, emphasizing the main areas of research that pertain to the research question. These are *expectations*, *entry timing*, *network size* and *platform quality*.

Finally, an overview of limitations and gaps in extant literature will be provided, in addition to a table of influential papers.

Following the introduction of both literature streams, a conceptual framework will be proposed which aims to integrate the two theoretical contexts in relation to the emphasis and purpose of the dissertation as a whole.

2.1 What is a Platform?

As Baldwin & Woodard (2009) point out, uses of the word 'platform' date back as far as to the sixteenth century. The Oxford English Dictionary cites examples from 1574 in which the word was used to refer to 'a design, concept, idea; (something serving as) a pattern or model'. In management research, the word was first used in three main streams of research, focused on *products*, *technological systems* and *transactions* (Baldwin & Woodard 2009). Its first use in the stream of research on product development was by Wheelwright & Clark (1992) who introduced the term 'platform product' to describe products that "*meet the needs of a core group of customers but [are designed] for easy modification into derivatives through the addition, substitution, or removal of features*". In this context, the term captures the modular nature of network goods without emphasizing complementarity or network externalities, i.e. the idea that "*the appeal of each of good increases with the popularity of its complements*" (Eisenmann et al. 2006). A related definition also emerged among technology strategists who identified platforms as "*valuable points of control (and rent extraction) in an industry*" (Baldwin & Woodard 2009). In this context, platforms are identified as intermediaries who perform an important function, again without particular emphasis on their relationship with complementary goods/service or network externalities.

In the streams of research emphasized in this dissertation, the term 'platform' is generally taken to mean "*products, services, firms or institutions that mediate transactions between two or more groups of agents*" (Rochet & Tirole 2003). Related definitions in the same stream of research include those who emphasize *search costs*,

e.g. "*products and services that bring together groups of users in two-sided networks*" (Eisenmann et al. 2006), *complementarity*, e.g. "*platforms coordinate the demands of distinct groups of customers who need each other in some way*" (Evans 2003), "*markets involving two groups of agents interacting via platforms where one group's benefit from joining a platform depends on the size of the other group that joins the platform*" (Armstrong 2006), *pricing*, e.g. "*platforms enable interactions between end-users and try to get the two (or multiple) sides 'on board' by appropriately charging each side*" (Rochet & Tirole 2006), "*businesses in which pricing and other strategies are strongly affected by the indirect network effects between the two sides of the platform*" (Evans et al. 2008) and *modularity*, e.g. "*a set of stable components that supports variety and evolvability in a system by constraining the linkages among the other components*" (Baldwin & Woodard 2009). Hagiu & Wright (2015) propose the definition of *multi-sided* platforms (MSPs) by the two key features: 1. MSPs enable the direct interactions between two or more distinct sides and 2. Each side is affiliated with the platform.

In this cover essay, by the term 'platform' we refer specifically to '*products, services, or technologies that can serve to mediate interactions and transactions between two or more sides, such as networks of providers and users*' (adapted from McIntyre et al, 2017). As such, we adopt a definition most closely related to the literature stream from industrial organization, emphasizing the role of platforms as mediators of interactions and transactions.

2.2 Network Externalities in Two-Sided Markets

The study of *network goods*, sometimes 'information goods' has for the last forty years been a tenant research within industrial organization (IO). Formally, industrial organization research is the study of the structure of industries and the behavior of firms and individuals in such industries (Einav et al. 2016).

Origins, Tradition and Context

Although the field's origin dates back to the in 1930s and 40s, the mathematical tools utilized to formally model industries featuring network externalities did not significantly mature until the 1970s (Tirole 1988). Specifically, until that point, there had been a lack of compelling models for studying imperfectly competitive markets. Only with the popularization of non-cooperative game theory (Nash 1951) among economists in the 1970s and 80s did IO economists' tools permit sharp modelling and analysis of problems involving the increasingly relevant topics of product differentiation, barriers to entry, pricing strategies, network externalities and multi-product pricing (Tirole 1988).

The increasing demand for better tools for modelling imperfectly competitive markets originated from a booming U.S. economy in the 1960s and 70s, spurred on by advances in manufacturing, mass production, consumer electronics and communication. Specifically, economists grew interested in new types of goods unlike the refrigerators, radiators and television sets that had been predominant in their analyses up until that point. Unlike for such "traditional goods", technology decisions for the modern goods and services of the 1970s, 80s and 90s were to a much greater extent being made by consumers rather than firms. Until the 1960s—due in large part to the considerable cost of manufacturing—large producers of goods such as Ford, General Electric and AT&T had been *de facto* creators of standards, as consumer choice within each product category was limited. Formally, a 'standard' defines the technical specifications for a product or service which producers must adhere to in order to ensure compatibility between architectural components (Eisenmann 2007). Beginning in the 1970s, the cost of manufacturing had decreased sufficiently to where multiple producers of similar technologies were engaging in "format wars" over which technologies were superior (Shapiro & Varian 1999). To a much larger extent than before, consumers were faced with the decision of choosing which technologies to support, having to formulate opinions about which producers and systems of goods they

believed would be reign superior in the future.

Simultaneously as the costs of manufacturing was decreasing (and so competition between producers increasing), the microprocessor revolution was allowing for the creation of new categories of goods entirely. The first microprocessor (the Intel 4004) was introduced in 1971, spurring the development of new types of consumer electronics. The first personal computer sold to directly to consumers (the Apple II) was introduced in 1977 (Sun & Tse 2009). By 1981, the introduction of the IBM PC had garnered an industry for consumer software programs such as the first spreadsheet (VisiCalc), the first mass-market word processor (WordStar), and the first hardware-independent PC operating system (MS-DOS). Unlike 'traditional' goods which work in isolation, such 'network' goods were by design never meant to.

As Varian (2006) writes, "*information technology is generally used in systems*". Such systems involve multiple components which are often supplied by different firms and only provide value when consumed together. By the 1990s, increasingly many traditional goods were being replaced by network goods which—at least to some extent—required compatibility with components and systems made by other firms (Shapiro & Varian 1999). Formally, system goods or *network goods* are products and services which behave as components in a system or network whose value is significantly enhanced by the presence of other components (Varian 2006). It is said that each component acts as a *complement* to other components, enhancing the utility of the other. Just as a left and a right shoe are complementary components in a system of goods known as 'shoes', hardware and software are complementary components in 'computers' and games and consoles are complementary components in 'video gaming systems'.

By the end of the 1990s, not only were there more producers of goods than ever before (leading to divergence in the compatibility of components) but the goods themselves had evolved to require greater interoperability in order to

deliver value to consumers. These trends—in addition to others such as the emergence of the World Wide Web—spurred the development of the modern field of industrial organization.

For the purposes of the investigation of this dissertation, we will in particular emphasize the trends within research on *network externalities*, *compatibility*, *multi-product pricing* and *two-sided markets*.

2.2.1 Network Externalities

Broadly, in economics, an *externality* is commonly defined as the cost or benefit that affects a party who did not choose to incur that cost or benefit (Buchanan & Stubblebine 1962). The first study of externalities dates back to Henry Sidgwick and his investigation of spillover effects, now informally defined as an economic event in one context that occurs because of something else in a seemingly unrelated context. First formalized using the term 'externality' in Arthur Cecil Pigou's work *The Economics of Welfare* (Pigou 1920), the first definition of the the concept was a divergence between private and social cost (Dahlman 1979). The term is today more colloquially used to describe "*goods and services people care about that are not sold on markets*" (Tirole 1988).

It is common to differentiate between consumption and production externalities. Examples of the former include loud music, cigarette smoke and flower gardens. Examples of the latter include the positive feedback loop that can occur when a beekeeper locates next to an apple orchard, or when a music college locates next to a concert hall (Varian 2006). The economic efficiency of an allocation or outcome of a trade in the presence of externalities is described by the well-known Coase theorem (Coase 1960). It states that if trade in an externality is possible and there are sufficiently low transaction costs, bargaining will lead to a Pareto efficient outcome regardless of the initial allocation of property. *Transaction costs* (Williamson 1979), herein, may be defined as 'the cost of making economic trades when participating in a market'. Described by British economist Ronald Coase in the 1960s, the Coase

theorem hence describes the property of externalities that if trade is possible, the incentives of participants in markets will lead them to find and agree on the most mutually advantageous deal (Coase 1960).

The effect that an additional user of a good or service has on the value of that good or service to others (Katz & Shapiro 1985) is referred to as a *network* externality, or in aggregate sometimes a 'network effect' (Liebowitz & Margolis 1994) or 'demand-side economies of scale' (Katz & Shapiro 1986, Parker & Van Alstyne 2005, Arthur 1989). Network externalities can be direct or indirect. In cases of positive direct network externalities, the value of a good increases to a user as the consequence of someone of similar interests joining the same network, i.e. a telephone user benefits when someone else joins because he/she has another person to call (Tirole 1988). Indirect network externalities, in turn, arise due to increasing returns to scale in production, a consequence of the fact that a greater number of complementary products ('complements') can be supplied at a lower cost as the network grows. Traditional examples include the increased availability of software for hardware solutions as well as greater availability of customer support or repair services with larger installed bases (Katz & Shapiro 1985).

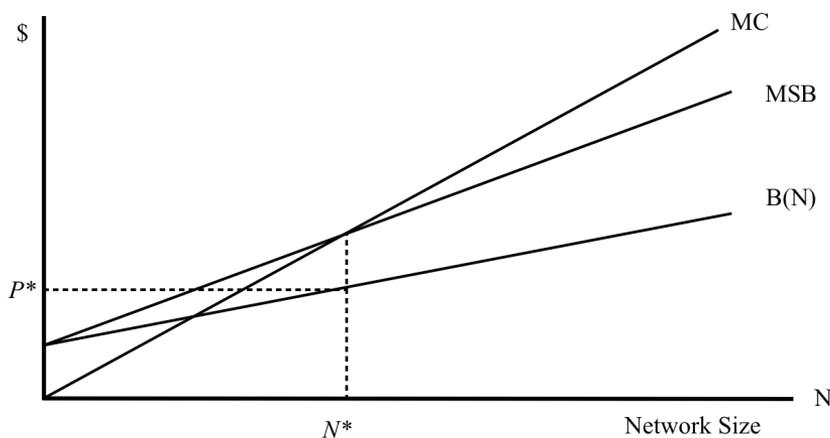


Figure 2.1: 'The benefit for an individual participant $B(N)$ from participation in a network relative to the marginal social benefit (MSB) and marginal cost of serving another participant (MC)'. From Liebowitz & Margolis (1994)

In Figure 2.1 from Liebowitz & Margolis (1994), the benefit (B) of the participation of one additional participant (measured in dollars) is shown as a function of the size of a network (N). As we can see, the benefit both to the marginal participant (B) and to the network as a whole (MSB) increases with N. The increase in social benefit from an additional participant is higher than the benefit derived by the marginal participant himself/herself because of the non-internalized positive externalities generated by their addition to the network. As such, setting marginal revenue equal to marginal costs, a profit-maximizing platform firm will accommodate N^* participants and charge P^* , despite the fact that the cost of serving an additional participant (MC) is higher than the marginal revenue the firm can expect to derive solely from that participant (B). As Varian (2006) writes: *"Nowadays it is quite common to see producers offering very cheap access to a piece of software or a communications service in order to 'create a market' where none existed before"*—Varian (2006)

Surges of interest in research on network externalities within industrial organization first appeared in the early to mid-1980s and then again in the early 2000s. Although closely related to the pioneering work of Rohlfs (1974) on interdependent demand, the first wave is generally thought to have been sparked by the publication of two articles, by Katz & Shapiro (1985) and Farrell & Saloner (1985).

2.2.2 Compatibility and Consumer Welfare

"The benefit that a consumer derives from the use of a good often depends on the number of other consumers purchasing compatible items" - Katz & Shapiro (1986)

Users of network goods—individuals or firms—desire compatibility (Eisenmann et al. 2011). Because network goods are meant to be consumed together/as part of a system, changing one component often has consequences on other components in the system (Varian 2006). That is, *switching costs*, defined as the costs associated with switching suppliers (Thompson & Cats-Baril 2002) can often be quite high in industries characterized by a presence of network externalities. This because, even barring the technical challenges of achieving interoperability between complementary

goods, ensuring compatibility of system components accompanies both social benefits and social costs (Farrell & Saloner 1985).

The social benefits of interoperability are many and often quite compelling to consider. For consumers, high degrees of compatibility—for instance in the form of standardization—ensures that many different television channels may be viewed on the same television. Either formal or *de facto* standardization also ensures that subscribers of one telephone carrier may call subscribers of other telephone carriers, computer programs written for the same operating system may be used on different computer hardware and different manufacturers' nuts and bolts may be used together (Farrell & Saloner 1985). Formally, the benefits of compatibility for consumers may be summarized as:

- *Lower switching costs*, i.e. the cost of switching between producers decreases with higher availability of substitute goods;
- *Enhanced network benefits*, in that high degrees of compatibility generally lead to higher volumes of production, generating markets for producers of complementary goods;
- *Lower prices*. If compatibility leads to increases in demand, competition between producers generally leads to lower prices for consumers;

Because standardization is so often advantageous to consumers, governments typically both favor and at times even sponsor the development of standards through governmental agencies such as the National Institute of Standards and Technology in the U.S., the British Standards Institute in the UK and Standard Norge in Norway. As Farrell & Saloner (1985) however point out, social *costs* may also arise as a consequence of standardization. In particular, if an industry agrees upon compatibility—by adopting a standard or otherwise—consumers may face social costs stemming from (Liebowitz et al. 1996):

- *A loss of variety*, in that high degrees of compatibility may lead to convergence among producers which may impede consumers' abilities find optimal solutions;

- *Innovation stagnation*, because the process of achieving compatibility in no way guarantees that the optimal technology wins out;
- *Lock-in*, because the switching costs of moving from one standard to another for consumers may impede the emergence of new and better technologies;

For the first point, it is important to emphasize that potential costs that stem from a loss of variety must be considered alongside the transaction costs related to consumers making technology decisions in the absence of interoperability or standardization. After all, minimizing transaction costs is the point of compatibility in the first place (Katz & Shapiro 1985). As for potential innovation stagnation that can result from increased compatibility, Hemenway (1975) describes how, for instance, the U.S. National Bureau of Standards declined to write interface standards for the computer industry because it feared that such standards would retard innovation (Farrell & Saloner 1985). In that case, lacking standardization is generally thought to have been positive for innovation, albeit potentially at the cost of higher learning curves for consumers. Consumer lock-in may be described as a situation where the cost of changing to a different system is so high that switching is virtually inconceivable (Varian 2006). The prototypical example of consumer lock-in is the "QWERTY" keyboard typeset *de facto* standard which although generally considered inferior in terms of both ergonomics and efficiency (Farrell & Saloner 1986, David 1985) still reigns supreme as the standard layout offered on virtually all modern keyboards (Liebowitz et al. 1996).

In a more modern context, a similar example of 'excess inertia' which may occur as the result of widespread adoption of a new technology are the social login systems which allow users of Facebook, Google and Apple to easily sign up and log into third-party websites using their existing social media credentials. Although seemingly convenient for users at the point of sign-up, the introduction of the additional component (a social login) indeed transforms the relationship between customers and owners of websites into a multi-sided network with substantial

switching costs. This because, if a user later decides to discontinue their customer relationship with Facebook, Google or Apple, his/her user accounts on third-party websites also cease to work. The introduction of a convenient, third-party method of quickly signing up for services (the social login) generates a switching cost that the user typically did not—knowingly—choose to incur.

However beneficial, the matter of standardization for network goods in the presence of externalities is in other words far from trivial. As such, the topic of how network industries reach consensus about compatibility to this day remains an important one.

2.2.3 Compatibility and Competition

As Katz & Shapiro (1985) point out, even in the 1980s goods and services could increasingly be characterized based on the level at which the utility a user derives from consumption is a function of the number of other users also consuming the same good/service. Such consumption externalities may result from several possible sources, such as:

- *Direct network effects*, such as the increased utility of a telephone from an increased number of households and businesses that join the telephone network;
- *Indirect network effect*, such as the increased utility of a computer from an increased number of users, leading to increased interest from developers of software programs;

Both sources of increased utility for consumers depend critically on the number of other users who are in the same network. As such, from the firm perspective, questions of 1) Which networked industries firms should participate in and 2) To which degree firms should make their goods and services compatible with one another, are considered very important. In their early investigations of such markets, the pioneering work of Katz & Shapiro (1985) finds that firm incentives to produce goods and services in industries characterized by network externalities depend on the level of compatibility/standardization in the industry, which itself is often a

function of consumers' expectations. As the authors write, "*network externalities are similar to fixed costs in that they can lead to a limited number of active producers*". For incumbents, of course, this means that compatibility may be less desirable, as "*when [...] network externalities are large, the choice of whether to make the products compatible will be one of the most important dimensions of market performance*" (Katz & Shapiro 1985). An important consequence of their analysis is hence that "*the products of a given set of firms will be made compatible if and only if all [...] firms would earn greater profits as a result. [...] In contrast, when the compatibility decision mechanism is an adapter and side payments are infeasible, the products of two firms will be made compatible if either firm would find the move to be profitable*". The conclusion must hence be that firms with good reputations or large existing networks (incumbents with a so-called 'installed base') will tend to *not* want to produce compatible goods/services, even in cases where compatibility increases consumer welfare. This because, if the dominant firm makes its goods/services compatible, due to network externalities, that will increase the value to consumers of competing firms' goods and services. Conversely, firms with small networks (installed bases) or weak reputations will tend to favor compatibility, even in cases where the social costs of compatibility outweigh the benefits.

2.2.4 Multi-Product Pricing

"Give'em the razor; sell'em the blade" - King C. Gillette

Sometimes, goods are sold at a low (sometimes zero or negative) price below marginal cost in order to maintain sales of a complementary good which is usually non-durable/consumable (Forbes 1988). The most well-known examples are razors/razor blades and ink-jet printers/cartridges. A commonly shared anecdote related to the phenomenon is the story of Standard Oil's entry into the Chinese market by giving away eight million kerosene lamps in order to sell kerosene in the future (Cochran, 2000). The first observation that lowering the price on one half of a matched pair sells more of the other was likely the observation of Cournot (1838) that discounting the price of zinc sells more copper in the brass market (Parker & Van Alstyne 2005).

The literature generally credits the works of Baumol & Panzar (1982) and Bailey & Friedlaender (1982) with the popularization of multi-product pricing, although even two years prior the textbook by Henderson & Quandt (1980) mentions that it *"may be optimal for a manufacturer of razors and razor blades to sell the razors at a loss because of the effect of their sale on razor blade profits"* (pointed out in Forbes 1988).

Baumol & Panzar (1982) is credited with the first comprehensive formalization of the economics of multi-product pricing strategies, which had been in development throughout the 1970s. Herein, sufficient conditions were given for a 'multi-product, multi-firm price/quantity configuration to be sustainable'. The key differentiator between single- and multi-product pricing strategies is that unlike the single-product case, *"a multi-product firm must decide about the structure of its relative prices as well as its overall price level"* (Armstrong & Vickers 2018). That is, because in the multi-product case a product is split into several complementary components (such as the razor and razor blades), the firm must find two optimal prices: one for the razor and one for the razor blades. As Baumol & Bradford (1970) note, *"the damage to welfare resulting from departures from marginal cost pricing will be minimized if the relative quantities of the various products sold are kept unchanged from their marginal cost pricing proportions"*. The formal model used to model such scenarios is based on Ramsey (1927)'s analysis of commodity taxation (Armstrong & Vickers 2018).

2.2.5 Platforms Firms in Two-Sided Markets

"The starting point for the theory of two-sided markets [...] is that an end-user does not internalize the welfare impact of his use of the platform on other end-users."
—Rochet & Tirole (2006)

A variety of network goods, including video games, enterprise software and social networks are organized around intermediary firms, or 'platforms', which facilitate transactions among participants who may not have been able to interact otherwise (Eisenmann et al. 2006, Evans et al. 2008, Gawer et al. 2009, Hagiu 2006). The

starting point for the theory is the observation credited to Rochet & Tirole (2003) that "many if not most markets with network externalities are characterized by the presence of two distinct sides whose ultimate benefit stems from interacting through a common platform".

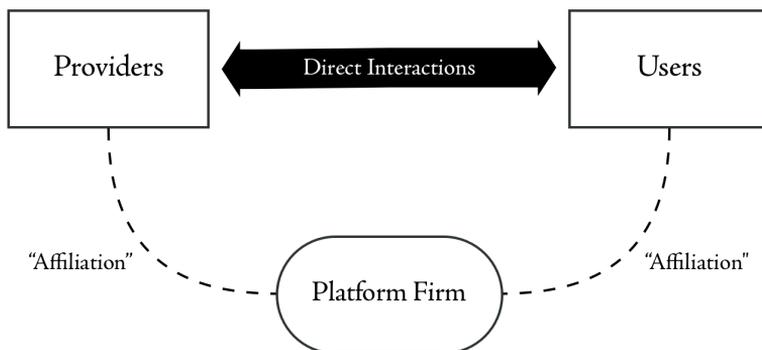


Figure 2.2: Figure depicting the relationship between providers, users and a platform firm in a two-sided market. From Hagiu & Wright (2015).

That is, in many of the markets for network goods we have discussed, there exists a coordination problem surrounding compatibility, where both consumers and producers of such goods would be better off if they could agree on which technology (platform) to support, but coordination *within* such markets may have little effect (Parker & Van Alstyne 2005). In such *two-sided* market, coordination *across* markets is essential (Rochet & Tirole 2003, 2006). The general form of the coordination problem that arises is depicted in Table 2.1, adapted from Besen & Farrell (1994).

		Producers	
		Platform A	Platform B
Consumers	Platform A	$a_{1,1}, b_{1,1}$	$a_{1,2}, b_{1,2}$
	Platform B	$a_{2,1}, b_{2,1}$	$a_{2,2}, b_{2,2}$

Table 2.1: Payoff matrix depicting the coordination problem for producers and consumers in two-sided markets. From Besen & Farrell (1994).

As we have read, the early research on markets featuring network externalities assumed that goods/services were the result of the output decisions of firms in an oligopolistic context. In such studies, firms were regarded as unitary decision makers and the appearance of network externalities was shown to ultimately depend on firm decisions of whether or not to enter a market or switch technologies. Moreover, the central objects of study in this early research stream were typically physical goods, technologies and/or technology standards such as VCRs, personal computers, ATM-cards and the QWERTY keyboard layout.

With the popularization of the world wide web in the 1990s, the theory of network goods was increasingly being decoupled from physical goods and more and more of research began regarding network services such as *marketplaces* (e.g. eBay, Amazon), *matchmaking services* (Match.com, OkCupid) and providers of tools for minimizing *search-* (Google, Yahoo) and *transaction-* (PayPal) *costs*. With this transition from physical to (increasingly) digital goods and services, the marginal cost of production for many network goods often decreased to the cost of distribution (i.e. the cost of Internet bandwidth). As such, experimental business models such as that of Google's Search Engine which relies on advertising revenue were becoming commonplace.

Unlike other software goods such as operating systems, word processors and web browsers (which are typically sold directly to customers), many digital services distributed online (such as YouTube, Google Search, Facebook and LinkedIn) are often provided to consumers at no direct cost to them. From a research perspective, despite their physical and functional properties, such goods and services more closely resemble radio programs, free magazines, newsletters and shopping malls. This because, in terms of pricing, they are indeed often treated as networks, or 'systems of components' much like that of the razor and razor-blades.

Recall that a firm may sell a razor at or below marginal cost because it expects to

make up the cost through the sale of compatible non-durable goods in the future (razor-blades) (Forbes 1988). In the context of markets for network goods, as Rochet & Tirole (2006) point out, the multi-product pricing literature does not allow for externalities in the consumption of different products that are related, meaning *"the buyer of a razor internalizes in his purchase decision the net surplus that he will derive from buying razor blades"*. Thus, the models used to conceptualize multi-product pricing does not apply to two-sided markets because *"an end-user does not internalize the welfare impact of his use of the platform on other end-users"* (Rochet & Tirole 2006). A familiar example is a user of Google's search engine who does not internalize his impact on the marginal increase in the price Google is able to charge firms for advertising services. The pricing set on one side of a two-sided market hence depends not only on the demand from and costs of serving that participant, but also on how their participation affects adoption on the other side of the market, and the profit that may be extracted from additional participation (Rysman 2009). The more adoption a platform firm is able to stimulate, the larger the positive externalities from their participation is available for the platform firm to absorb. In Figure 2.1, such network externalities appear as the difference between the benefit derived by an individual user, $B(N)$ and the marginal social benefit (MSB) generated from their participation.

2.2.6 Market Structures and Multi-Homing

In the context of firms deciding whether or not to produce nuts or bolts depending on the level of compatibility with other producers' complementary goods, it is most typically assumed that the context is an oligopolistic markets shared by a small number of producers. The number of producers may typically be thought of as a function of the considerable investment costs for research and development, manufacturing, distribution and so on. In markets for digital goods however, the investment costs for producing new goods and services are most often considerably lower. As a consequence, we can imagine a much larger number of producers of non-network digital goods such as e.g. a word processing software delivered over the

internet, a website for posting personal photographs or data backup software. Indeed, there are numerous producers of such goods, and their competitive markets bare the trademark signs of *monopolistic competition*, which we may define as "*imperfect competition where many producers of somewhat differentiated products which attempt to seem substantially different from one another*" (Chamberlin 1933).

According to the theory of industrial organization, as a function of network externalities firms operating platforms in two-sided markets for network goods and services are not in monopolistic competition. Rather, the outcome from competition in such markets tends to be oligopoly or in some cases, duopoly or even monopoly (Caillaud & Jullien 2003). This because, it is claimed, following a successful entry where a platform is able to get 'both sides on board' (Rochet & Tirole 2003), self-reinforcing network effects may lead to winner-take-all situations (Lee et al. 2006) where the market 'tips' in the favor of one or a handful of platforms (Besen & Farrell 1994, Caillaud & Jullien 2003). Rysman (2009) argues that there are three key factors that determine whether such tipping of a two-sided markets will occur:

1. *Product differentiation*, i.e. if the platforms can sufficiently differentiate from one another, they may successfully co-exist (Chou & Shy 1990, Church & Gandal 1992);
2. *Multi-homing*, if participants on one or both sides can cost-effectively use multiple platforms simultaneously (Corts & Lederman 2009); and
3. *Supply-side differentiation*, i.e. if supply-side participants are able to differentiate themselves (Ellison & Fudenberg 2003, Augereau et al. 2006);

Overall, whether the outcome in a two-sided market is monopoly or oligopoly is thought to turn mostly on whether it is beneficial for participants to become members of two or more platforms (multi-homing), or whether the nature of heterogeneity and search/transaction costs is such that participants favor being member of one platform (single-homing) (Schmalensee 2014). Credit cards is an example of the former (symmetric multi-homing, Figure 2.3), where both merchants and consumers often prefer to support/belong to more than one platform. Technical standards

typically end up with the inverse case (symmetric single-homing, Figure 2.4), while smartphone operating systems is an example of a mixture of the two (asymmetric homing, Figure 2.5) with single-homing occurring on only one side of the market (among consumers). Optimal pricing strategies for each of these markets are discussed, respectively, in Rochet & Tirole (2003), Liebowitz & Margolis (1995), and Armstrong (2006).

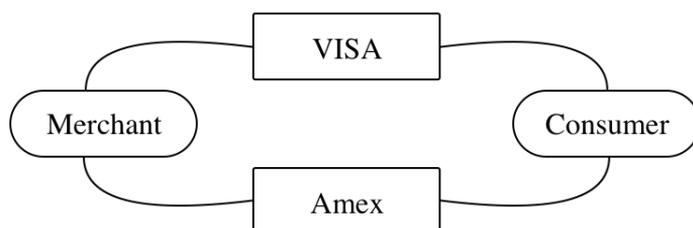


Figure 2.3: *Symmetric multi-homing in the credit card market. Merchants and consumers both prefer to belong to two platforms.*

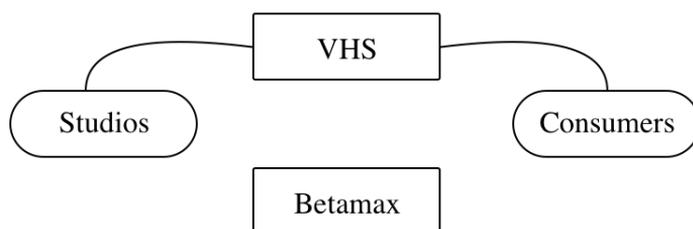


Figure 2.4: *Symmetric single-homing in a technical standard. Film studios and consumers both prefer to belong to one platform.*

In general, single-homing on one side of a market—all else being equal—tends to intensify price competition on that side in a so-called "competitive bottleneck" yielding a price level more favorable to participants on the other side (Rochet & Tirole 2003, Armstrong 2006). In cases where both sides of the market can only single-home and competing platforms' products are undifferentiated (such as often occurs in format wars, Figure 2.4) it is efficient for a market to support only a single firm (Caillaud & Jullien 2003). In such cases a platform may also be viewed as monopolist

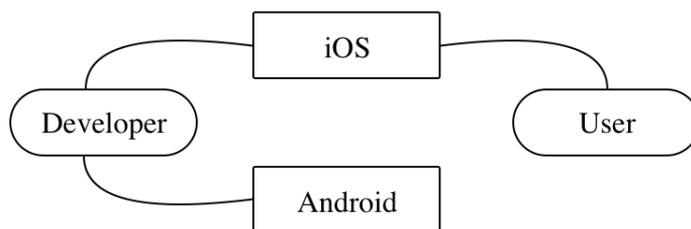


Figure 2.5: *Asymmetric homing in smartphone operating systems. While software developers prefer to belong to both platforms, most smartphone users only belong to one*

to participants on that side because they can charge monopoly prices to participants on the other side for access (Rysman 2009), the opposite of a "competitive bottleneck" (Armstrong 2006).

2.2.7 Coordination, Expectations and Quality

In the two-sided market literature, whether one group will choose to affiliate with a platform is assumed to depend on their confidence in the participation of members of the other group. As such, 'beliefs matter' and the attractiveness of a new entrant platform may be viewed as a function of its history and reputation (Jullien 2005). Upon entry, new entrant platforms have no history and so are assumed to have no reputation, leading extant theory to predict that the occurrence of the prototypical coordination or 'chicken-and-egg' problem (Rochet & Tirole 2003, Caillaud & Jullien 2003) sometimes referred to as the 'circular conundrum' (Spulber 2010, Hagiu & Spulber 2013) if potential participants' expectations are unfavorable (Hagiu 2006). As Caillaud & Jullien (2003) write: *"to attract buyers, an intermediary should have a large base of registered sellers, but these will be willing to register only if they expect many buyers to show up"*. Indeed, as Evans & Schmalensee (2010) point out, it is not sufficient for buyers and sellers to merely show up, they also need to maintain a certain level of participation in order for their participation to stimulate further growth. This because, unlike many other types of businesses, platform

participants' costs of reversing participation are negligible (Evans & Schmalensee 2010). Somewhat abstractly, Besen & Farrell (1994) argue that there are four main strategies for overcoming the 'chicken-and-egg' problem in two-sided markets:

1. *Building an early lead*, taking advantage of the inertia that can occur as a result of network effects;
2. *Attracting the suppliers of complements*, increasing both the attractiveness of the primary service and barriers preventing rival firms from doing the same;
3. *Product preannouncements*, retarding the growth of rivals' products prior to the introduction of one's own;
4. *Price commitments*, convincing potential participants that they will obtain large savings in the long term if they join early;

Spulber (2010) similarly argues for three strategies: 1. Reducing transaction costs for buyers and sellers, fostering direct coordination between groups; 2. Providing media content and consumer rewards, giving participation incentives independent of participation of other groups; and 3. Acting as a market maker, reducing participation risks. In markets where two groups of participants make adoption/purchasing decisions in sequential order, Hagi (2006) argues that it is rational for a monopoly platform to delay announcing its price for buyers until after sellers have adopted, as this reassures sellers that the platform will *ex post* attract a sufficient number of buyers. Indeed, several authors have investigated the role of preannouncement strategies in overcoming the chicken-and-egg problem (Farrell & Saloner 1986, Besen & Farrell 1994). As Chellappa & Mukherjee (2020) write, "*the information contained within [...] preannouncements not only shape expectations of distinct but connected sides, [...] but also informs a rival platform in a competitive market*". Bhargava (2014) studied preannouncement and launch timing as two of several key considerations for platform firms' successful entry. In their investigation of three different preannouncement strategies (formal, informal and none), Chellappa & Mukherjee (2020) found that when competing platforms are less differentiated (or, potential participants' preferences are weak), the firms will avoid preannouncement.

If the platforms are highly differentiated (or, potential participants' preferences are strong), they will commit to formal preannouncement strategies.

Another commonly suggested strategy for overcoming the 'chicken-and-egg' problem is to develop first-party content that can act as a substitute for third-party participation among supply-side participants until demand-side participants join (Hagiu & Spulber 2013).

In both console gaming and operating system markets it is commonplace for manufacturers to both preannounce new platforms and include in the preannouncement a suite of first-party software in order to demonstrate the capabilities of the new technology. Alongside providing software development kits (SDKs), the goal of the strategy is to encourage software developers to build third-party games and applications prior to launch. A recent example is when Apple announced its transition from Intel's x86 architecture to its own ARM-based processors in 2020, and simultaneously announced a suite of developer tools as well as demonstrated the performance of its own, first-party applications running on the new architecture. Examples of first-party content in the console gaming market include Nintendo's Super Mario Bros and Microsoft Xbox's Halo games.

Formally, first-party content strategies aim to overcome unfavorable expectations among demand-side participants (Spulber 2010, Hagiu & Spulber 2013). As discussed, expectations are thought to be a function of platform firms' reputations (Jullien 2005). As such, absent any reputation, unfavorable expectations is the default impression of unaffiliated participants towards new entrants in two-sided markets. When investing in first-party content strategies, extant research finds that platform firms facing such unfavorable expectations should invest more relative to platforms facing favorable expectations when first- and third-party content are substitutes (Hagiu & Spulber 2013).

Other entry strategies related to content explored in extant literature are

tying/bundling and *freebies* (Carlton et al. 2010, Amelio & Jullien 2012, Farrell & Katz 2000). Tying/bundling or 'the practice of selling one product or service as a mandatory addition to the purchase of a different product or service' may be particularly attractive for online services because of fixed production costs and (for all intents and purposes) no distribution costs (Jullien 2005). A common example in traditional markets is cell phones being locked to mobile phone carriers (requiring the purchase of a subscription). In two-sided markets, tying/bundling may take the form of bundling complementary software tools with service offerings (such as Google Docs being bundled with a Google Search account). Freebies may take the form of giving free gift-cards when new users sign up for a service (e.g. a Google advertising coupon given away with each new YouTube Creator account). As with first-party content strategies, the goal of tying/bundling and freebies is typically thought to be to overcome the unfavorable expectations of potential participants about the future value of the platform (Hagiu & Spulber 2013). In cases where multi-homing is present on one or both sides of the market, tying/bundling and freebies may also be viable strategies for competition (Jullien 2005). Carlton et al (2010) for instance examine the usefulness of tying/bundling goods and services consumers will not use, in order to decrease consumers' willingness to pay for a rival's good. An example is phone manufacturers' bundling of third-party applications on smartphones running the Android smartphone operating system.

2.2.8 Pricing Strategies

"It was really hard to understand market power [...] when everything is free. But of course [it's] not free. The costs are somewhere else"—Tim Wu

Since its inception, by virtue of the tradition of the scholars first studying the phenomenon, two-sided market research has revolved around finding optimal pricing strategies (Gawer 2014, McIntyre & Srinivasan 2017) to account for the level of network externalities present and so get 'both sides on board' (Rochet & Tirole 2003). As Rysman (2009) writes, *"in a one-sided market we can characterize the price-cost mark-up in terms of elasticity of demand and marginal cost, but in a two-sided market*

pricing decisions will also include the elasticity of the response on the other side and the mark-up charged to the other side". Price on both sides of a two-sided market hence ultimately depends on the joint set of demand elasticities and marginal costs on each side (Rochet & Tirole 2003, 2006, Weyl 2010). The key insight that sets two-sided markets apart from traditional markets in terms of prices is hence that *"the volume of transactions on and the profit of a platform depend not only on the total price charged to the parties to the transaction, but also on its decomposition"* (Rochet & Tirole 2003). That is, equilibrium prices in two-sided markets are made up of both a price *level* (in accordance with demand) and a price *distribution* (in accordance with the levels of network externalities).

A nightclub may charge men more than women for entry, while a celebrity may be paid to show up. The distinction of which participant pays most is a function of both 1. The level of demand in each group and 2. How an additional participant from each group influences the demand for access among the other groups of participants.

In the model of Rochet & Tirole (2003), participants pay only when transactions occur, and so the level of participation among each group depends only on the cost of transactions. A real world example of such a market is Airbnb, which is free to browse for both hosts and guests, but which charges a positive fee when participants of the two groups transact. Armstrong (2006) considers the alternate case where participants pay for participation (not usage) in a market featuring differentiated products.

The nightclub owner needs to consider both 1. The price level for entry among men and 2. The distribution of attendance among men and women. A too high entry fee for men may negatively influence attendance, while a too low entry fee among men may skew the distribution towards mostly male attendance, which may again negatively influence the attendance of women, and so on. In some

cases (when demand to attend among men is high), the owner may have to both subsidize the entry fee for women *and* arrange a special "ladies night" where women drink for free in order to balance demand among the two sides.

In most two-sided markets however, platform firms charge for both participation and usage (Weyl 2010, Rochet & Tirole 2006), though it is not always intuitive whether prices are positive or negative, and which group is charged which fee (Schmalensee 2014).

Credit card companies typically charge consumers an annual membership for having the the card and—through its rewards' program—a negative usage fee in the form of bonus points. On the other side of the market, the credit card company may charge merchants for payment processing on a per-transaction basis while waving any participation fees in order to stimulate adoption.

The role of dynamic pricing, in particular *penetration pricing* has also been a topic of research in two-sided markets. As a consequence of the nature of network effects and the potential for first-mover-advantages, it may be advantageous for new entrant firms to lower prices early in the product life cycle and raise prices after establishing an installed base (Rysman 2009). In such cases (and cases such as that of razors and razor blades) *"individual participants internalize their own value calculation such that the price changes affecting a matched item are reflected in their willingness to pay for the other"* (Parker & Van Alstyne 2005). Related, yet different from these phenomena (and the phenomenon of freebies) Parker & Van Alstyne (2005) explored the role of complete subsidization on one side of a two-sided platform. Their findings were that it may be rational for platform firms to invest in goods/services they intend to give away for free if the product is one half of a matched pair and the other half may be sold at a profit as a consequence of positive network externalities. Examples include CAD software which is sold to professional users who create 3D models, while a free version is given away to consumers who only care about viewing such models.

Although some platform firms charge both participation (membership) and usage (advertising) fees which the firm needs to get right (both in terms of price level and distribution), pricing in two-sided markets does not solely depend on quantitative measures. Indeed, as Weyl (2010) points out, user heterogeneity is an additional dimension of price discrimination for platform firms in two-sided markets. Whereas credit card users derive their benefit mostly from interactions (usage) in the two-sided market for digital payments (and so care less about the type of credit card, as long as it is accepted by merchants), newspaper readers derive most of their benefit from being a subscriber to a particular newspaper, in that there is a qualitative difference in e.g. the editorial emphasis of different newspapers.

Authors have also investigated the role of product differentiation to account for user heterogeneity in quality preferences (Bhargava & Choudhary 2004). Indeed, if platforms are viewed as homogeneous/undifferentiated by supply-side participants but heterogeneous/differentiated by demand-side participants, competitive 'bottlenecks' may arise in which competing platforms may engage in indirect competition by subsidizing demand-side participants (Armstrong & Wright 2007) and/or signing exclusive contracts which prevent supply-side participants from single-homing. Another variable managers of platform firms must consider when formulating optimal pricing strategies is whether or not the platform is *proprietary* (in the sense that the firm can charge both sides for use) or *open* (where neither side is charged for use) (Economides & Katsamakas 2006). If the case is the former, platform firms must consider the ability for supply-side participants to multi-home as well as users' switching costs, especially if the platform firm is an incumbent. Boudreau (2010) investigated how a platform's level of openness influences supply-side participants' innovation levels by looking at data about handheld computing systems. He found that higher degrees of openness on platforms (operating systems) produced higher levels of innovation among manufacturers of handheld computers, but that manufacturers were less inclined to support platforms in which the operating system was opened completely, suggesting an important role for platform 'sponsors', see Gawer & Henderson (2007). Overall, depending on these attributes of the platform

and more, firms may choose to employ either usage fees or membership fees, or both (Armstrong 2006).

A table of influential studies from the perspective of industrial organization is provided in Table 2.2 below.

Authors	Year	Journal	Title	Methodology	Topics
Farrell, J. & Katz, M.L.	2000	<i>The Journal of Industrial Economics</i>	Innovation, Rent Extraction, and Integration in Systems Markets	Theoretical (Formal model)	Tying, Innovation
Rochet, J. & Tirole, J.	2003	<i>Journal of the European Economic Association</i>	Platform Competition in Two-Sided Markets	Theoretical (Formal model)	Pricing, Governance
Caillaud, B. & Jullien, B.	2003	<i>RAND Journal of Economics</i>	Chicken & Eggs: Competition among Intermediation Service Providers	Theoretical (Formal model)	Pricing, Entry, Outcomes
Bhargava, H.K. & Coudhary, V.	2004	<i>Information Systems Research</i>	Economics of an Intermediary with Aggregation Benefits	Theoretical (Formal model)	Pricing, Quality, Product Differentiation
Clements, M.T. & Ohashi, H.	2005	<i>Journal of Industrial Economics</i>	Indirect Network Effects and the Product Life Cycle: Video Games in the US, 1994-2002	Empirical (Quantitative)	Entry, Adoption
Parker, G. G. & Van Alstyne, M. W.	2005	<i>Management Science</i>	Two-Sided Network Effects: A Theory of Information Product Design	Theoretical (Formal model)	Loss-Leader Pricing, Product Differentiation
Armstrong, M.	2006	<i>RAND Journal of Economics</i>	Competition in Two-Sided Markets	Theoretical (Formal model)	Pricing, Multi-Homing

Authors	Year	Journal	Title	Methodology	Topics
Hagiu, A.	2006	<i>RAND Journal of Economics</i>	Pricing and Commitment by Two-Sided Platforms	Theoretical (Formal model)	Pricing, Expectations
Rochet, J. & Tirole, J.	2006	<i>RAND Journal of Economics</i>	Two-Sided Markets: A Progress Report	Theoretical (Formal model)	Pricing, Market Structure
Economides & Katsamakas	2006	<i>Management Science</i>	Two-Sided Competition of Proprietary vs. Open Source Technology Platforms and the Implications for the Software Industry	Theoretical (Formal model)	Pricing, Market Structure
Armstrong, M. & Wright, J.	2007	<i>Economic Theory</i>	Two-Sided Markets, Competitive Bottlenecks and Exclusive Contracts	Theoretical (Formal model)	Product Differentiation, Multi-Homing
Rysman, M.	2007	<i>Journal of Industrial Economics</i>	An Empirical Analysis of Payment Card Usage	Empirical (Quantitative)	Multi-Homing
Evans, D. & Schmalensee, R.	2010	<i>Review of Network Economics</i>	Failure to Launch: Critical Mass in Platform Businesses	Theoretical (Formal model)	Entry, Expectations
Boudreau, K. J.	2010	<i>Management Science</i>	Open Platform Strategies and Innovation: Granting Access vs. Devolving Control	Empirical (quantitative)	Openness, Complements
Carlton, D. W. & Gans, J. S. & Waldman, M.	2010	<i>American Economic Journal</i>	Why Tie a Product Consumers Do Not Use?	Theoretical (Formal model)	Tying
Weyl, E.G.	2010	<i>American Economic Review</i>	A Price Theory of Multi-Sided Platforms	Theoretical (Formal model)	Pricing
Amelio, A. & Jullien, B.	2012	<i>International Journal of Industrial Organization</i>	Tying and Freebies in Two-Sided Markets	Theoretical (Formal model)	Tying, Loss-Leader Pricing

Authors	Year	Journal	Title	Methodology	Topics
Hagiu, A. & Spulber, D. F.	2013	<i>Management Science</i>	First-Party Content and Coordination in Two-Sided Markets	Theoretical (Formal model)	Entry, Expectations, Coordination
Hagiu, A. & Wright, J.	2015	<i>International Journal of Industrial Organization</i>	Multi-sided Platforms	Theoretical (Formal model)	Market Structure, Coordination
Spulber, D.F.	2019	<i>Journal of Economics & Management Strategy</i>	The Economics of Markets and Platforms	Theoretical (Formal model)	Market Structure
Chellappa, R.K. & Mukherjee, R.	2020	<i>Management Science</i>	Platform Preannouncement Strategies: The Strategic Role of Information in Two-Sided Markets Competition	Theoretical (Formal model)	Entry, Expectations, Information

Table 2.2: *Influential papers from the industrial organization perspective*

2.3 Platform Strategies in Two-Sided Markets

In the field of management, broadly speaking strategic management is concerned with *"relating a firm to its environment in order to successfully meet long-term objectives"* (De Wit & Meyer 2010). Whereas the formal tools of economics (including industrial organization) regard the product and market-aspects of competition, the traditional concept of strategy (Andrews 1971) is more-so phrased in terms of the resource position of a firm (Wernerfelt 1984, Barney 1991, Peteraf 1993). Thus far, the management literature on platforms and two-sided market has been limited and divided (Gawer 2014, McIntyre & Srinivasan 2017). In particular, management scholars have sought two distinct theoretical paths, based on 1) economic theory and 2) engineering design. Given the origin of the field, the rest of this chapter aims to provide an overview of the management literature related to the former path, based on economic theory.

In a broad sense, strategic management research has thus far sought to contribute to the burgeoning literature on platforms in two-sided markets by investigating how platform managers strategize to achieve competitive advantages (McIntyre & Srinivasan 2017). The traditional notion of competitive advantage in strategic management research is *"when [a firm] is able to implement a value crating strategy not simultaneously being implemented by any current or potential competitors"* (Barney 1991). That is, firms' competitive advantages are typically thought to depend on their ability to create more value than their rivals (Porter 1985).

In industrial organization literature, competitive advantages emerge not as functions of a firm's idiosyncratic competencies and resource-based deployments, but rather typically as functions of external characteristics (Lado et al. 1992). The resource-based perspective of competition, in turn, views firms not as idealized, unitary decision-makers but rather as bundles of resources (Caves 1980, Wernerfelt 1984) and thus shifts the attention of researchers away from external factors (markets or industries) to firms' internal operations. As such, in the resource-based view (RBV), value creation is typically thought to be a function of the resources the firm has at its

disposal. "*By specifying a resource profile for a firm, it is possible to find the optimal product-market activities*" (Wernerfelt 1984), or said more simply, "*firms with superior resources will earn rents*" (Peteraf 1993). By a resource is meant anything which could be thought of as the strength or weakness of a given firm (Wernerfelt 1984). Daft (1983) defines firm resources as all "*assets, capabilities, organizational processes, firm attributes, information, knowledge [...] controlled by a firm that enables the firm to conceive of and implement strategies that improve its efficiency and effectiveness*". One of the most important sources of competitive advantages, according to the RBV is thus *resource heterogeneity* among firms (Barney 1991, Peteraf 1993). Competitive advantages that persist over time, so-called *sustainable* competitive advantages, are in the RBV the result of various 'isolating mechanisms' (Rumelt 1984) that firms strategically erect in order to maintain their resource advantages (Barney 1991, Dierickx & Cool 1989, Lippman & Rumelt 1982). Examples include *property rights* (including intellectual property rights), *reputation, information asymmetries* (including secrecy), *causal ambiguities, learning curves, switching costs, search costs, firm size* and *economies of scale* (Ghemawat & Spence 1985, Rumelt 1987). The sustainability of a firm's privileged resource bundle (which enables their competitive advantages) thus hinge on how easily their isolating mechanisms may be replicated (Dierickx & Cool 1989).

The ease with which a competing firm may imitate another firms' resource position (and so address its competitive advantage) is thought to rely on five characteristics of the 'resource accumulation process' which may generate such barriers to imitation. They are, according to Dierickx & Cool (1989):

1. *Time compression diseconomies*, as certain resource accumulation processes are required to be conducted over a period of time in order to be value-generating, and so there are 'decreasing returns to the fixed factor of time';
2. *Mass efficiencies*, as the initial level of a resource significantly influences its further accumulation;
3. *Interconnectedness*, as the pace of resource accumulation is also influenced by

the level of accumulation of other resources;

4. *Erosion*, as resources often decay in the absence of adequate maintenance expenditures;
5. *Causal ambiguity*, as the resource accumulation process is often far from deterministic and so probabilities play an important role;

In the context of two-sided markets, Sun & Tse (2009) show that a platform's process of accumulating network effects satisfies all five characteristics, and so argue that network effects function as an isolating mechanism capable of sustaining a firm's competitive advantage. Using a dynamic system model, the authors show how a platform firm's resource-based competitive advantage stemming from accumulation of the *critical* resource (Peteraf & Barney 2003) of 'platform participants' is influenced by single-homing versus multi-homing. In relation to the five characteristics above, they argue that network effects indeed show signs of time compression diseconomies in that, *ceteris paribus*, in their quest to recruit participants (and so accumulate demand-side economies of scale) new entrant platforms must lower their fees in order to narrow resource gaps to incumbents. Incumbents could however respond by appropriately lowering their own fees. This implies that both mass efficiencies and interconnectedness are also characteristic of the process of accumulating network effects, as incumbents' critical resource (level of participation) helps protect against competition from new entrants. Simultaneously, new entrants face faster erosion of extant customer relationships, as network benefits are thought to be a function of the size of the network and so weaker at the outset of a new platform. Sun & Tse (2009) ascribe potential sources of causal ambiguity to be a failure to understand the market and/or the accumulation process itself (e.g. as a function of incomplete information).

Thus far, beyond Sun & Tse (2009)'s paper and the related early work by Shankar & Bayus (2003) (both of which address competitive advantage in two-sided markets directly) much of the other extant research on platform strategies in strategic management research has revolved around identifying and describing the dynamics

of entry and competition in two-sided markets (McIntyre & Srinivasan 2017). In particular, researchers have investigated drivers of competitive advantage in two-sided markets, such as the role of *expectations*, *entry timing*, *network size* and *platform quality* (McIntyre & Srinivasan 2017).

2.3.1 Expectations and Preannouncements

In extant literature from industrial organization, as discussed, potential participants' *expectations* about the future dominance of a new platform is thought to be a function of the firms' reputation (Jullien 2005). Thus, the 'chicken-and-egg' problem for new entrant platforms hinges on the lack of information among potential participants about previous levels of adoption (since there is none). In the context of strategic management, expectations are by some scholars viewed as not solely influenced by the previous levels of adoption (which assumes perfect information), but rather as a construct susceptible to strategic manipulation (McIntyre & Srinivasan 2017). Indeed, it has in extant literature been suggested that expectations condition the size of platform firms' installed base (Fuentelsaz et al. 2015b), suggesting that the causal direction may in some markets be reversed. As such, firms are thought to have strong incentives to launch signals to influence user expectations about their future network's dominance. Such signals may contain the values of their brand, claims about reputation or, as was previously mentioned, the preannouncement of a new product or service that has yet to launch (Bhargava 2014, Dranove & Gandal 2003, Chellappa & Mukherjee 2020).

Indeed, in the management literature too, preannouncements are thought to be good ways for platforms to catalyze initial adoption of a new platform by creating expectations of a sufficiently robust network size. It is believed that such expectations can both deter competitors and preempt customers from adopting an alternative platform and later having to incur switching costs (Bhargava 2014). In terms of competitive advantages, the trade-off of preannouncing a service before it is viable is that it gives competitors an early warning and so more time to respond. In other words, although preannouncements may raise expectations among future

participants (potentially circumventing the 'chicken-and-egg' problem and leading to the generation of network effects), such network effects may be less robust as the benefit of time compression diseconomies is weakened in that it allows other firms to do pursue a similar strategy. Simultaneously, there is the potential for erosion of expectations among potential participants if the product is not released within a certain time frame, the so-called "vaporware" effect (Ofek & Turut 2013).

The specifications of the DVD standard were released in September 1996 by a consortium of hardware and software firms including movie studios and technology companies. The new standard included better video quality, support for multiple surround sound specifications and future support for high-definition televisions.

As early adoption was beginning to take hold (among both studios and consumers), in September of 1997 the leading consumer electronics retailer in the U.S., Circuit City, preannounced the release of DIVX, a competing standard that would additionally allow for encryption of discs and digital rentals. Although the firm gave no specific date for the introduction of DIVX players, the announcement shocked DVD adopters who feared being locked out, as DIVX players would support DVDs but not visa versa.

However, as DIVX players were nowhere to be found during the 1997 Christmas season, rumors began circulating online that Circuit City's preannouncement was merely a strategic maneuver to try to slow the growth of the DVD standard, which its main competitor Best Buy was rapidly becoming the nation's leading retailer of. By January of 1998, shares of Circuit City had declined 24% while Best Buy's shares had climbed 89%, forcing Circuit City's CEO to make an announcement that players of the DIVX standard would not be available until the fall. With the second announcement, fears of a format war died down (Dranove & Gandal 2003).

In general, firms in dominant competitive positions are thought to derive a greater

advantage from preannouncements than firms in weaker competitive positions (Bhargava 2014). However, there is also evidence that preannouncements by a weaker platform may slow down the adoption of equivalent more established technologies, as was the case for the DVD standard following the preannouncement of DIVX by Circuit City in 1997. Dranove & Gandal (2003) found that despite DIVX' eventual failure, the preannouncement of its future release temporarily slowed the adoption of the (later dominant) DVD standard. Conceptually, the 'growth path' dictating how such platform adoption may proceed has previously been modelled both as a *catalytic process* emphasizing a critical point at which 'ignition' stimulates further 'spontaneous combustion' (Evans 2009) and as a *epidemic process* (Kim 2018). In the former, entry is modelled as a process which requires continuous participation in order to avoid the equilibrium where nobody participates and so the platform "*fizzles rather than ignites*" (Evans 2009). In the latter, entry is modelled as a traditional diffusion process where the number of adopters at a time t is a function of the probability that potential adopters have been exposed to the platform (Kim 2018). Overall, management researchers have found that firms may strategically leverage network effects through their decision-making regarding both participants' expectations, coordination and compatibility (Fuentelsaz et al. 2015b). Specifically, in a study of the European mobile telecommunications industry it was found that firms' strategic initiatives regarding the management of platform participants (including entry timing and switching costs) were especially influential in these dimensions. As Fuentelsaz et al. (2015b) write, entry timing is important in markets with network effects as network value (defined as 'the value stemming from other consumers already using the product') increased with the time that a firm had been operating in the market. This is in line with the prevailing literature from industrial organization that as the result of early entry, firms will be able to determine the dominant design of a product (Arthur 1989) and influence the formation of users' preferences (Carpenter & Nakamoto 1989). Although switching costs have previously been shown to be used as a strategic tool in order to maintain the competitive advantage of a platform firm, switching costs have in some cases also been found to decrease the value of a network

by decreasing users' perceived utility from participation (Maicas et al. 2009).

2.3.2 Entry Timing

Regarding the timing of entry, industrial organization researchers' emphasis on the *level* of network effects in two-sided markets has motivated studies highlighting the importance of, in particular, early entry (McIntyre & Srinivasan 2017). Indeed, in addition to the traditional advantages that are associated with being a first-mover (Suarez & Lanzolla 2007), in two-sided markets it is thought that managers must additionally account for first-movers' advantages from gaining a lead in accumulating participants (whose affiliation generate positive direct and indirect network effects). Such a group of participants is typically referred to as an 'installed base' (Farrell & Saloner 1986, Kim & Kwon 2003). The presence of a large installed base of participants is generally thought to act as a signal that a given product exhibits some degree of long-term viability (Shankar & Bayus 2003), thereby reducing consumer concerns and assuring adopters that investments in learning (and potentially switching) will be beneficial (Brynjolfsson & Kemerer 1996). As the story goes, when the value of network membership is strong enough (i.e. network effects on one platform are sufficiently strong), a new entrant may be unable to attract adopters despite having a superior product, as consumers value an existing installed base more than the intrinsic (potentially superior) characteristics of a new product or service.

However beneficial first-mover advantages and early entry appear to be, strategic management scholars have also proposed the opposite hypothesis that early entry may be detrimental in two-sided markets, given that there are many examples of late entrants outselling incumbents (McIntyre & Subramaniam 2009). Among the more well-known examples of this phenomenon is Diner's Club, which although it was first to market with a "charge card" in 1949, remains a minor competitor to VISA and American Express which both entered the market for credit cards nine years later, in 1958 (Evans 2003). Similar stories may be told about the early social networks Friendster, Orkut and MySpace (which all lost out to Facebook) and the mobile operating systems Palm OS and Windows Mobile (which both lost out to iOS and

Android). Such examples are in keeping with the findings that very early entrants (much like very late entrants) run a higher risk of losing network battles (Schilling 2002). This unique danger of late entry in two-sided markets, the potential for "lock-out" occurs as the benefits of compatibility reaped by manufacturers, distributors and customers creates pressure for a single technology standard to be adopted (Farrell & Saloner 1985, Arthur 1989, 1994, Economides 1989). Schilling (2002) studied this phenomenon in the context of PC operating systems and video game hardware. Her findings were that the size of an installed base, availability of complementary goods, learning orientation and timing of entry may all significantly influence the likelihood of a platform or technology being locked out due to network effects. As we reviewed earlier, Fuentelsaz et al. (2015a) found that early entry timing was indeed positively correlated with higher network value in the European mobile telecommunications industry.

2.3.3 Network Size and Lock-In

Early entry and the signalling of future dominance are both strategies proposed by researchers to help raise participants' expectations about the future size of a platform firms' installed base. The assumption at the core of such strategies are in accordance with the prevailing wisdom emanating from the IO perspective, which has typically been that the level of network externalities is the main determinant of success for platform firms (Eisenmann 2006). According to the view, affiliation/participation on a platform (paying membership- or transaction fees) has been interpreted as positive signals that network effects are in place and so comparisons of competitive advantage (i.e. network effects) may be reduced to comparisons of the number or value of the transactions / interactions on the platform. As Afuah (2013) writes, *'rooted in neoclassical economics, network effects research has revolved around size, arguing that the more users a network has, the more valuable that network will be to each user'*. Strategic management researchers have however argued against the notion that the best estimate of a platform firm's competitive position in two sided markets is best represented by network *size* (Shankar & Bayus 2003), arguing that there must also

be a role for network *intensity*, defined as the 'relative value generated by network size for the participants' (Fuentelsaz et al. 2015a). One important implication of this view is that network effects may "*play an important and perverse role*" (Tellis et al. 2009) if it leads to outcomes where the services of dominant firms are not those of the highest quality. This was noticed early by Farrell & Saloner (1985) who write that "*it is plausible that the industry, once firmly bound together by the benefits of compatibility or standardization, will [only] be inclined to move extremely reluctantly to a new and better [platform] because of the coordination problems involved*".

As many users over the years have been dissatisfied with Facebook's offering, various new startup companies have periodically tried to overtake their dominance by offering competing services. A notable example was Path, a social networking firm that between 2010-15 raised over \$65 million from angel investors and venture capitalists to build a 'personal network' that was to be higher quality than Facebook's³. Path's product was differentiated from Facebook in that it limited the number of friends each user could have to 50, incentivizing the sharing of more personal photos and updates to smaller groups of actual acquaintances and relying on social capital to mediate negative network effects. At its height the service had 50 million users, versus Facebook's 1.5 billion⁴. The service was terminated in 2018 due to a lack of traction in the market, as reportedly for many users "*the majority of [their] friends weren't on Path. They were too busy posting on Facebook and Twitter*"⁵.

It is known that some platforms are perceived by users as being of higher quality than others (McIntyre & Srinivasan 2017)) and so that affiliation and participation on/with

³TechCrunch, 2014. 'Path Finally Closes That Elusive Series C'. Available at <https://techcrunch.com/2014/01/10/path-finally-closes-that-elusive-series-c/>

⁴TechCrunch, 2018. 'Mobile social network Path, once a challenger to Facebook, is closing down'. Available at <https://techcrunch.com/2018/09/17/rip-path/>

⁵Gizmodo, 2018. 'Path, the Doomed Social Network With One Great Idea, Is Finally Shutting Down'. Available at <https://gizmodo.com/path-the-doomed-social-network-with-one-great-idea-is-1829106338>

some platforms lead to stronger network effects than affiliation and participation on/with others. It is also known that the advantage stemming from an installed base is not sufficient in defending first movers' advantages if the preferences of participants is for higher-quality platforms (Zhu & Iansiti 2012). Related, Tellis et al. (2009) showed how quality differences manifested among adopters of consumer software applications for the Mac, DOS and Windows operating systems. Their findings were that both quality *and* network effects were important factors in determining which platform was dominant, adding however that 'quality is more important' (Tellis et al. 2009). The finding was duplicated in a separate investigation of the same industry, where quality was found to have a positive and significant impact on adoption, even after controlling for installed base size (McIntyre 2011). Zhu & Iansiti (2012) found that quality level is a necessary but insufficient condition for competitive advantage and that first movers 'may indeed drive out new entrants even if their quality is inferior'. As summarized by McIntyre (2011), "*effective strategy in network competition appears to center on the trade-off between early product releases (with the intent of establishing an early installed base) and later product releases (with the intent of improving the quality of the focal product)*".

A table of influential studies from the perspective of strategic management is provided in Table 2.3 below.

Authors	Year	Journal	Title	Methodology	Topics
Schilling, M.	2002	<i>Academy of Management Journal</i>	Technology Success and Failure in Winner-Take-All Markets: The Impact of Learning Orientation, Timing and Network Externalities	Empirical (Quantitative)	Entry, Quality
Kim, H-S. & Kwon, N.	2003	<i>Information Economics and Policy</i>	The Advantage of Network Size in Acquiring New Subscribers: A Conditional Logit Analysis of the Korean Mobile Telephony Market	Empirical (Quantitative)	Market Structure, Competition
Shankar, V. & Bayus, B.L.	2003	<i>Strategic Management Journal</i>	Network Effects and Competition: An Empirical Analysis of the Home Video Game Industry	Empirical (Quantitative)	Market Structure, Competition
Sheremata, W.A.	2004	<i>Academy of Management Review</i>	Competing Through Innovation in Network Markets: Strategies for Challengers	Theoretical (Formal model)	Entry, Incumbents, Innovation
Venkatraman, N. & Lee, C-H.	2004	<i>Academy of Management Journal</i>	Preferential Linkage and Network Evolution: A Conceptual Model and Empirical Test in the U.S. Video Game Sector	Theoretical (Formal model)	Entry, Coordination, Market Structure
Suarez, F.F.	2005	<i>Academy of Management Journal</i>	Network Effects Revisited: The Role of Strong Ties in Technology Selection	Empirical (Quantitative)	Quality, Market Structure

Authors	Year	Journal	Title	Methodology	Topics
Eisenmann, T.R	2006	<i>Strategic Management Journal</i>	Internet Companies' Growth Strategies: Determinants of Investment Intensity and Long-Term Performance	Empirical (Quantitative)	Entry
Lee, E. & Lee, J. & Lee, J.	2006	<i>Management Science</i>	Reconsideration of the Winner-Take-All Hypothesis: Complex Networks and Local Bias	Theoretical (Formal model)	Outcomes
Gawer, A. & Henderson, R.	2007	<i>Journal of Economics and Management Strategy</i>	Platform Owner Entry and Innovation in Complementary Markets: Evidence from Intel	Empirical (Qualitative)	Entry, Incumbents
Tellis, G. & Yin, E. & Niraj, R.	2009	<i>Journal of Marketing Research</i>	Does quality win? Network Effects Versus Quality in High-Tech Markets	Empirical (Quantitative)	Quality, Outcomes
Adner, R. & Kapoor, R.	2010	<i>Strategic Management Journal</i>	Value Creation in Innovation Ecosystems: How the Structure of Technological Interdependence Affects Firm Performance in New Technology Generations	Empirical (Quantitative)	Markets Structure, Innovation
Zhu, F. & Iansiti, M.	2012	<i>Strategic Management Journal</i>	Entry into Platform-Based Markets	Empirical (Quantitative)	Entry, Expectations
Afuah, A.	2013	<i>Strategic Management Journal</i>	Are Network Effects Really All About Size? The Role of Structure and Conduct	Conceptual	Market Structure, Governance
Cennamo, C. & Santalo, J.	2013	<i>Strategic Management Journal</i>	Platform Competition: Strategic Trade-Offs in Platform Markets	Empirical (Quantitative)	Outcomes
Kapoor, R. & Lee, J.M.	2013	<i>Strategic Management Journal</i>	Coordinating and competing in ecosystems: How organizational forms shape new technology investments	Empirical (Quantitative)	Firm Structure, Complements

Authors	Year	Journal	Title	Methodology	Topics
Chintakananda, A. & McIntyre, D.	2014	<i>Journal of Management</i>	Market Entry in the Presence of Network Effects: A Real Options Perspective	Conceptual	Entry
Fuentelsaz, L. & Garrido, E. & Maicas, J.P.	2014	<i>Strategic Management Journal</i>	Incumbents, Technological Change and Institutions: How the Value of Complementary Resources Varies Across Markets	Empirical (Quantitative)	Complements, Incumbents, Firm Structure
Boudreau, K.J. & Jeppesen, L.B.	2015	<i>Strategic Management Journal</i>	Unpaid Crowd Complementors: The Platform Network Mirage Effect	Empirical (Quantitative)	Openness, Governance, Complements
Fuentelsaz, L. & Garrido, E. & Maicas, J.P.	2015	<i>Journal of Management</i>	A Strategic Approach to Network Value in Network Industries	Empirical (Quantitative)	Expectations, Coordination
Jacobides, M.G. & Cennamo, C. & Gawer, A.	2018	<i>Strategic Management Journal</i>	Towards a Theory of Ecosystems	Conceptual	Entry, Market Structure

Table 2.3: *Influential papers from the strategic management perspective*

2.4 Conceptual Framework

A conceptual framework integrating the various theoretical perspectives introduced in the previous two sections is depicted in Figure 2.6. The figure incorporates topics and emphases from the two disjoint literature streams of industrial organization and strategic management to illustrate how the various theoretical constructs relate to the topic of entry in two-sided markets.

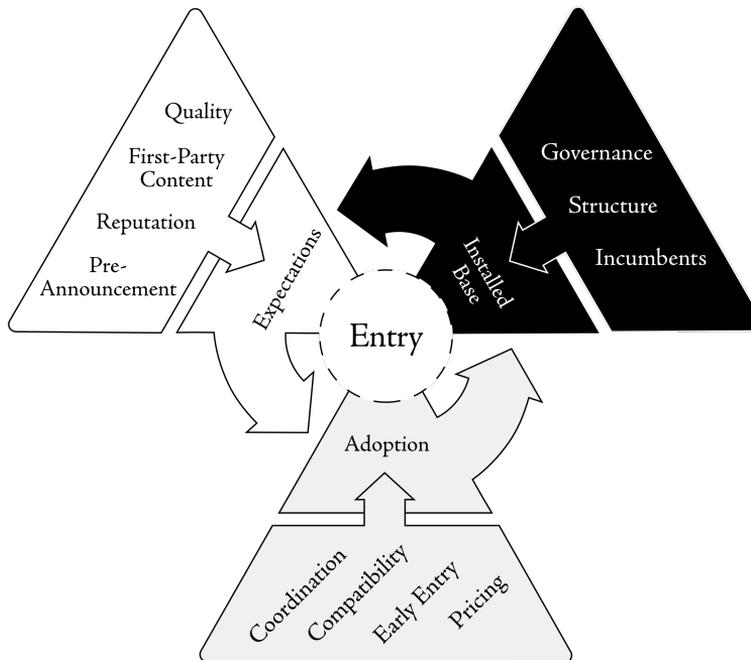


Figure 2.6: *Conceptual framework integrating extant perspectives on how entry occurs in two-sided markets*

The overall research question addressed in this dissertation ("*How can managers of platform firms strategize to successfully enter two-sided markets?*") is mainly positioned to contribute to the nascent body of literature on platform strategies in two-sided markets within strategic management research. In particular, the various contributions of the research papers included in Part II regard managerial questions of strategic positioning at the firm level. In addition are contributions presented in

Chapter 3 and 5 which mainly regard the usefulness of conceptual modelling and the dangers of deductive reasoning in the absence of empirical verification within industrial organization.

Overall, as depicted in Figure 2.7, the contributions of the four papers included in the dissertation build on observations in the form of interviews with managers and statistics about consumer perceptions. The findings of the four papers each contribute empirical findings and hypotheses to the cover essay, which as a whole builds on and adds to the (mostly) disjoint research streams within IO and SM on the dynamics of platform entry in two-sided markets. The first paper, in addition to contributing findings to the cover essay, also motivated the third paper, whose findings and discussion constitute a significant part of the argument presented in Chapter 5.

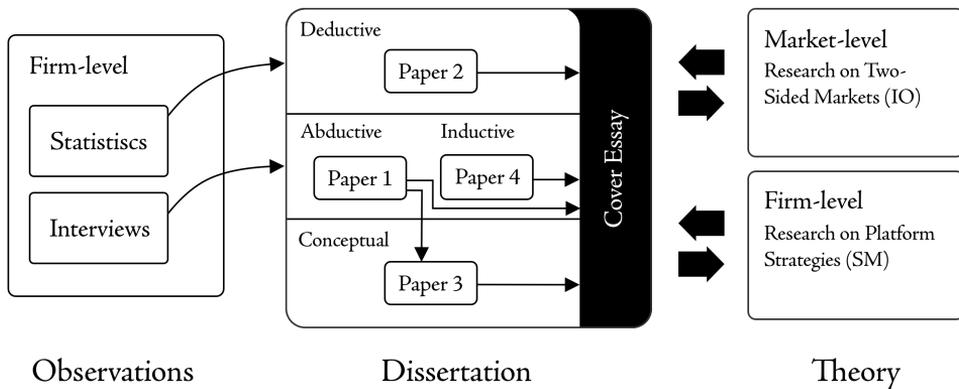


Figure 2.7: *The relationship between observations, the four research papers, the cover essay, and extant theoretical perspectives*

However, given that the findings of the dissertation as a whole both builds on and inherits findings, assumptions and traditions from industrial organization literature, the dissertation also has a relationship with this research stream. In particular, this applies to the methodological perspectives presented in Chapter 3 and the propositions presented in Chapter 5 as well as their implications for future research.

2.5 Gaps and Contributions

Table 2.4 summarizes the gaps in extant literature that each of the four research paper addresses, as well as the contributions that emerged from the studies that were conducted.

Research Paper	Research Question	Research Gaps	Contribution
<i>The Dynamics of Entry for Digital Platforms in Two-Sided Markets: A Multi-Case Study</i>	How do managers of nascent digital platforms in two-sided markets strategize to recruit early suppliers?	<ul style="list-style-type: none"> The role of firm-level strategies Lack of heterogeneity in extant studies Indirect network effects treated as 'black-box' in extant studies 	<ul style="list-style-type: none"> Empirical grounding for theory-driven hypotheses. New perspectives on platform quality and the role of demand
<i>Value Perceptions of First-Party Content on Multi-Sided Platforms</i>	How do consumers perceive the value of first-party content as compared to equivalent third-party alternatives?	<ul style="list-style-type: none"> First-party content treated as substitute for third-party participation in extant studies. Empirical grounding for theoretical predictions 	<ul style="list-style-type: none"> First-party content found to be an imperfect substitute to third-party participation Implications for managers looking to pursue content-based entry strategies
<i>The Role of Innovators in Two-Sided Markets</i>	How does the introduction of innovators influence early adoption to platforms in two-sided markets?	<ul style="list-style-type: none"> Adopter preferences are assumed to be homogeneous 'chicken-and-egg problem' is assumed to be endogenous Platform adoption is assumed to depend solely on level of network effects 	<ul style="list-style-type: none"> Conceptual model explaining how entry is possible in the absence of network effects Emphasis on the role of technology factors
<i>From Product to Platform: A Case Study of Popton</i>	What are the enabling factors for managers to successfully leverage an existing value proposition to permit entry in a two-sided market?	<ul style="list-style-type: none"> The dynamics of the 'single-side first' strategy The role of firm-level strategies 	<ul style="list-style-type: none"> Empirical grounding for theory-driven hypotheses. New perspectives on platform entry and enabling factors

Table 2.4: *Summary of identified research gaps and contributions included in the research papers*

2.6 Limitations of Extant Research

The dynamics of entry in two-sided markets in the presence of network effects has been studied across multiple settings by both economists and management scholars over the last twenty years. Selected papers featuring many of the most important findings of this literature stream is included in Tables 2.2 and 2.3. Despite this progress, a number of ambiguities and limitations still remain before the field is capable of providing a comprehensive and robust understanding of entry dynamics (McIntyre & Srinivasan 2017). We may subdivide the most commonly-cited limitations of extant research into three categories:

1. *Methodological limitations*, such as over-simplified and unrealistic assumptions, emphasis on static as opposed to dynamic studies and so on;
2. *Theoretical limitations*, such as lacking conceptualization of observed phenomena;
3. *Empirical limitations*, such as lacking empirical grounding for unverified hypotheses and lacking empirical verification of proposed unverified phenomena;

In the following subsections the main limitations of each of the three types are outlined. While not exhaustive, the overview is meant to sufficiently highlight the main limitations as they relate to the research included in this dissertation.

2.6.1 Methodological Limitations

Methodological limitations are at the heart of many of the most prominent theoretical and empirical limitations of extant research. Many of these limitations stem from assumptions which are taken for granted (in particular) in the industrial organization perspective, such as (McIntyre & Srinivasan 2017):

- Positive network effects, the 'chicken-and-egg' problem and winner-take-all outcomes are generally assumed to be exogenous and constant factors;
- Network effects are assumed to be dichotomous, either present or absent;

- Indirect network effects are assumed to be a "black-box";

Of course, in many cases such assumptions are necessary in order to make new discoveries. However, until such assumptions are either verified or further examined, the topic of entry in two-sided markets is likely to remain mysterious. For instance, as long as positive network effects are assumed to be exogenous, we will lack the ability to measure how network effects accumulate over time. This eliminates any hope of trying to explain how platform firms' competitive advantages are achieved (Barney 1991) and retained over time (Rumelt 1984). Similarly, until theoreticians are able to more accurately measure and model the strength and *intensity* (Fuentelsaz et al. 2015a) of network effects, we will remain unable to accurately study their influence on competitive advantage relative to other forces such as demand, preferences and competition (Tellis et al. 2009). Finally, as a result of the three assumptions above, studying indirect network effects solely through market outcomes effectively excludes the option of strategic positioning, and so the role of managers which we know from extant studies play an important part (Gawer & Henderson 2007).

2.6.2 Theoretical Limitations

Although theory development is seemingly the area where extant literature has made the most progress, theoretical limitations still remain prominent obstacles to our understanding of platform entry in two-sided markets. In particular, for the purposes of this dissertation, the following theoretical limitations stand out:

- The role of firm-level strategies remains unresolved;
- Participants and the contexts platforms operate in are treated as homogeneous;
- Platform adoption is assumed to depend solely on the level of network effects;

As much of extant research has been conducted from a market-level perspective, the field still lacks an integrated view which incorporates the perspectives of strategic management research and so allows for the influence of firm-level strategies (McIntyre et al. 2020). This should be considered a considerable limitation to how the field

has evolved, and perhaps even a fundamental limitations to future developments on the topic. Whereas IO researchers often lack empirical grounding for both their hypotheses and hypotheses, SM researchers still lack sufficient theoretical development that is able to incorporate existing findings in a comprehensive and explanatory way. Important exceptions include Sun & Tse (2009)'s effort to model network effects as isolating mechanisms (Rumelt 1984) and the early work of Shankar & Bayus (2003) on competitive advantage in two-sided markets. Whereas SM researchers' theories in principle allow for heterogeneity among both providers and platform contexts, this has received little attention in extant theoretical work. In the context of discussions on pricing strategies, IO researchers have pointed out that heterogeneity in consumer preferences may be a source of price differentiation in two-sided markets (Weyl 2010). However, these efforts too have yet to yield actionable insights with managerial implications for entrants in two-sided markets. Finally, as "*the literature on two-sided markets could be seen as a subset of the literature on network effects*" (Rysman 2009), the implicit assumption that network effects is the key driver of successful entry in two-sided markets should—at the very least—be further investigated empirically before being incorporated as a tenant of platform theory.

2.6.3 Empirical Limitations

Finally, as a function of both methodological assumptions and theoretical predictions, the progress of empirical work on entry in two-sided markets too remains limited. At a very basic level,

- Many unverified theory-driven hypotheses remain unexplored;
- Theoretical predictions often lack sufficient empirical grounding to warrant researchers' further attention;
- The characteristics and dynamics of many if not most of the commonly cited phenomena in extant research remain unexplored;

Whereas plenty of theoretical progress has been made on, in particular, *pricing strategies*, *the implications of strong network effects* and *competition* on market

outcomes, the findings of such studies still largely remain unverified empirically. Such findings must in other words be caveat with the limitation that they may not represent accurate depictions of the real world, and be in need of further revision before implications for managers and policy makers can be made. Similarly, theoretically-derived hypotheses which have yet to be measured through deductive empirical studies should too be caveat with the potential limitation that they do not in fact manifest in the world. Beyond these rather fundamental limitations, there simply hasn't been a sufficient number of good empirical studies to help us understand what the characteristics and dynamics of entry are in two-sided markets, such that we may differentiate them from traditional entry. McIntyre et al. (2020) for instance makes the point that although extant research—as a function of its methodological limitations—has tended to assume that incumbent firms are at a considerable advantage to new entrants, anecdotal evidence appears to suggest that *"pioneers often pave the way for the subsequent success of later entrants"*. If true, this would radically alter our understanding of both entry and competition in two-sided markets and effectively require the formulation of completely new theories. However, lacking such studies, the point remains anecdotal and so seemingly impenetrable.

3 Methodology & Research Design

This chapter outlines the main methodological approaches employed in the research that culminated in this dissertation. In particular, the motivations and objectives of the research are described in Section 3.1 in order to help the reader grasp the origin and intended scope of the work. Epistemological and ontological questions are tackled in Section 3.2, which regards the philosophical stance on which the dissertation is based. Section 3.3 introduces the various influences and positions that oriented the work, and Section 3.4 provides an overview of the various research designs employed. Finally, some of the most important limitations and challenges of the work is presented in Section 3.5.

3.1 Motivations and Objectives

In the broadest sense, the motivation for the research that culminated in this dissertation may be described as phenomena-driven. From there, the path from phenomena lead to a theoretical investigation, which—as will be outlined below—culminated in three empirical and one conceptual study. These studies are included in their entirety in Part II of the dissertation, and in summarized form in Chapter 4.

The phenomena which initially sparked interest was the observation that in the early twenty-first century, many traditionally undifferentiated industries appeared to be consolidating around one or a handful of technology companies. Examples of such industries include *advertising*, *communications*, *lodging/accommodations*, *transportation* and *commerce*. Moreover, in many cases this phenomenon appears to have occurred not as a function of resources-based competitive advantages (in the traditional sense), but rather as a consequence of strategic maneuvering. Prototypical examples of the phenomenon at the time of the writing of this cover essay are ride-sharing platforms Uber and Lyft in the transportation industry and Airbnb in the lodging/accommodations industry.

As is true for most research, the phenomena described above may be investigated through a variety of different theoretical and methodological 'lenses'. From a macroeconomic perspective, for instance, technology-driven consolidation in traditional industries as a consequence of the emergence of platform firms in two-sided markets has clear implications for labour and unemployment. Increased demand for transportation services such as those offered by Uber and Lyft has obvious implications for the demand of taxicabs. Facing less demand, providers of taxi services may need conduct layoffs. When viewed as a trend in the economy as a whole, increased unemployment has macroeconomic consequences. Similarly, the emergence of lodging/accommodation alternatives such as those offered by Airbnb accompanies implications for property rights and zoning laws. From the perspective of property law, although a host is legally the owner of their apartment, that apartment may be located in an area not properly zoned for accommodation services. As such, the entry of platform firms in two-sided markets similarly challenges our preconceived notions of where the distinctions between businesses and residences are, and how the laws that enforce such distinctions should be reinforced.

From the firm-level perspective, the question of *how* new entrant firms are able to enter and ultimately dominate traditional industries—such as those mentioned above—is a natural one to ask. As outlined in the previous chapter, one may go about trying to answer the question in at least two ways: by investigating the market the firm operates in (as is the custom in the field of industrial organization) or by investigating the firms themselves (as is the custom in strategic management). This cover essay aims to investigate the phenomenon from a position at the nexus of both fields. This because the dissertation as a whole has two primary objectives, one of which may be regarded as theoretical and the other methodological. The theoretical objective is that which is addressed by the research question, which regards the dynamics of entry for platform firms in two-sided markets. In spite of how the question is phrased, the goal was never to try to fulfill this objective by

providing an exhaustive answer. Rather, the goal was to provide nuance and fresh perspectives—both empirical and theoretical—to try to shed new light on a nascent phenomenon in order to stimulate further progress towards the ultimate goal of being able to provide such an answer. The methodological objective has been to highlight the constructive role of inductive and abductive studies for theory-building. That is, the cover essay in particular aims to convey to the reader what the nature of the challenges are for extant research, including such challenges' origins and potentially limiting implications. As a whole, the dissertation thus has two intended audiences:

1. **Managers**, for whom the research papers in particular aim to provide qualitative and quantitative findings which hope to provide nuance, structure and actionable implications;
2. **Researchers**, for whom the cover essay in particular aims to initiate a discussion on the state of research in two-sided markets. In particular, the cover essay argues that there is a need for an epistemological debate regarding the role of formal models vs. empirical and (in particular) inductive/abductive studies;

3.2 Philosophy of Science

The central discussions of ontology and epistemology in this dissertation largely regard the uses of explicative versus ampliative methods of reasoning and what their role can and should be in the social-scientific process (Johnson 1996, Fann 2012). In the process of outlining this argument, however, it is first necessary to establish its philosophical basis.

Ever since its eighteenth-century inception, the science of economics has been methodologically controversial (Hausman 1994). In a sense, the question 'What is the goal of economics?' succinctly summarizes what has become a main point in this debate, as—unlike in the natural sciences—a suggested answer such as 'to make accurate predictions' does not necessarily suffice. As early as in John Stuart Mill's 1836 methodological essay *On the Definition and Method of Political Economy*,

attention is paid to the notion that the conclusions economists draw should be treated cautiously 'because so much is left out of their theories'. As a field of study, Mill described economics as 'hypothetical', 'a science of tendencies whose influence may be overwhelmed by inferences' (Hausman 1994). As he wrote (Mill 1836):

"If indeed every phenomenon was generally the effort of no more than one cause, a knowledge of the law of that cause would, unless there was a logical error in our reasoning, enable us confidently to predict all the circumstances of the phenomenon. [...] If the causes of erroneous conclusions were always patent on the face of the reasonings which lead to them, the human understanding would be a far more trustworthy instrument than it is. But the narrowest examination of the process itself will help us little towards discovering that we have omitted part of the premises which we ought to have taken into our reasoning."

Unlike the natural sciences and most of the rest of social science, economic theorizing relies mainly on models, which 'unlike natural laws or theories are to be manipulated, explored and modified' (Hausman 1994). Controlled and ideal representations of a hyper-rational world, such models depict 'simplified and isolated settings which usually cannot be reproduced empirically' (Mäki 1988). Although it is sometimes appropriate to ask whether parts of such models are true or false, economists more often assess models in terms of their 'fruitfulness or usefulness' (Hausman 1994). Given this tendency, from an epistemological perspective one might then expect that economics as a science would proceed in accordance with the tradition of *pragmatism*, seeking to clarify meanings and looking mainly to anticipated consequences which are based on values and visions of human action (Cherryholmes 1992). Researchers in economics would then pay close attention to the research literature in order to uncover the 'opportunities and constraints it suggests', as well as its 'conceivable practical consequences' which for a pragmatist serves as the basis for organizing future observations and experiences (Cherryholmes 1992). This is however far from how economics as a field has evolved.

Rather, as philosopher of economics Daniel M. Hausman puts it "*economists*

often explore the implications of perfect rationality, perfect information and perfect competition, without immediate concerns about empirical application or testing". That is, although economists in principle are said to design and assess economic models in terms of their 'fruitfulness or usefulness', little or no attention is often paid to how such models apply to the real world. Instead, rather, economists form claims about the real world *using* models, by 'asserting that the predicates that models constitute or define are true or false of systems of things in the world' (Hausman 1994). One such predicate might be 'Such and such is a two-side market if and only if ...', as opposed to a more general claim such as 'Two-sided markets are markets in which such and such ...'. The benefits of the predicate view of epistemology are mainly technical and for the means of formulating new concepts. As is the view of proponents of *positive* economics, the ultimate goal of studying economics is indeed *"the development of a 'theory' or 'hypothesis' that yields valid and meaningful predictions about phenomena not yet observed"* (Friedman 1953).

3.2.1 Scientific Realism

Regarding ontology and epistemology, this dissertation takes the view that the goal of research should be to, in addition to formulating *"meaningful predictions about phenomena not yet observed"* (Friedman 1953), also make strides towards explaining phenomena which *have* been observed. As such, the dissertation pursues a realist point of view, attempting to describe what has been observed without artificially or speculatively adding assumptions and/or extrapolating constructs beyond their reasonable limits (House 1991).

One definition of *scientific* realism is as a school of thought which holds that science *"in addition to helping people make accurate predictions, should also discover new truths about the world and explain phenomena"* (Hausman 1994). According to this view, the goal of conducting science is hence to discover truths. Beliefs may be considered true if sufficient evidence justify such claims, and revisions and corrections of formerly believed truths are recognized as imperative for the growth and improvement of scientific knowledge. Another definition of scientific realism, posed

by Bas C. van Fraassen (1980) is the position that *"scientific theory constructions aim to give us a literally true story of what the world is like, and that acceptance of a scientific theory involves the belief that it is true."* Many other definitions surely exist, each of which emphasizes different aspects and nuances. Indeed, the likely case is that there are no good shorthand definitions (and indeed no single non-disjunctive definitions, whether short or long) that accurately describes what scientific realism in its broadest form may entail (Mäki 1988). Rather, realism in general is perhaps best described in terms of its ontological and epistemological claims, which although not exhaustive, provides a sufficient overview for the purposes of this cover essay.

An ontological doctrine of realism may be expressed in the general form of the statement 'X exists' or 'X is real'. As such, substituting for the variable of X concepts such as "universals", "particulars", "material entities" or "the entities of scientific theories", obtains various realist doctrines of ontology such as Platonic realism, nominalism, commonsense realism and scientific realism, respectively (Mäki 1988). A key difference between scientific realists and pragmatists is that the former believes in the objective truth of existence, whereas the latter seeks mainly to clarify meanings and look for consequences (Cherryholmes 1992).

The ontological meaning of realism is generally considered the traditional and primary one. It may however additionally be complemented by an epistemological dimension which can similarly be expressed as 'X is knowable', implying that humans have epistemic access to X such that there is no *"veil separating the cognitive subject and the existing subject"* (Mäki 1988). A shared view of all realists is *fallibilism*, the view that knowledge claims are in principle fallible, and indeed that the resolution of most ontological and epistemological inquiries is up to future science. Like pragmatists, scientific realists agree that scientific research always occurs in social, historical, political and other contexts (Cherryholmes 1992). Unlike pragmatists, scientific realists allow for the possibility of explaining the world by *"discovering more complex layers of reality to explain other levels"* (House 1991). As such, realists disagree with pragmatists that we can never be quite sure if we are reading 'the world' or reading 'ourselves'.

3.3 Influences and Positions

"In their anxiety to be scientific, students of [economics] have often imitated the latest forms of sciences with a long history, while ignoring the steps these sciences took when they were young. They have, for example, striven to emulate the quantitative exactness of natural sciences without asking whether their own subject matter is always ripe for such treatment, failing to realize that one does not advance time by moving the hands of the clock." – Solomon Asch (1987)

The above paraphrased criticism—although originally aimed at researchers in modern social psychology—I believe, also resonates well when considered in the context of much of the literature at the foundation of platform research. In particular, the criticism should—in my view—be taken to heart by researchers who claim to be conducting research with managerial implications, without ever bothering to talk to managers first-hand or at least, citing other researchers who have. To again paraphrase Asch: *"Because physicists cannot speak with stars or electric currents, [economists] have often been hesitant to speak to [managers]."* — Solomon (Asch 1987, p. 14-15).

The analogy between physics and neoclassical economics has indeed arguably been influential to the development of the theory (Becchio 2020). Both fields' epistemological basis may be summarized by the assumption of the existence of what Paul Samuelson referred to as 'operationally meaningful theorems' which may be unified by a 'general theory' (Samuelson 1947). By an operationally meaningful theorem is meant *"a testable hypothesis about empirical data which could conceivably be refuted, if only under ideal conditions"*. Although economics has been methodologically controversial from its outset (Hausman 1994), the field has in more recent years made considerable strides towards modernisation. In particular, the acknowledgement of the limitations of the neoclassical tradition through the embracing of bounded rationality (Simon 1957) has been an important step in this process. However, such progress notwithstanding, much work no doubt still remains before managers can comfortably rely on economic modelling as their main tool

for strategic understanding and decision making. Indeed, economists themselves acknowledge this limitation (Tirole 1988): *"Industrial organization has become a fairly theoretical field in recent years. At first sight even a theorist should regret the very high ratio of theory to evidence in a field in which theoretical models are often lacking in generality and in which practical implications are so crucial"*.

Generally, neoclassical economic theory is predicated on the logic of economic efficiency as a selective force that determines the long run survival of a firm (Friedman 1953). In this view, firms are assumed to be rational with an overriding objective of allocating scarce resources to alternative ends in such a way as to maximize profits (Lado et al. 1992). Central to the assumptions of rational choice theory (Scott 2000) at the theory's core is the premise that *"the aggregate behavior in society reflects the sum of the choices made by individuals. Each individual, in turn, makes their choice based on their own preferences and the constraints (or choice set) they face"* (Coleman & Fararo 1992). Whereas the manager of a two-sided platform may view him or herself as an integral part of the firm (whose skills and competencies are invaluable to its success), in the formalized models of neoclassical economics managerial competences are implicitly reduced to elements of labor input whose value is realizable only in combination with other factors of production (Lado et al. 1992). To add insult to injury, a consumer in this paradigm is viewed not as person but rather as a 'perfectly rational agent' the so-called *homo economicus*, 'economic man', once described by prominent economist and sociologist Thorstein Veblen as:

"A lightning calculator of pleasures and pains, who oscillates like a homogeneous globule of desire of happiness under the impulse of stimuli that shift him about the area but leave him intact. He is an isolated, definitive human datum, in stable equilibrium except for the buffets of the impinging forces that displace him in one direction or another." – Veblen (1898)

Researcher Richard Rumelt later summarized some of the most common critiques of neoclassical economics (in the context of management research) with the statement:

"Neoclassical theory fails to provide a basis for understanding firm-level strategic

behavior as it assumes away such phenomena as transaction costs, limits on rationality, technological uncertainty, constraints on factor mobility, informational asymmetries, consumer and producer learning, and dishonest or foolish behavior of the firms' key actors." – Rumelt (1984).

3.3.1 The Dangers of Deductive Reasoning

Whereas many social scientists aim to provide understanding 'from the inside', as it permits them to empathize with the agents and find what happens 'understandable' (Weber 1949), economists describe two distinct worlds and so two distinct types of 'agents'. In one world, 'the world inside the model', theory may be derived from assumptions and more theory from extant theory. The (seemingly) anecdotal observations of Katz & Shapiro (1985) and Farrell & Saloner (1985) which are conceptualized and formalized in their papers lead to the formulation of theoretical predictions which are later confirmed by empirical studies. However, examples also abound of the former occurring without the latter, as summarized in Jean Tirole's statement above about the state of the field of industrial organization. Indeed, the origin of platform research itself was arguably Tirole and his collaborator Rochet's theoretical observation that two streams of research (network externalities and multi-product pricing) together *might* describe a separate phenomenon which *may* be found in the 'real world'. Having briefly and anecdotally argued this position in their 2003 paper, they go on to state that "*platform owners or sponsors in these industries must address the celebrated 'chicken-and-egg' problem and be careful to "get both sides on board."* (Rochet & Tirole 2003). Unfortunately, little emphasis is placed by the authors on verifying these and other claims, apart from anecdotal discussions about various industries. As such, many claims from deductive studies within industrial organization remain mere 'ivory-tower prescriptions' (Meredith 1993) in the sense that they may or may not depict accurate descriptions of reality. This fact, however, appears to have had little influence on the (claimed) theoretical progress of the field, which seventeen years later is abound with theoretical, unobserved predictions featuring economic models at their core, some of which are included in the literature

presented in Chapter 2.2. A pessimistic interpretation of such deductive processes of theory formation may be summarized as follows (Figure 3.1):

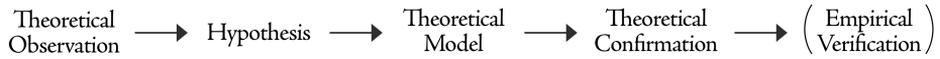


Figure 3.1: *A deductive process of theory formation*

The primary danger of such a deductive process of knowledge formation is that the last step (which brings implications out of the 'world inside the model' to the 'real world') "*lies beyond the scope*" of the studies included in such papers and thus may be omitted or postponed in favor of further theoretical development. "*The research in the field [then] iterates between explanation and testing; hence the term 'theory-testing research'. The result is that research 'findings' become more and more disconnected from the real world and irrelevant to the reality of the problems facing managers*" (Meredith 1993). Absent empirical verification, the foundations of the field thus become vulnerable to gradually growing "porous" or "hollowed-out", as future empirical work may disagree with accepted hypotheses based on which new hypotheses may later have been posed.

The key to avoiding such a dysfunctional deductive research methodology is hence to ensure at each step in the theory formation processes that the hypotheses, assumptions, limitations and findings of the studies—to the best extent possible—are in agreement with observation, both *ex ante* and *ex post* (Jacquette 2007).

3.3.2 The Limitations of Inductive Reasoning

Whereas deductive reasoning is an example of employing explicative inferences where conclusions follow from premises *necessarily*, inductive reasoning is an example of employing ampliative inferences where conclusions do not necessarily follow from premises (Fann 2012). Thus, unlike explicative conclusions, ampliative conclusions amplify rather than explicate what is stated in the premises (Peirce 1958).

According to a realist view, one might argue that deduction cannot in a systematic and credible way lead to reliable knowledge discovery if conducted in the absence of prior induction. That is, if we are interested in determining what *is*, we first must go through the exercise of observation in order to formulate claims about what we believe *might be*. In some cases anecdotal observations, so-called 'war stories' (Meredith 1993) may be sufficient evidence to motivate deductive studies. However, with each step such processes run the risk of *non sequitur*, 'the deductive fallacy', where the next step 'does not follow' from the former (Jacquette 2007) and so the dangers of a dysfunctional process such as that outlined above.

Unlike deductive reasoning, inductive reasoning thus begins in the real world, as depicted in Figure 3.2:



Figure 3.2: *An inductive process of theory formation*

The virtues of inductive reasoning are hence that such processes start 'from within', and aim not to immediately derive a theory which describes an observation, but rather, to derive a hypothesis from which further inductive *and* deductive studies may be based. That is, inductive studies only claim to provide a theory of what has been specifically observed rather than what is. Inductive reasoning thus avoids the danger of 'ivory-tower prescriptions' (Meredith 1993) because the phenomenon being researched begins 'on the ground' with specific examples (rather than with a rule, which later requires *ex post* empirical verification) (Reichertz 2013).

The primary limitation of inductive reasoning is that inferences made solely based on specific observations are necessarily lacking in predictive power because they are made based on what is observed, not on what is *not* observed but may still be either 1. True, and observable; or 2. True and unobservable. How to derive rules from inductive reasoning given this limitation is the essence of David Hume's famous problem of induction:

"If a body of like color and consistency with that bread with which we have formerly eaten be presented to us, we make no scruple of repeating the experiment and foresee with certainly like nourishment and support. Now this is a process of mind or thought of which I would willingly know the foundation." – Hume (1999)

The power of deductive reasoning, including in neoclassical economics, is its ability to generate theories which predict phenomena prior to their needing to be observed. As Friedman wrote, *"the ultimate goal of a positive science is the development of a 'theory' or 'hypothesis' that yields valid and meaningful predictions about phenomena not yet observed"* (Friedman 1953). As we know, many real phenomena cannot be observed directly without knowing what we are looking for. Einstein's theory of general relativity could not have been established when it was, for instance, from inductive reasoning. This because the first observation of the theory's implications 'in the real world' was the deflection of starlight by the Sun due to the anomalous perihelion advance of the planet Mercury by Arthur Eddington in 1919. In that instance, theoretical *deduction* lead to predictions which motivated astronomers to point their telescopes towards a phenomenon which could empirically verify that the theory had explanatory power. Without a prior theory, astronomers would neither have known what they were looking for, nor where to look for it.

3.3.3 The Virtues of Abductive Reasoning

Abductive reasoning is a third logical inference form, advanced most prominently by philosopher Charles S. Peirce (Fann 2012). Sometimes referred to as 'inference to the best explanation' abductive reasoning begins with (admittedly) incomplete observations, based on which the simplest and most likely conclusion is drawn. The process of abductive reasoning may thus be depicted visually as follows:



Figure 3.3: *An abductive process of theory formation*

In accordance with the principle of Occam's Razor (Blumer et al. 1987), it is the abductive reasoner's view both that *entia non sunt multiplicanda praeter necessitate* ('entities are not to be multiplied beyond necessity') and *frustra fit per plura quod potest fieri per pauciora* ('in vain is that explained by many things which can be explained by fewer things'). Proponents of Occam's Razor in other words advocate for simplicity and parsimony, i.e. that when presented with competing hypotheses about the same prediction, one should select the solution with the fewest assumptions (Ariew 1976). Credited to William of Occam in the Middle Ages, the argument of Occam's Razor has been shown to—under very general assumptions—produce hypotheses that will with high probability be predictive of future observations (Blumer et al. 1987). The removal of metaphysics from science by Leibniz and Newton is also credited to their adoption of Occam's principle (Becchio 2020). Epistemically, we may define Occam's Razor as follows: if a theory T is simpler than a theory T*, then it is rational, *ceteris paribus*, to believe T rather than T*. The justification for such a principle, based on simplicity, has been argued in many ways going back to post-medieval theological debates over the existence of God. Indeed, even in neoclassical economics Occam's Razor has arguably been employed regularly in the development of theoretical concepts, both an epistemic tool and a methodological principle (Becchio 2020). Examples of the former is perhaps most notably found in Paul Samuelson's revealed preference theory (Samuelson 1938, 1948) and in Milton Friedman's concept of positive economics (Friedman 1953). Specifically, when viewed simply as a logical tool, Occam's Razor can also be found in economists' assumptions, such as 'an economic agent is assumed to be able to rank her preferences, which are transitive, complete and convex', or 'given a budget constraint, an agent maximizes his utility function in order to achieve optima' (Becchio 2020). Although far from simple to employ in practice, such assumptions are in a sense the least complex assumptions necessary to make (for instance) general equilibrium theory operational.

3.3.4 An Integrated, Mixed-Method Approach

In this dissertation, elements of both induction, abduction and deduction are integrated in a mixed-method approach which aims to combine the virtues of each process in a complementary manner. The suggested approach begins with real-world observations, which form the basis for inductive, hypothesis-generating studies. Such hypotheses are next tested in deductive studies, whose findings form the basis for conceptual modelling. Such models are next explored and their implications employed to help explain further observations, which form the basis for new, more targeted inductive studies and so on. An overview of the benefits of mixed-method approaches is provided in Fetters et al. (2013). The helical structure of the methodology employed in this dissertation is depicted in Figure 3.4.

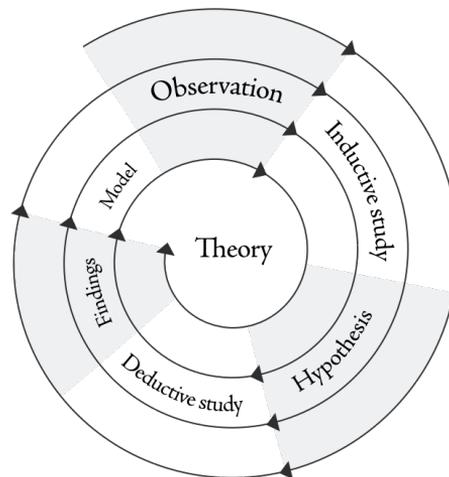


Figure 3.4: *An integrated, realist-oriented theory-formation process. Adapted from Meredith (1993).*

In the dissertation, the fourth paper is an example of an inductive study in that it consists of empirical observations in a longitudinal data set collected over the period of over a year from multiple informants regarding a specific, single-case study investigating the real-world phenomenon of successful platform entry. Although in no way claiming to be conclusive in its findings, the study provides a basis for

amplified inferences which, when stated as hypotheses, may be further explored in future deductive research. The second paper is an example of such a deductive study. Although concerning different hypotheses than those derived from the fourth paper, the second paper from a combined theoretical and empirical basis tests a specific hypothesis which has been observed both in theoretical (e.g. Hagiú & Spulber 2013) and empirical studies (paper 1).

The first paper employs a mixture of the two processes in an abductive study—which aims to observe and describe the real world—but which also contrasts its findings with extant theory to provide the 'best explanation with the fewest assumptions' (Becchio 2020). Contrasting these three empirical papers, the third paper provides a conceptual model which aims to better explain the observations of the first paper such that future studies may be informed by both new observations and theoretical predictions.

3.4 Research Design

As described above, this dissertation as a whole employs a mixed methodology as both empirical and conceptual, quantitative and qualitative studies are included. The motivation for choosing a mixed methodology is that it allows researchers to integrate qualitative and quantitative data in order to both inform and test hypotheses and findings (Fetters et al. 2013). The following subsection provides an overview of the research designs employed in the studies.

3.4.1 Empirical Research

The empirical findings of the research emerged largely from data gathering in two disjoint empirical contexts which may be roughly categorized as 'start-up technology firms in Norway' and 'an e-commerce platform in the United States'. The former context regards the environment in which the qualitative data was collected (the first and fourth paper) and the latter context regards the environment in which the quantitative data was collected (the second paper).

	Research Design	Observations	Sampling Approach	Data	Method of Analysis
1	Multi-case study	10 firms Firm-level	10 semi-structured interviews with 11 managers and financial data	10 hours of interviews	"Gioia-method" (Gioia et al. 2013)
2	Paired student's t-tests	500 products Consumer-level	Data scraping, 13 variables per product	Three measurements 19,500 data points	Student t-tests (Mara & Cribbie 2012)
3	Diffusion Model	Conditional statements Firm-level	N/A	N/A	"Bass Model" (Bass 1969)
4	Single-case study	Poption AS Firm-level	11 semi-structured interviews with 4 managers	8 hours of interviews	"Gioia-method" (Gioia et al. 2013)

Table 3.1: *Research design and descriptions of the four studies*

All of the qualitative observations were collected from start-up technology companies in Norway. In this context, 15 managers of eleven companies were interviewed, most of which held the title of co-founder (meaning they owned equity in the company) and the majority of which also held the title chief executive officer (CEO). The firms were founded in the years from 2012 – 2017 and all maintained offices in Oslo, Norway. As of 2019, their numbers of employees ranged from 3-49 and their yearly revenue from 1 – 59 million Norwegian kroner. One company (Konsus, later Superside) was incorporated in the United States and thus not required to disclose their number of employees and revenue to the Norwegian tax authority from which such data was acquired. An overview of the eleven companies is provided in Table 3.2.

The first paper describes a qualitative, exploratory multi-case study of ten start-up technology companies from Norway. Data for the study was collected in the period December 2017 – February 2018 in Oslo, Norway. The manager of each company was interviewed in person. Data analysis was conducted according to the so-called Gioia-method of data analysis (Gioia et al. 2013). The fourth paper describes a similar exploratory and qualitative case study, but in this case of the start-up

Firm	Founded	Industry	Employees as of 2020	Revenue as of 2019	Informant(s)
Graphiq	2015	Graphic Design	10	9 700	COO
Konsus***	2016	Graphic Design	–	–	CEO, COO
LearnLink	2014	Education	8	4 100	CEO
Nabobil	2015	Transportation	16	45 600	CEO
NyBy	2015	Public Sector	7	2 600	CEO
Poption	2017	Recruiting	5	1 200	CEO, CPO, CTO
TikkTalk	2016	Translation	6*	6 100*	CEO
Tise	2014	Marketplace	20	10 700	CEO
Uninite**	2016	Accommodations	3	2 200	CEO
WeClean	2015	Cleaning	24	5 900	CEO
Xeneta	2012	Shipping	49	58 900	CEO

Revenue numbers in thousands of NOK. *Parent company Skiwo AS, **Later 'Unite Living', ***Later 'Superside'.

Table 3.2: *Overview of platform firms included*

technology company Poption. Longitudinal data for the study was collected in the period February 2018 – June 2019 through semi-structured interviews with managers.

The second paper regards a quantitative study of content/products on the e-commerce platform 'Amazon Marketplace' offered by Amazon Inc. In 2019, Amazon Inc reported net sales of USD 280.5 billion, amounting to approximately 49% of all business-to-consumer e-commerce retail in the United States and making it the largest e-commerce merchant in the country by a wide margin⁶. Data about 250 product pairs (500 products) was collected from August 2018 – February 2019. Equivalence of product pairs was evaluated using the so-called nonparametric two one-sided test of equivalence for paired samples (NPAR). The data was sampled from 17 departments using web scraping software at three times with two months' interval. The data types collected were 'Brand', 'Item', 'ID', 'Department', 'URL', 'Price',

⁶Techcrunch, 2018. 'Amazon's Share of the US E-Commerce Market is Now 49% Available at <https://techcrunch.com/2018/07/13/amazons-share-of-the-us-e-commerce-market-is-now-49-or-5-of-all-retail-spend/>

Department	N	$\mu(P)$	$\mu(\#R)$	$\mu(R)$
Arts, Crafts & Sewing	4	\$ 12.75	397	4.45
Automotive	14	\$ 40.32	724	4.16
Baby Products	2	\$ 12.04	588	4.80
Beauty & Personal Care	2	\$ 18.59	834	4.50
Cell Phones & Accessories	4	\$ 11.49	2035	4.43
Clothing, Shoes & Jewelry	8	\$ 35.45	1587	4.41
Electronic	88	\$ 15.37	3069	4.43
Health & Household	16	\$ 26.12	2408	4.24
Home & Kitchen	156	\$ 22.94	1435	4.34
Musical Instruments	4	\$ 22.57	677	4.53
Office Products	82	\$ 20.98	906	4.38
Patio, Lawn & Garden	10	\$ 59.61	648	4.18
Pet Supplies	28	\$ 29.98	1886	4.23
Sports & Outdoors	44	\$ 38.03	832	4.42
Tools & Home Improvement	26	\$ 18.73	457	4.33
Toys & Games	2	\$ 14.71	62	4.00
Video Games	10	\$ 15.21	546	4.43
Number of products	500	-	-	-

Table 3.3: Summary statistics of the sample of products by department, including mean values for 'Price', 'Number of Ratings' and 'Avg. Rating'

'Avg. Rating', 'Number of ratings', 'Rating Distribution', 'Item weight', 'Shipping weight', 'Date captured' and 'Keywords'. The dependent variables in the study were 'Price', 'Avg. Rating', 'Number of Ratings' and 'Ratings Distribution'. Data analysis was conducted in accordance with the established procedures of so-called paired student t-tests.

3.4.2 Conceptual Research

In addition to the empirical works presented in the first, second and fourth paper, the dissertation also contains two conceptual studies, presented in the third paper and this cover essay. Conceptual research by its nature is in many ways the opposite of empirical work. Rather than gather new data to draw hypotheses from (inductive/abductive research) or use existing data to test hypotheses (deductive

research), conceptual research aims to represent or describe (but not explain) a phenomenon (Meredith 1993).

The conceptual study presented in the third paper consists of an extended analytic model of new product adoption based on the diffusion model first proposed by Bass (1969) and later extended by several scholars, including Mahajan et al. (1990). As in these works, the proposed new model assumes that adopters may broadly be categorized as either 'innovator' or 'imitator'. Moreover, like its predecessors the model assumes that adopters of the type 'innovator' make decisions exclusively based on technology factors, whereas adopters of the type 'imitator' make decisions based both on technology factors and the number of people who have previously adopted. The model parts from extant literature by considering a two-sided market where both users and providers (buyers and sellers) may be classified as either innovative or imitative. In the study, it is assumed both that 1. Adopters of each classification exist in viable two-sided markets and that 2. Imitators adopt based on technology factors, as well as direct *and* indirect network externalities. Analysis of the model proceeds by outlining the necessary conditions for which entry of a new platform in two-sided markets is viable, as a function of the strength of technology factors among innovative adopters on either side of its market.

The literature review presented in Chapter 2 of this cover essay was collected through a combination of structured database searches of the literature and backward snowballing (Jalali & Wohlin 2012, Wohlin 2014). As we have seen, the literature consists of two partly disjointed branches of research within industrial organization (Section 2.2) and strategic management (Section 2.3). The Scopus database was used for structured literature searches. Both economics, business and management literature were included in the searches. The search for literature for sections 2.2.1 – 2.2.4 was limited to works published prior to the year 2002 in order to limit the scope to studies published prior to the emergence of the two-sided market literature. Similarly, the search for literature for sections 2.2.5 – 2.2.8 was limited to works published after the year 2002. Data analysis consisted of going through abstracts of papers in descending order based on the number of citations. Emphasis was here

placed on finding the most relevant papers in order to provide an overview of the main narratives in each field. Papers were selected based on their topical relevance. For this, the abstract of each paper was read. As the purpose of each section in Chapter 2 varied, some topics were given less attention than others. Broadly, literature published prior to the year 2002 was given less attention. Table 3.4 provides an overview of the search strings used, the number of results for each search, the number of papers included in the dissertation and the section in which the literature is outlined in the dissertation.

Search string	Results	Included	Section
("network externalities") OR ("multi-product pricing")	151	10	Section 2.2.1 – 2.2.4
("network externalities") AND ("two-sided market")	72	20	Section 2.2.5 – 2.2.8
("network effects") AND ("entry")	79	20	Section 2.3.1 – 2.3.3

Table 3.4: *Research design and descriptions of the four studies in Part II*

In addition to structured searches, snowballing (Jalali & Wohlin 2012) was utilized to identify additional relevant works which (for one reason or another) were omitted from the sampling of literature from structured searches. This process involved scanning the reference lists of included papers, as well as looking at lists of referencing documents on the Scopus database. Emphasis was here placed on finding papers which were referenced by more than one paper found through structured searches.

3.5 Limitations and Challenges

The methodologies presented in this cover paper and in each of the four research papers feature a number of limitations and challenges which impose a bound on the scope of the findings and their purported implications. For the specific limitations of each of the four methodologies employed, see appended the research papers in Part II. At an overall level, the limitations and challenges of the dissertation as a whole may be subdivided into two categories, for *empirical* and *conceptual* research.

3.5.1 Limitations of Empirical Research

Conducting empirical, qualitative research in social science accompanies a number of limitations regarding criteria such as, in particular, *construct validity*, *reliability* and *external validity* (Yin 2009).

Construct validity, which may be defined as 'identifying correct operational measures for the concept being studied' is one of the key challenges often posed to proponents of, for instance, the case study research methodology (Yin 2009). The claim is that, because each case study is different, researchers will often struggle to find a sufficiently operational set of independent methods and measures by which to construct and evaluate case studies. As such, case studies in particular are often criticized as being 'descriptive, but lacking reliability and external validity' (e.g. Eisenhardt 1989, Gioia et al. 2013). In the two case studies presented in this dissertation, the challenges related to construct validity are dealt with by employing triangulation in the data collection process in order to determine whether converging evidence has been obtained (Yin 2009). In practice, this was operationalized by conducting semi-structured interviews wherein, to the highest degree possible, informants would be the source of observations rather than biases of the interviewer. Vulnerabilities related to response bias and reflexivity (saying what the informant thinks the interviewer wants to hear) were hence attempted mitigated by systematically aiming to let informants choose the topics of the discussions. As for the deductive study presented in paper 2, one might argue that the construct 'value perception' is poorly defined and so difficult to capture from the variable 'average rating'. However imperfect, the same variable, captured from the same marketplace has previously been employed to study perceived product quality (Sun 2012), which is known to be one of the main influential factors on consumers' value perceptions (e.g. Kirmani & Rao 2000).

Challenges of reliability regard whether or not the operations of a study, such as data collection and analysis, are sufficiently formalized such that they may be repeated with the same result by other researchers (Yin 2009). For the deductive study presented in paper 2 this is less of a concern as the data source is publicly available

and the methodology presented in the paper in detail provides the required steps to order replicate the study's operations. As for the two inductive studies, however, the findings should indeed rightfully be challenged on their reliability, as they are vulnerable to both 1. Bias due to poorly articulated questions and 2. Inaccuracies due to poor recall on the part of the informants (especially in cases where entry occurred several years ago). In the case of the first study, the effects of such limitations were mitigated by the research design (multi-case study), which allowed for triangulation of constructs (Yin 2009), which should ensure higher degrees of reliability than if the research design was a single-case study. For the fourth paper, which was a single-case study, triangulation was similarly attempted by interviewing informants separately over a period of 18 months.

Finally, questions of external validity regard the usefulness of the findings of a study beyond the specific domain in which they were observed (Yin 2009). In this dissertation, challenges to the external validity of the findings might argue that, for instance, differences in value perceptions between first- and third-party products as described in the second study, in fact only apply to the Amazon's Marketplace, where they were measured. The 250 product pairings compared in the study consisted of one first-party brand (AmazonBasics) and over 200 third-party brands. If more than one first-party brand had been compared and the findings remained, the external validity of the study would have been strengthened, although likely at the expense of the practicality of conducting the study. For the studies included in the first- and fourth paper, due to their methods of reasoning (abduction/induction), claims of external validity are much more limited. Although the contributions of the studies surely extend beyond the empirical contexts they were gathered (among Norwegian start-up companies), the conclusions of the papers acknowledge that the findings are preliminary and in need of further research in order to be able to claim high degrees of external validity.

3.5.1.1 Unique Challenges of Platform Research

In addition the limitations mentioned above, the empirical phenomena of 'platform research' presented unique challenges, in particular related to data collection. Primarily, these challenges manifested at the outset of the studies, wherein in the search for case firms one is faced with the challenge of either 1. Including in the study less established platform firms, whose managers' observations may turn out to be less interesting, should the firm fail to successfully enter their two-sided market; or, 2. Relying on managers' recollections about events which, although interesting, occurred several years ago. The additional constraint that network effects tend to lead to 'winner-take-all' outcomes in two-sided markets further limits the inclusion of many firms whose companies are unsuccessful in competing against larger, more established incumbents who, in turn, may be difficult to approach for inclusion in research studies. The constraint also opens the possibility of overemphasising positive findings which emerge due to 'survivorship bias' (e.g. Brown et al. 1992) while omitting potential negative findings which do not emerge as a function of the chosen methodology and/or method of reasoning.

For the first study, these challenges were met by focusing on start-up technology companies in particular, such that their established platforms were still in a sense nascent, and managers' recollections would be more reliable. For the fourth study, the challenges were met by conducting pilot interviews with several nascent platforms as early as at the time of their establishment, and later evaluating whether or not it would be worthwhile to continue data collection in order to document the firms' progress. As such, a fair bit of ambiguity and luck was involved in securing longitudinal data from the firm that eventually was included, whose fate was unknown at the outset of the data collection process. Limitations which may have occurred as a function of survivorship bias were handled by limiting the scope of the claims of each study to their empirical contexts and making sure to emphasize that the purpose of each study was exploratory. The rationale for why such studies may be valuable is eloquently provided in Siggelkow (2007).

3.5.2 Limitations of Conceptual Research

As has been a central topic of this chapter, conceptual research which takes the form of theoretical deduction accompanies several ontological challenges which need to be properly addressed in order for such methodologies to warrant credibility. In one sense, the study presented in the third paper indeed is limited by many of the same challenges as much of the established literature on platform entry from industrial organization. Namely:

1. The model presented is not empirically verified in the study, and so may in fact not illustrate an accurate depiction of reality;
2. The model accompanies several idealized assumptions which, upon further investigation, likely warrant future scrutiny;
3. Absent future empirical verification, the study's deductive argument remains a conjecture, whose external validity is lacking;

A mitigating factor which, it is argued, differentiates the study from much of extant conceptual research on entry is the fact that its research hypothesis was derived not from anecdotal 'war stories' (Meredith 1993), but rather, the inductive study presented in paper 1. As such, although its theoretical and deductive nature and lack of empirical verification certainly warrants suspicion, the motivation for the study originated not in the 'idealized world of the model', but rather, in the real world.

4 Summary of Research Papers

This chapter aims to summarize the four research papers included in the dissertation. Emphasis is placed on outlining the research question, methodology and contributions of each paper as they pertain to the research question of the cover essay (addressed in dissertation as a whole). All four works feature independent contributions to the body of literature on entry strategies for platform firms in two-sided markets. The four papers are written in the format and style required for consideration for publication in relevant international peer-reviewed journals. As such, as a consequence of the preferences of editors and reviewers, specific terminology and technical terms used in this summary may differ from the original works.

Title	Author	Research Question(s)	Research Design	Type, Method of Reasoning	Emphasis	Publication Status
<i>The Dynamics of Entry for Digital Platforms in Two-Sided Markets: A Multi-Case Study</i>	Veisdal, J.	How do managers of nascent digital platforms in two-sided markets strategize to recruit early suppliers?	Exploratory multi-case study of ten established start-up firms through semi-structured interviews with CEOs, analyzed using the systematic 'Gioia method' of grounded theory articulation	Qualitative, abductive	A conceptual framework for analysis of entry strategies is developed. Implications for managers and further research emphasize the role of demand among suppliers as an enabling factor.	Published in <i>Electronic Markets</i> 30(3): 539-556. (2020)
<i>Value Perceptions of First-Party Content on Multi-Sided Platforms</i>	Veisdal, J.	How do consumers perceive the value of first-party content as compared to equivalent third-party alternatives?	Hypothesis derived from extant literature on private label strategies. Evaluated statistically using data on 500 listed products on Amazon's Marketplace using paired t-tests	Quantitative, deductive	Consumers were found to perceive products from private labels as delivering less value than products from manufacturer brands. This finding was largely independent of quality and price-inferences.	Submitted to journal

Title	Author	Research Question(s)	Research Design	Type, Method of Reasoning	Key Contribution	Publication Status
<i>The Role of Innovators in Two-sided Markets</i>	Veisdal, J.	How does the introduction of innovators influence early adoption to platforms in two-sided markets?	Extending growth model derived from extant literature on new product adoption to evaluate plausible entry scenarios in two-sided markets	Conceptual, conditional	Adopter heterogeneity was found to be enabling for successful platform entry in two-sided markets, given the assumptions that 1. Innovators exist and 2. Technology factors are sufficiently strong.	Submitted to journal
<i>From Product to Platform: A Case Study of Popton</i>	Veisdal, J.	What are the enabling factors for managers to successfully leverage an existing value proposition to permit entry in a two-sided market?	Longitudinal single-case study of an established start-up company through semi-structured interviews with managers, analyzed using the systematic 'Gioia method' of grounded theory articulation	Qualitative, inductive	A conceptual framework of firm-level enabling factors. Implications for managers emphasize the need for new entrant firms to excel at 1. Opportunity recognition and pursuit, 2. Feedback acquisition and incorporation and 3. Swift and Decisive Decision making	Preparing for submission to journal

Table 4.1: Overview of research papers

4.1 Paper 1: The Dynamics of Entry for Digital Platforms in Two-Sided Markets: A Multi-Case Study

Introduction

The nascent notion that firms looking to enter markets characterized by the presence of network effects may be faced with a so-called 'chicken-and-egg' problem was first identified by researchers as far back as the 1980s (Katz & Shapiro 1985, Farrell & Saloner 1985). That is, it has since then been assumed that motivating buyers and sellers to join an empty platform is a key challenge for firms attempting to launch platform businesses in two- and multi-sided markets (Caillaud & Jullien 2003). Despite this well-established assumption, few good empirical studies exist which actually ground the assumption to observation (Gawer 2014). Previous empirical research related to the topic include investigations of entry from the perspectives of a *platform sponsor* (Gawer & Henderson 2007), *lock-out* (Schilling 2002), the importance of *platform quality* (Zhu & Iansiti 2012) and *openness* (Ondrus et al. 2015). Few previous studies have ventured into exploring the specific dynamics of *how* platform firms successfully enter markets, including the strategies managers pursue to successfully do so. A notable exception is Kyprianou (2018), who studied how nascent platforms govern producers' and consumers' participation in value creation processes. As such, this study investigates the phenomenon of platform entry in two-sided markets in a grounded, exploratory multi-case study of ten startup technology firms operating digital platforms in two-sided markets. The objective of the paper is to establish an empirical foundation from which future hypotheses may be developed.

Methodology

For the purpose described above, an abductive, exploratory case study design was chosen (Eisenhardt 1989). Case firms were found through search and selected using inclusion criteria which ensured that the firms included in the study were sufficiently 'established' so as to indicate that they had overcome any potential 'chicken-and-egg' problems. These included a financial evaluation of the scope of the firms' operations, ensuring that firms' only major business activity was platform-related and ensuring that the managers interviewed had worked at the firms from the time of their founding. The final sample included ten firms. Nine of the eleven interviewees held the titles 'CEO' and 'co-founder'. Ten semi-structured interviews were conducted, comprising approximately ten hours of spoken words. The goal of the data collection was to document managers' perspectives on how the firms' successfully entered their respective markets.

Analysis of the interviews was structured according to the established procedures for grounded, theory-building research (Locke 2001, Miles & Huberman 1994), following guidelines for constant comparison techniques and working recursively back and forth between the data and emerging theoretical constructs. The analysis was conducted according to the so-called "Gioia-method" of data analysis (Gioia et al. 2013) where statements are captured as first-order 'open' codes (Locke 2001), which are next grouped according to their theoretical contents. The theoretical groups are later further grouped to constitute theoretical dimensions, and later aggregate theoretical dimensions which make up the core tenants of the findings of the study.

Findings

Findings from the study revealed that managers of platform firms consider both firm-specific and contextual factors when formulating entry strategies. It was for instance found that many firms were able to overcome potential 'chicken-and-egg' problems (Caillaud & Jullien 2003) by approaching supply-side participation from sources within or close to the firm, such as managers, employees and suppliers from

their social- and professional networks. This finding is related to (but more elaborate) than the proposition by Evans & Schmalensee (2010) that, depending on the market, certain platforms can launch by simply signing up the firm's founders as users. Further, it was found that most of the firms employed multiple (both simultaneous and sequential) recruitment strategies and that managers' initial perceived challenge of recruiting a sufficient *level* of supply (quantitative) often gradually shifted to instead emphasizing the *quality* of supply. Finally, it was found that in several cases, managers described rather easily being able to attract both supply- and in some cases demand-side participants, even in the absence of participants on the other side(s) of the various markets.

Key Contributions

Extant research has tended to view network externalities as dichotomous (Afuah 2013, McIntyre & Subramaniam 2009, Suarez 2005) i.e. that they are either present or absent. The findings of the study clearly indicate that from the perspective of managers of platform firms, new suppliers recruited from word-of-mouth (potential positive network effects) were often recruited simultaneous as managers pursued other strategies (including digital advertising, PR, online communities and more). The finding that managers initially tended to focus their attention on the *level* of participation on the supply side of their platform confirms the intuition that the initial challenge platform firms face is a quantitative one (Srinivasan & Venkatraman 2010), and the suggestion that quality of supply is also a key consideration (Tellis et al. 2009). Regarding the popular 'chicken-and-egg' problem, in the study examples were found of managers who described being able to recruit participants to their nascent platforms in the absence of participation, preannouncements or other signals indicating participation (Bhargava 2014). This goes against the common belief that platform firms face an initial 'chicken-and-egg' problem at launch (Caillaud & Jullien 2003).

Relevance for Dissertation

A key contribution of the dissertation as a whole is the emphasis that is placed on the importance of conducting research based on *empirically-driven hypotheses* rather than hypotheses generated from 'war stories' (Meredith 1993) or formal modals based on idealized assumptions. The relevance of the first paper is that it provides the necessary empirical foundation from which future hypotheses can be formulated, including several 'existence proofs' (Siggelkow 2007). Being of an exploratory nature, the paper also provides a cross-industry analysis of managers' perceptions of the dynamics (i.e. challenges and opportunities) they encountered in the processes of establishing their platforms in two-sided markets. The insights from conducting the study and contrasting its findings with predictions from existing literature motivated the topic for the third paper, and indeed the positioning of the dissertation as a whole.

4.2 Paper 2: Value Perceptions of First-Party Content on Multi-Sided Platforms

Introduction

The strategic use of so-called 'first-party' content on platforms in two-sided markets has previously been studied from the perspectives of *entry* (Hagiu & Spulber 2013), *rent extraction* (Katz & Shapiro 1985), *integration* (Adner & Kapoor 2010) and *governance* (Eaton et al. 2015, Gawer & Henderson 2007). Regarding entry, studies have proposed that first-party content may be used as a strategic tool to overcome the prototypical 'chicken-and-egg' coordination problem by making participation more attractive to one side of the market (e.g. buyers), whose participation may next be used to attract the other side (e.g. sellers) (Hagiu & Spulber 2013, Carlton et al. 2010, Gawer & Henderson 2007). In such studies, potential participants' perceived value of first- and third-party content has thus far been treated as equal. That is, it has been implicitly assumed that 'all content is created equal', and so that buyers/sellers are equally likely to join a platform offering first-party goods as they are a platform offering third-party goods. This notion goes against the increasing trend in the literature towards emphasizing the *quality* of participation (e.g. Tellis et al. 2009) in addition to *level* (e.g. Fuentelsaz et al. 2015a). Given already well known results from research on retail and supermarkets (Rubio et al. 2014), this study investigates whether the same difference in value perception persists for consumers in a two-sided market. The objective of the paper is to contribute nuance to extant research on the efficacy of first-party entry strategies for platform firms in two-/multi-sided markets.

Methodology

In order to evaluate whether or not consumers perceive a meaningful difference between the quality of first- and third-party content on a two-sided platform, so-called *paired student t-tests* were applied on 250 product pairs from the Amazon Marketplace, the largest e-commerce marketplace in the world at the time of the study.

First-party products were first randomly sampled from the brand "AmazonBasics". Next, a systematic search for functionally and aesthetically equivalent third-party products was conducted, and qualitative assessments based on four variables (name, category, appearance and product specifications) were used to match product pairs. Before applying the t-tests, an additional paired-sample test of equivalence—the so-called nonparametric two one-sided test of equivalence for paired samples (NPAR) test—was applied to evaluate the quality of the pairings based on the variable 'item weight'. Data about the product pairs was collected at three different times in order to ensure that potential findings were representative. The dependent variables in the study were 'price', 'number of ratings', 'average rating' and 'ratings distribution'. In addition to t-tests comparing first- and third-party values for each of these variables, additional t-tests were applied to subsets of product pairs to account for price and popularity inferences, as well as rating variances.

Findings

The main findings from the investigation of differences between consumers' perceptions of the value of first- and third-party products were that 1. Third-party products were more highly rated than equivalent first-party alternatives; 2. First-party products were substantially lower priced than third-party alternatives; and 3. Differences in consumers' perceptions of value were independent of both price and popularity differences. In addition, through an investigation of rating variances it was found that equivalent first- and third-party products were rated approximately equally in terms of one-, two-, three- and four-star ratings (in Amazon's five-star rating system), but that first-party products were assessed to be worthy of five stars significantly less frequently than third-party products.

Key Contributions

The findings of the study confirm the hypothesis that consumers perceive a difference in value between first- and third-party goods. That is, the findings confirm the well-known proposition from the literature on supermarkets- and retail that also in two-

and/or multi-sided markets, consumers perceive first-party products as delivering less value than equivalent products from third-party manufacturer brands (Rubio et al. 2014). The study also finds that this difference is largely unaffected by price differences, only partially diminished by popularity differences and found to stem partially from consumers' higher willingness to award third-party products with five-star ratings than they do first-party alternatives. The primary implication of these findings for managers is that in pursuing first-party content strategies, it may be advantageous to disassociate the platform from the first-party brand, i.e. signal implicitly that the first-party goods are in fact third-party. Traditionally, this is done through naming and branding.

Relevance for Dissertation

The primary objective of the study was to contribute nuance to extant research on the efficacy of first-party entry strategies for platform firms in two-/multi-sided markets (Hagiu & Spulber 2013). Inspired both by the discovery of the various strategies managers in the first study pursued *and* existing predictions from literature, the study afforded the opportunity to investigate the topic further in a deductive study. The relevance of the study in the dissertation is hence primarily that it contributes to the nascent stream of empirical research on platform strategies. Being the only quantitative and deductive study in the dissertation, the paper also provides an example of how theory *testing* may complement the (nascent) theory *building* attempted in the qualitative studies included in papers 1 and 4.

4.3 Paper 3: The Role of Innovators in Two-Sided Markets

Introduction

In extant economics research on the so-called 'chicken-and-egg' problem in two-sided markets, it is often assumed that the participation decisions of potential adopters are made exclusively based on the presence of direct and/or indirect network externalities (e.g. Parker & Van Alstyne 2005). That is, the prevailing assumption has hence been that in such markets, it is essential to "*get both sides on board*" (Rochet & Tirole 2003) and so that 'no one joins until everyone joins'. Contrasting this assumption however, are both recent empirical studies (e.g. Kyprianou 2018) and extant literature from strategic management (Fuentelsaz et al. 2015b, Chellappa & Mukherjee 2020) which indicate that platform adoption is a function of a variety of variables including governance, demand and technology factors. In the first paper of this dissertation, for instance, it was found that some platform firms were able to enter distinct two-sided markets by recruiting one group of participants at a time. This is in line with the predictions of established research on new product adoption, which suggests that adopters consider both technology factors *and* extant levels of adoption when making purchasing decisions (Bass 1969, Mahajan et al. 1990). Taking these perspectives into account, in this study a new model of platform adoption is proposed which shows how the presence of so-called 'innovative adopters' may better describe the phenomenon of successful platform entry in two-sided markets.

Methodology

Ever since the publication of Everett Rogers' 1962 book on the diffusion of innovations, it has been commonplace for researchers to characterize adopters of new products and services according to the timing of their adoption. In particular, the Bass model of new product adoption (1969) is often used to model how individual consumers' adoption decisions affect the cumulative adoption of a new product, depending both

on its technology factors and the level of adoption among other consumers. For the purposes of investigating when potential adopters are likely to join a platform the celebrated "Bass model" of new product adoption is hence extended to a two-sided market, introducing indirect network externalities. The extended model classifies potential adopters as either 'innovator' or 'imitator' based on whether or not their decision to adopt is influenced by the decisions of others or not. The model is related to that presented in Evans & Schmalensee (2010), but rather than emphasizing participants' 'level of participation over time' and the stability of equilibria, assumes that ongoing participation based on an accepted value proposition is a function of marketing costs, and so not inherently unstable. In accordance with Rogers' framework and Bass' original model, the extended model predicts the adoption of a platform to be normally distributed and so follow a bell-shaped marginal adoption curve and an S-shaped cumulative adoption curve. In the two-sided context the slope of the adoption curve is however considerably steeper as a function of to the presence of indirect network effects in addition to technology factors and direct network effects.

Findings

Representing potential entry strategies as nodes consisting of conditional statements in a tree structure, the necessary conditions for various successful platform entry strategies (in terms of the required level of technology factors *and* direct- and indirect network effects) are proposed. The main finding of the paper is the following trilemma⁷ which, based on the findings of the model, argues that at least one of three propositions must almost certainly always be true in two-sided markets:

1. Innovative providers and/or users exist, and technology factors are sufficiently strong to attract at least one side;
2. Innovative providers and/or users exist, but technology factors are insufficiently strong to attract at least one side;

⁷A trilemma is a difficult choice of three options, each of which appears unfavorable

3. Neither innovative providers nor users exist in the market;

The main implication of the trilemma is that the 'chicken-and-egg' problem only applies if the third case is true, because either:

1. Innovators on one side of the market are susceptible to recruitment based on technology factors alone, and the 'chicken-and-egg' problem is solved;
2. Innovators on neither side of the market are susceptible to recruitment based on technology factors alone, suggesting that there isn't sufficient demand for the platform and so no 'chicken-and-egg' problem exists;
3. Innovators do not exist in the market, violating the assumption that adopters in two-sided markets may be characterized according to their innovativeness and that there exist adopters whose decisions are influenced only by technology factors;

The conclusion of the findings are hence that in order for the 'chicken-and-egg' problem to manifest empirically, the assumptions of the Bass diffusion model (Bass 1969) must be violated.

Relevance for Dissertation

As discussed in Section 3.3.1, deductive conceptual studies are inherently reliant on a theory from which the hypotheses they test are derived. All theories are built on assumptions and feature limitations. For most of the extant theoretical literature on platform in two-sided markets, the assumptions and limitations on which theories are based are those of neoclassical economics, which include assumptions about the preferences of consumers and their ability to make choices in the presence of (at times) perfect information about levels of participation and expected utility. In models depicting consumers' choices about joining an empty platform, the implications of such assumptions lead to a theoretical prediction often referred to as the 'chicken-and-egg' problem.

The third paper aims both to: 1. Conceptually explain findings from the first

paper suggesting that entry was possible in the absence of network effects and 2. Highlight the vulnerability of hypotheses derived solely from theoretical models. This is attempted by demonstrating how a minor adjustment in assumptions ('in all viable two-sided markets there exists adopters who make participation decisions based solely on technology factors') can lead to the elimination of seemingly important paradoxes derived from theoretical observations in the absence of empirical verification.

4.4 Paper 4: From Product to Platform: A Case Study of Poption

Introduction

The 'chicken-and-egg' problem is often cited as the archetypal initial challenge for managers of firms looking to enter two-sided markets (Rochet & Tirole 2003, Caillaud & Jullien 2003). Extant theory suggests that a plausible strategy for overcoming the challenge is for firms to offer especially advantageous terms to one group of participants first, before extracting and transferring the surplus from their participation to attract the other group (Jullien 2005). The strategy is anecdotally referred to as the 'single side first' strategy (Parker et al. 2016, Bhargava 2014). Although commonly cited, the dynamics of the strategy have yet to be investigated empirically. This paper provides such a study, through a case study of Poption, a Norwegian start-up company. In particular, the study investigates organizational capacities required to successfully execute a 'single-side first' strategy from the perspective of organizational ambidexterity theory.

Methodology

A grounded, inductive, exploratory case study was employed in the study (Eisenhardt 1989). The case firm was selected through an informal screening of nascent platform businesses in the start-up ecosystem at the Norwegian University of Science and Technology (NTNU). During the time of the data collection, the case firm Poption consisted of three founders, all in their early twenties, studying computer science and business. The study features data from four informants: Petter (CEO), Jon (CPO), Daniel (CTO) and Morten (business developer). Eleven exploratory, semi-structured interviews were conducted, constituting approximately 8 hours of spoken words. The overall goal of the data collection was to document the activities of the firm from their founding (the fall of 2017) to the end of the data collection period (June of 2019).

As in the first paper, analysis of the transcribed interviews was structured according to the established procedures for grounded, theory-building research (Locke 2001, Miles & Huberman 1994), using the 'Gioia-method' (Gioia et al. 2013) of data analysis. Following guidelines for constant comparison techniques and working back and forth between the data and emergent theoretical constructs, the process may be described not as linear but as a 'recursive, process-oriented analytic procedure' which continued until the codes were deemed satisfactorily representative of the content of the primary data source. Once this was accomplished, raising the level of abstraction further, groups of first-order codes were next further categorized into theoretical dimensions, and later aggregate theoretical dimensions which make up the core tenants of the findings of the study and the conceptual framework.

Findings

Analysis of the case study found that Poption's ability to leverage their existing value proposition (a candidate management software) to permit entry in the two-sided market for on-campus recruiting was enabled by three factors. These may be summarized by the organization's ability to 1. Recognize and pursue opportunities; 2. Acquire and incorporate feedback; and make 3. Swift and Decisive decisions. Through simultaneous pursuit of both exploratory and exploitative activities, the nascent team was able to ambidextrously navigate between both its business- and product development domains and succeed in entering the two-sided market for on-campus recruiting within a year of its founding.

Key Contributions

The paper purports to make three contributions to the literature. Firstly, the paper grounds an extant theoretical phenomenon from the literature to the real world, through the narration of an empirical case study. Secondly, the paper proposes a conceptual framework which classifies the challenges of successfully pursuing a 'single side first' entry strategy according to the theory of organizational ambidexterity. Finally, based on the findings of the case study, the paper explores the managerial

implications of the findings and proposes an agenda for further research on the 'single side first' strategy in two-sided markets.

Relevance to Dissertation

The fourth paper, somewhat in the same vein as the second paper, explores attributes of a specific proposed entry strategy from the literature, namely the so-called 'single side first' strategy (Parker et al. 2016, Bhargava 2014) . Unlike the second paper, this paper does so through a qualitative, inductive approach and so aims not to measure performance, but instead illustrate firm dynamics. However dissimilar in this way, both papers share commonalities in that they propose useful, actionable implications for managers which are derived not from theoretical observations but rather from empirical data analysed using rigorous methodologies. Findings from both papers contribute inductively towards the key findings and theoretical development of the cover essay, presented in Chapter 5.

Methodologically, the fourth paper also has a relationship with the first paper of the dissertation, as both may be characterized as ampliative in that they employ inductive and abductive inferences, respectively, in their methods of reasoning. In addition, both are qualitative and employ case study methodologies inspired by Eisenhardt (1989) and data analysis procedures in accordance with Gioia et al. (2013). As seen, the first paper narrates a multi-case study and makes abductive inferences from the analysis of its findings to nascent theory. Although more concrete in its claims (and so seemingly perhaps more useful) a potential weakness of this methodology is that its analysis is limited by the state of extant research. This as opposed to the fourth paper, which investigates a longitudinal single-case study which, rather than explain in terms of extant two-sided market literature, proceeds according to a more inductive approach. As opposed to the methodology of the first paper, the strength of this methodological approach is that its findings are more 'grounded' in the sense that they represent observations which are very close to empirical truth, albeit at the potential risk of lacking in prescriptive power.

5 Conclusions and Implications

Broadly, the purpose of this dissertation has been to explore firm-level entry dynamics in markets characterized by network effects at scale, addressing the overall research question *"How can managers of platform firms strategize to successfully enter two-sided markets?"*. Figure 5.1 illustrates how the dissertation is situated relative to empirical observations and extant theoretical perspectives, as well as how the four research papers contribute key findings to this cover essay.

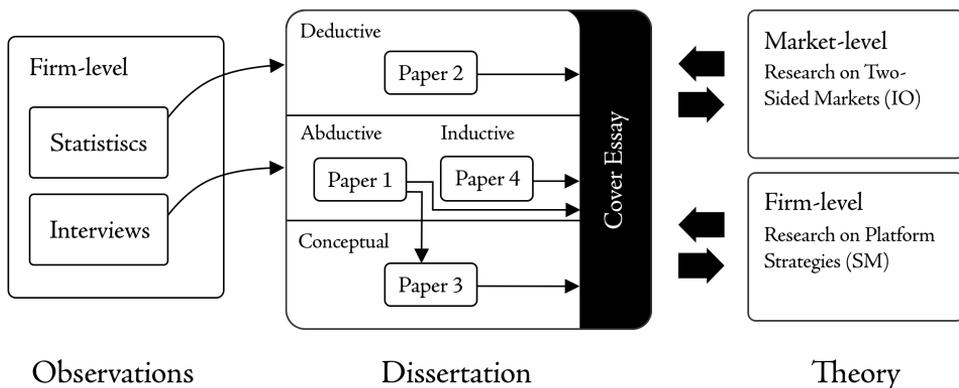


Figure 5.1: *The relationship between observations, the four research papers, the cover essay, and extant theoretical perspectives*

This chapter is organized into three parts. First, a review of the key findings and main theoretical developments of the four papers and this cover essay are presented and discussed. Overall emphasis is here placed on addressing the research question by contrasting the main findings of the four research papers with the conceptual framework developed in Chapter 2 of the cover essay, illustrated in Figure 2.6. The discussion additionally addresses the connections and interactions between the four papers and how they in aggregate contribute to addressing the main research question. Second, a discussion of the implications of the research for practice and policy is provided, before finally, the scope and limitations of the findings are presented.

5.1 Key Findings and Theoretical Development

The key findings of the dissertation may be summarized by six propositions, which all address the supposed 'main obstacle to entry' in two-sided markets, the "celebrated" 'chicken-and-egg' problem (Rochet & Tirole 2003, Caillaud & Jullien 2003). Following an outline of the problem and two helpful interpretations, these propositions are presented below.

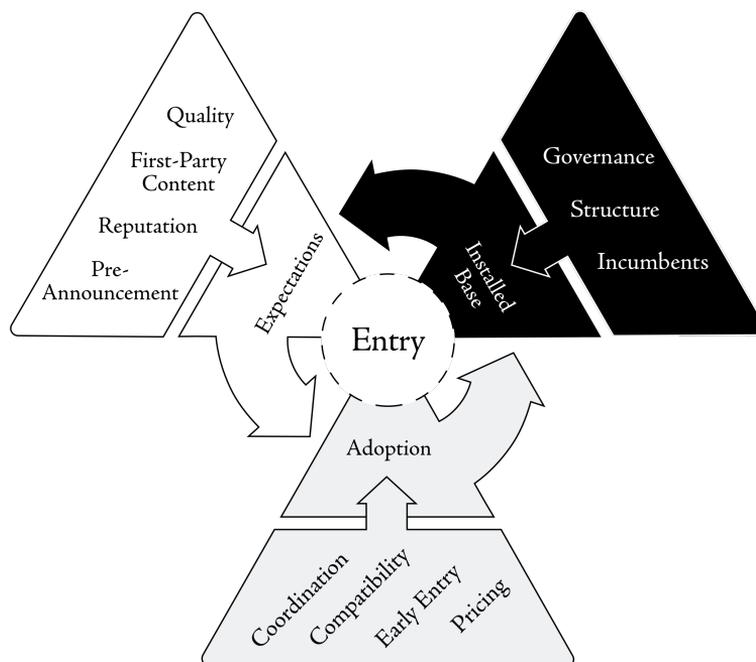


Figure 2.6: *Conceptual framework integrating extant perspectives on how entry occurs in two-sided markets*

In Figure 2.6, extant research on the 'chicken-and-egg' problem is represented in the circular reasoning of extant literature regarding the respective roles of *expectations* (e.g. Fuentelsaz et al. 2015b, Hagiu 2006), *installed base* (e.g. Eisenmann et al. 2011, Schilling 2002) and *adoption* (e.g. Rochet & Tirole 2003, Armstrong 2006) prior to entry. Summarized, this debate may be interpreted as follows:

1. Potential participants of a new entrant platform make adoption decisions based

- on their *expectations* about the platform's **future** level of adoption among other participants;
2. Potential participants' expectations about the future level of adoption among other participants is more favorable if the platform has an *installed base* of participants in the **present**;
 3. A platform with an installed base of participants in the present has been successful in convincing potential participants to *adopt* in the **past**;

As such, for new platforms (which have no past) it follows that there is no installed base which may positively influence potential participants' expectations. *Ceteris paribus*, adoption decisions in such cases may thus, according to extant literature, be assumed to depend only on such participants' **present** expectations about the platform's **future** level of adoption. In extant literature, such participants' expectations have thus far generally been assumed to be unfavorable (Hagiu & Spulber 2013, Jullien 2005). A reduced-form conceptual framework integrating extant theoretical perspectives as they pertain to the specific topic of the 'chicken-and-egg' problem may thus be illustrated as follows (Figure 5.2).

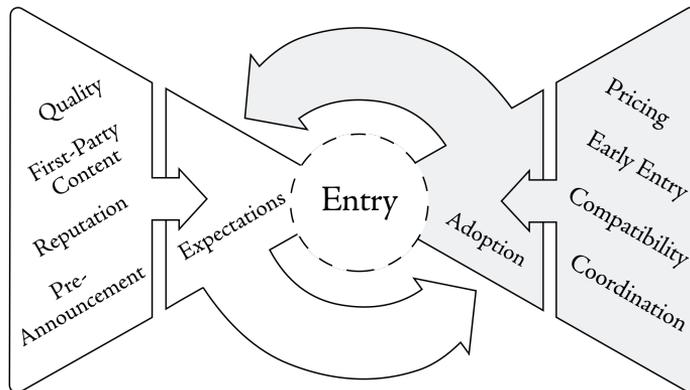


Figure 5.2: *Reduced conceptual framework integrating extant theoretical perspectives on the nature of the 'chicken-and-egg' problem*

In regards to this reduced conceptual framework, literature from the industrial organization tradition has particularly emphasized the role of *pricing strategies*

(Rochet & Tirole 2003, Armstrong 2006, Hagiu 2006, Weyl 2010), *early entry* (Fuentelsaz et al. 2015b, Arthur 1989), *compatibility* (Katz & Shapiro 1985) and *coordination* (Besen & Farrell 1994, Rochet & Tirole 2003, 2006), emphasizing such factors' influence on market outcomes. In strategic management literature, emphasis has been placed on firm-level strategies for influencing potential adopters' participation decisions, such as on *quality-* (Tellis et al. 2009, Afuah 2013, Zhu & Iansiti 2012), *preannouncement-* (Bhargava 2014, Chellappa & Mukherjee 2020) and *content-* (Spulber 2010, Hagiu & Spulber 2013) *strategies*.

As conceptualized in the third and fourth research papers, an alternative way to interpret the 'chicken-and-egg' problem is as a sub-optimal equilibrium point in a symmetric coordination game involving two groups of agents such as e.g. buyers and sellers (Besen & Farrell 1994, Jullien 2005). The dynamics of such a coordination problem may be described as follows, for a static, repeating game in which two groups of agents coordinate around the same equilibrium point:

1. Buyers and sellers expect to obtain payoffs of 2 if both join;
2. Buyers and sellers expect to obtain payoffs of 1 if both wait;
3. If one joins and one waits, buyers and sellers expect to obtain payoffs of -2 and 0, respectively;

Assuming that both buyers and sellers are rational profit maximizers and are acting on the same (public) information (and no private information)—as researchers in the tradition of industrial organization do (Van Hove 1999)—we may analyze the expected payoffs for buyers and sellers of joining and waiting. In a game that repeats until both coordinate on the optimal equilibrium point, absent any additional information we either choose the payoff dominant strategy (join) or the risk dominant strategy (wait). Putting ourselves in the shoes of either buyers or sellers facing the decision to either join or wait, given our assumptions above, we find it rational that the other group of agents will choose to wait, as this gives them a slightly higher average payoff over time in a repeated game (0.5 vs 0). Thus, we too choose to wait. This dynamic is represented in extant literature's assumption that platforms without

reputations are assumed to have negative reputations (Jullien 2005). Although it is not the most efficient outcome for either player, the decisions of both groups of players to delay adopting the new platform is still a pure Nash equilibrium in the game (Nash 1951), as both players are playing their optimal strategies, given their knowledge and assumptions about the optimal strategies of the other player(s). In order for the optimal equilibrium (join, join) to occur, the game thus relies on either 1. Both groups of players choosing to **not** play the strategy with the largest expected payoff over time (waiting), violating our assumptions that they are behaving rationally and profit maximizing, or 2. New information, altering the expectations of one or both groups of players about the optimal strategies of the other.

In the following subsections, examples of ways of overcoming the coordination problem are outlined, based on the findings of each of the four research papers included in Part II.

5.1.1 The Role of Demand

The study included in the first paper of this dissertation proceeds very much in the same vein as Kyprianou (2018). The paper narrates the entry process of new platforms based on exploratory, semi-structured interviews with ten founders of established start-up technology companies. The study did not find any data to support the theoretical observation that a new entrant platform will experience a 'chicken-and-egg' problem upon entry. Rather, it was found that entry proceeded very much according to the strategies one might assume a 'traditional' firm might employ. Namely, managers described talking to potential users in their social and professional networks, using the service themselves, entering into partnerships, using paid advertising and PR, and so on. Most surprisingly, perhaps, was the description by several managers of "*quite easily*" recruiting participants to new entrant platforms using such methods, which included cold-calling and sales meetings, paid Facebook advertising and recruiting from Facebook groups and other online communities. Identifying the commonalities among the ten firms' experiences, it was found that the *level of demand for new services* appeared to be enabling for new entrant platforms,

even in the absence of network effects. That is, for some early users *the potential future existence of the platform itself* appeared sufficient to spur adoption. These observations lead to the first proposition of the dissertation with implications for future research:

Proposition A: *The level of demand for a platform may alone be sufficient to motivate adoption*

The perhaps most poignant—admittedly circumstantial—'existence proof' (Siggelkow 2007) to support the proposition is the quote by the CEO of Xeneta, Patrik Berglund, who described their firm's entry process as follows. *"In the beginning we cold-called. The approach that has always worked fairly well is to first get a hold of the right person and [...] tell them that you've built something they can offer a qualified opinion of. [...] Within two weeks I had booked meetings with approximately eight of the ten largest [firms] we had picked out, and then just travelled around. More or less all of them provided some data"*. Paraphrased, Berglund is stating that despite Xeneta's nascent status at the time, the firm was able to convince potential participants to adopt their platform *"in the hope that one day"*, this might change the nature of the industry they were operating in.

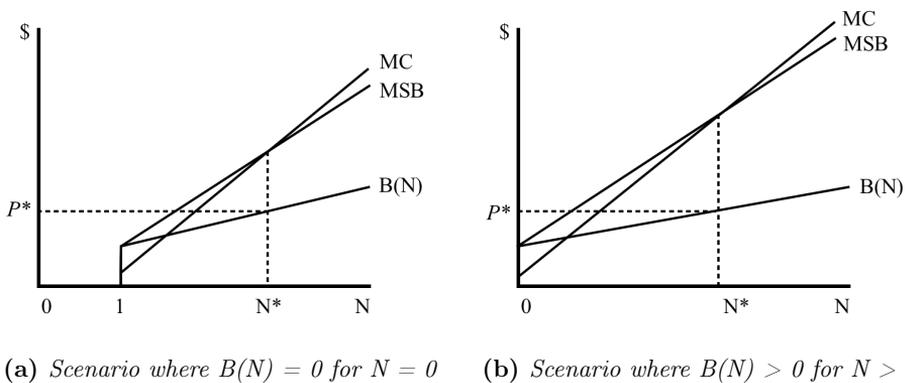


Figure 5.3: *The hypothesized 'chicken-and-egg' scenario (Fig 5.3a) contrasted against the implications of empirical observations from paper 1 (Fig 5.3b)*

In Figure 5.3, proposition A is illustrated alongside the theoretical prediction of the 'chicken-and-egg' problem (Liebowitz & Margolis 1994). As we can see, according

to extant theory (Fig. 5.3a) the common assumption that the benefit $B(N)$ that any individual participant derives from participation in the network only becomes positive only when the number of participants in the network (N) is greater than zero. Prior to that, the willingness to adopt among potential participants is absent. The implication of proposition A is that the benefit to some participants, in some markets, is positive even prior to when $N \geq 1$ (Fig. 5.3b). In speculation of how this may be so, consider the following hypothetical scenario:

A retail firm is looking to transport a shipping container of goods from Shanghai to Rotterdam. The firm acquires price quotes from three logistics companies, which together operate 99% of all commercial sea freight shipping on this particular route. The firm has acquired shipping services from all three vendors before. It receives three price quotes, which differ by as much as 50%. The retail firm inquires to each firm about how they arrived at their quotes. Neither gives an especially illuminating response. Busy as they are, the retail firm accepts the offer from the least expensive shipping vendor.

Fast forward a year, and the retail firm has acquired shipping services from each of the three shipping vendors several dozen times. In cases where there was enough time, they acquired price quotes from all three vendors. When they did, the price quotes always differed, however seemingly never in the favor of one shipping vendor or the other.

The organizational capacities required to acquire, evaluate and bargain over shipping quotes are substantial for the retail firm. In some cases, such as for small orders, they may exceed the savings from choosing the least expensive vendor. However, prior to acquiring and bargaining over price quotes, the firm is unable to evaluate which orders this will be the case for, as prices for shipping services vary based on a variety of factors including season, the price of oil, peak demand and so on.

In the example above, inspired from the case study of Xeneta in paper 1, buyers

of freight services (the retail firm) are met with the challenge of simultaneously minimizing their cost of shipping and their internal costs related to acquiring, evaluating and bargaining over shipping prices. They face a dilemma:

1. Continue choosing shipping vendors on a per-transaction basis;
2. Choose one shipping vendor based on their own historical data, and hope they spend less than or equal as they would have if they continued choosing vendors on a per-transaction basis;

In this scenario, prior to entry, managers of retail firms may hypothesize that if there was a way for them to efficiently pool their price quotes with other retail firms, a third option might be to simply calculate the market price at each moment based on each firms' price quotes. However, the costs of setting up such a system—which would rely on the accumulation of millions of prices embedded in non-standardized spreadsheets—is considered too great and not within the scope of the firms' core competences.

One day, a former sell-side employee of one of the three logistics companies calls the person at the retail firm and says the following: *"I've quit my job in order to start a company that solves retailers' problem of acquiring the best price quotes from shipping vendors. We are just getting started. If your company provides us with some of your price data, we'll let you access the aggregated, average prices quoted to all the other retailers who decide to join. Over time, we'll be able to provide you with accurate, up-to-date shipping quotes which you can use in your negotiations with vendors about what the accurate price should be."*

As Berglund testified about Xeneta's entry strategy: *"We had nothing to offer, but at least they had a pain that was interesting enough that it should be possible to persuade them."* By the CEO's reasoning, prior to Xeneta's entry, buyers of freight shipping were facing considerable costs resulting from a nontransparent and inefficient shipping industry. As a result, in his view, retail firms were willing to

take a chance by providing historical prices *"in the hopes"* that one day in the future, things might change. This despite, both the fact that 1. Such historical price quotes are confidential between the issuer and each firm; and 2. Both Xeneta and the participating retail firms knew that the utility of the service would be severely limited in the beginning because *"There wasn't enough data at the time, right? But there was still more than [each buyer] themselves had"*. In other words, given sufficiently inefficient market circumstances, in some cases an appeal to a better future may be sufficient to alter the expectations of potential participants such that at least a (small) percentage of them decide to attempt to coordinate around the equilibrium point where both are better off.

5.1.2 The Role of Technology Factors

Whereas Xeneta's strategy to overcome the hypothetical 'chicken-and-egg' problem in a sense relied on the demand for a market-level change among potential participants (increased efficiency in the shipping industry), evidence was also found in the first research paper that entry could occur as a function of the level of demand even in well-functioning industries. Take, for instance, the cases of TikkTalk, WeClean and LearnLink. All three platforms operate in industries which supply low-wage workers with freelance work. The industries are translation services, cleaning service and tutoring services, respectively. As in the Xeneta case, each CEO testified to *"quite easily"* attracting suppliers to their nascent platform, overcoming the hypothetical 'chicken-and-egg' problem and proceeding to mediate transactions. This leads to the second, related proposition with relevance for future research:

Proposition B: *Technology factors may alone be sufficient to motivate adoption*

By technology factors in this context we refer to 'the sum of techniques, skills, methods, and processes used in the accomplishment of objectives'. In the cases of the three examples above, the main technology factor that attracted suppliers was related to customer acquisition/lowering search costs. Namely, each platform solved the problem of advertising/sales for freelance workers by helping them find customers

in the market for services they could provide. Such customers included lawyers offices (TikkTalk), shopping malls (WeClean) and the parents of middle- and high school students (LearnLink). Summarized, we may state that whereas proposition A regards the demand for a new market, proposition B regards the demand for new technologies. In relation to Figure 5.3a and 5.3b, the proposition may be illustrated as follows (Figure 5.4):

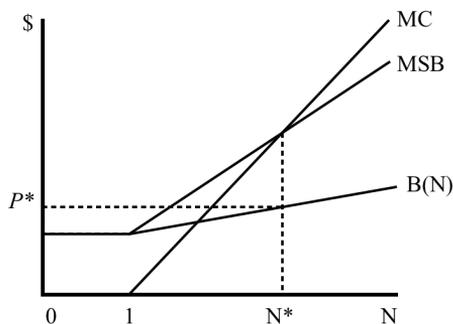


Figure 5.4: *The scenario where $B(N) = P(\text{Technology Factors})$ when $N < 1$*

The notion that 'technology factors' may be used to alter unfavorable expectations was in the context of two-sided markets most explicitly suggested by Bhargava (2014). He writes that a 'separate standalone benefit' may help new entrant platforms *'kickstart product adoption by achieving early sales on the basis of that standalone benefit, attracting those customers who have highest value for standalone features'* (Bhargava 2014, p. 202). Indeed, as early as 1992, Saloner & Shepard (1992) write that an end-user's 'per period benefits' may be represented by $a + b(N)$, where a represents a 'stand-alone' benefit which the user obtains regardless of the size of the network. Liebowitz et al. (1996) four years later similarly write that an 'autarky value' provides benefit in the absence of adoption, but that in 'pure network goods' (Van Hove 1999) such as e.g. telecommunications systems, *"it is reasonable to assume that the autarky value is zero"*, i.e. that there is no stand-alone benefit. In Figure 5.4 we see such a 'standalone benefit' influence the benefit curve of participants $B(N)$ prior to adoption (represented by the horizontal line of $B(N)$ until the first participant adopts, when $N = 1$) followed by a similar linear marginal benefit that

scales relative to the size of the network (N).

The theoretical role of 'stand-alone' technology factors was explored in depth in the third paper, using a similar conceptual model as that presented in Figures 5.3 and 5.4. Using a conditional argument, the findings of the paper are that conceptually, technology factors are sufficient to overcome the hypothetical 'chicken-and-egg' problem if (and only if) such factors are sufficiently strong to attract so-called 'innovative adopters', whose adoption decisions are not solely made based on the level of participation. The implications of the result are discussed further in subsection 5.1.4 below.

5.1.3 The Role of Platform Strategies

In addition to the two propositions presented above—which anecdotally argue that the promise (or hope) of a future valuable proposition may alone be sufficient to spur adoption—it was also found that platform firms may employ firm-level strategies which are contingent on immediate, rather than future value creation. One such strategy is related to the findings of the second paper, which regards the perceived value of first-party content.

First-party content has in the literature been described as content provided "*often for free or as part of a product bundle, which makes participation more attractive to one side (typically, buyers), sometimes independently of the presence of the other side (typically, sellers)*" (Hagiu & Spulber 2013). Commonly cited examples include first-party *games* (e.g. Microsoft's Halo, Sony's Gran Turismo and Nintendo's Wii Sports), *products* (Amazon Basics) *market information and customer ratings* (Amazon Marketplace, eBay, Alibaba), *applications* (e.g. on Apple's iOS, Google's Android and Facebook's Oculus), *functionality* (Facebook's newsfeed, friend suggestions, content moderation) and so on. One goal of providing such content is to ensure that new platforms are able to provide sufficient value to early adopters prior to the adoption by other participants. As such, types of first-party content (such as the examples above) may be categorized according to their relationship with third-party

participation as either *complements* or *substitutes*. First-party content that acts as a complement to third-party participation includes market information and customer ratings, Facebook's newsfeed, friend suggestions and content moderation. First-party content that acts as a substitute includes applications and games. The former is value-creating only after adoption by other participants, while the latter is value-creating prior to any adoption at all. Whereas the emphasis of the second paper is on first-party content which acts as a potential substitute for third-party participation (products labeled 'AmazonBasics'), the emphasis of the fourth paper is mainly on first-party participation which may be regarded as complementary. Findings from both studies suggest the same implication for entry, namely:

Proposition C: *First-party participation may alone be sufficient to motivate adoption*

In the case study presented in the fourth paper, first-party participation takes two forms, both of which may be considered conducive to successful entry. The first is the case firm Poption's execution of the so-called 'single side first' strategy (Parker et al. 2016, Bhargava 2014) wherein the firm initially sold candidate management software to small and medium enterprises (SMEs) whose value proposition was wholly independent of participation by other SMEs (or students). This scenario is depicted in Figure 5.5a. As can be seen, customers of the firm at that point derived a benefit (B) which was constant and independent of N, as the value proposition of the service did not rely on the adoption by other participants.

Because the firm had already sold its vertically integrated service to business customers (implicitly establishing an installed base), the firm entered the two-sided market for on-campus recruiting with an established level of participation ($N = n$) such that, even prior to entry, both the marginal private benefit $B(N)$ for potential participants and the marginal social benefit (MSB) were greater than zero (Fig. 5.5b). Formally, the firm was able to leverage an extant customer relationship by extracting and transferring the surplus from their participation to attract another group of participants and thus voided the 'chicken-and-egg' problem (Jullien 2005).

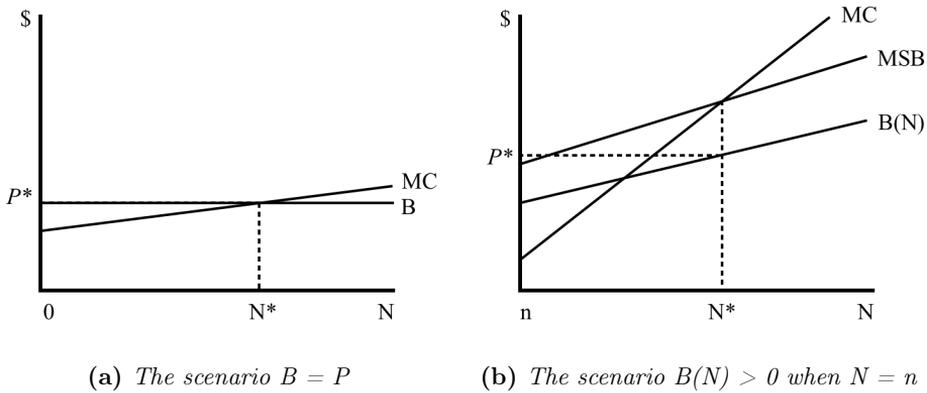


Figure 5.5: The benefit to customers (B) of Poption's first (Fig. 5.5a) and second (Fig. 5.5b) value propositions

5.1.3.1 On the Relative Value of First-Party Substitutes

Although the key finding concerning first-party participation (such as e.g. the strategy employed by Poption) was that such participation in itself be sufficient to motivate adoption, the ability for first-party participation to achieve adoption may be contingent on adopters' *perceived value of first-party participation*. The contingency was explored in the second paper, wherein the goal was to measure differences in consumers' perceived value of first-party versus third-party products, and thus highlight that 'not all participation is created equal'. Findings from the paper provide a quantitative measurement of the differences between how first- and third-party participation is perceived by consumers, which may be interpreted as empirical support for the claim that participants should be considered heterogeneous, at least in terms of their ability to generate marginal social benefits (MSB). The finding contributes to extant theory which argues that quality is often a determining factor for successful entry in markets characterized by a presence of network externalities (e.g. Zhu & Iansiti 2012, Tellis et al. 2009).

A prime example of the limitations of first-party participation strategies was Microsoft's development of smartphones (the Lumia 950, Lumia 950 XL, and Lumia 550) for its Windows Mobile operating system, as well as its bundling of Office Mobile,

the Edge web-browser and Groove music player. The strategy was not successful in spurring adoption of a sufficient number of buyers and developers to successfully enter the market for mobile operating systems with its introduction of Windows 10 Mobile in 2015. The firm was effectively 'locked out' (Farrell & Saloner 1985, Liebowitz & Margolis 1995, Schilling 2002) as a consequence of its late entry in a highly competitive two-sided market already dominated by Google's Android and Apple's iOS operating systems.

5.1.4 The Role of Adopter Heterogeneity

In extant literature on entry and adoption in two-sided markets it is generally assumed that participants are homogeneous in that their willingness to adopt a new platform depends solely on the level of previous adoption by other participants (e.g. Rochet & Tirole 2003, Armstrong 2006). An important exception includes Evans & Schmalensee (2010) who argues conceptually that that 'eager early adopters' may influence how platform adoption proceeds. This point is related to streams of research on new product adoption (Bass 1969, Mahajan et al. 1990), consumer behavior (Cronin et al. 2000, Miyazaki et al. 2005) and diffusion of innovations (Rogers 2010), where consumers are generally assumed to be heterogeneous in their preferences. This is, it is assumed that consumers may be grouped according to—for instance—their differing levels of *innovativeness* which may be defined as a measurement of an individual's 'willingness to adopt a new idea' (Rogers 2010). In such 'traditional' markets, extant literature in other words considers the willingness of '*some individuals do adopt an innovation independently of the decisions of other individuals in a social system*' (Bass 1969). Such individuals are referred to as 'innovators' in that they are not influenced in the timing of their adoption by the pressures of a social system, as are the 'non-innovators', sometimes referred to as 'imitators'. The theory of the adoption and diffusion of new products in a social system has been discussed at length by Rogers (2010), who finds that adopters differ in their timing of adoption according to the categorization above (innovators and imitators), and moreover, that imitators may be further subcategorized as early adopters, early majority, late majority and

laggards. Although 'innovators' are few in number (representing the leftmost section of a normal distribution, two standard deviations from the mean) their decisions are, according to the theory, eventually influential on all adopters as an innovation and its level of adoption is communicated ("diffused") throughout a social system.

As indicated above, findings from the conceptual study presented in paper 3 indicate that given sufficiently strong technology factors, platform firms in two-sided markets may overcome the hypothetical 'chicken-and-egg' problem by appealing first to innovative adopters on either side of a two-sided market. Such adopters may be buyers or sellers motivated by either of the three enabling factors outlined in sections 5.1.1–5.1.3, such as market-level inefficiencies, technology factors or first-party participation. As such, adopters' level of 'innovativeness' may itself be a function of either market-, firm- or product level factors. Following such innovator's adoption, the platform firm may next advertise their participation to either imitators on the same side or pursue innovators on the other side of the market, hence 'getting both sides on board' (Rochet & Tirole 2003). The main implication of the finding is hence that entry is independent of the level of third-party participation in such contexts', as innovators break the coordination problem by making their adoption decisions based on e.g. technology factors exclusively. The finding is in accordance with (and indeed was inspired by) findings presented in the first paper, and leads to the following proposition for further research:

Proposition D: *Platform adopters are heterogeneous in their motivations*

If the proposition is found to be supported by further studies, there is a degree of innovativeness in certain two-sided markets which voids the 'chicken-and-egg' problem, as new entrant platform firms may spur adoption from such innovators by leveraging technology factors (or e.g. third-party participation). As a solution to the coordination problem described at the outset of Section 5.1, such a scenario may be illustrated follows (Table 5.1).

From the perspective of a user, superficially we recognize that waiting to join secures us a higher expected payoff over time if we consider our actions in isolation (2 or -2

		Users	
		Join	Wait
Innovative providers	Join	1,2	1,0
	Wait	-1,-2	0,1

Table 5.1: *Payoff matrix depicting a potential role for innovators in resolving the 'chicken-and-egg' coordination problem*

if we join vs 0 or 1 if we wait). However, as users, putting ourselves in the shoes of innovative providers we also recognize that innovative providers will never choose to wait because this strategy is strictly dominated. That is, innovative providers will never do better by choosing to wait (-1 or 0 vs 1 or 1). Thus, as a user we are confident that innovative providers will always join, and so may be confident in coordinating on the strategy set (join, join) as it yields us a strictly higher payoff than waiting (2 vs 0). As opposed to the scenario of the 'chicken-and-egg' problem, the game between innovative providers and users thus only has one pure Nash equilibrium point, (join, join).

In addition to Bhargava (2014)'s emphasis on the role of technology factors for entry, he also explicitly suggests that heterogeneity among potential participants (on the value they place on each additional network participant) is also conducive to successful entry. In addition to this discussion, the topic of adopter heterogeneity has previously been studied in the context of price discrimination and product differentiation. Weyl (2010) studied sources of user heterogeneity and their implications for the pricing strategies of platform firms, including user preferences. He does not investigate heterogeneity in terms of willingness to adopt a platform, but rather how differences in income and a participants' level of interaction lead to differences in platform firms' optimal pricing strategies.

Methodologically, here it is prudent to mention that the empirical findings that underpin both propositions A and B also imply proposition D, in that—from the perspective of managers—adopters to Xeneta and TikkTalk, WeClean and LearnLink differed in their reasoning for why they joined prior to the existence of an installed

base. In the former case (Xeneta), adopters were willing to join due to external motivations whereas in the latter case, the conditions were internal. Overall we may conjecture that differing motivations in both cases was sufficient to enable entry. The necessary conditions for various entry scenarios are provided in paper 3.

5.1.5 The Role of Imperfect Information

As we see, extant literature has suggested that the willingness of potential participants to adopt a new-entrant platform is contingent on their expectations about the future level of participation on the platform (e.g. Fuentelsaz et al. 2015b, Hagiu 2006). Expectations, thus, may be considered a function of a platform's reputation (Jullien 2005), which in turn must be a function of potential adopters' information about a platform's level of adoption. In extant literature, it is generally assumed that adopters are homogeneous also in their levels of information, and thus that a platform either has a 'universal' reputation among all potential adopters, or none at all (implying a 'chicken-and-egg' problem due to unfavorable expectations). The strategic role of information in two-sided markets has previously been studied by Chellappa & Mukherjee (2020), who investigated the information contained within platform preannouncements. Through a game-theoretic analysis, the authors model platform firms' preannouncement strategies under different market conditions and find that depending on adopter preferences, it may be beneficial for new entrant platforms to pursue elaborate information-sharing strategies in order to spur adoption.

The empirical findings from paper 1 suggest that participants to several of the platform firms included were unaware of the level of participation from third-parties at the time of their adoption. For instance, Konsus' manager stated that he himself would do jobs if designers were absent, presumably without notifying customers. Xeneta's manager similarly stated that early buyers of shipping quotes were unaware of the amount of data that constituted a representative market price, stating "*We had some of the map, but how much data was behind it? Some [prices] had a lot of data behind them and were very accurate, while some had less, just enough data. Legally, you can't call something an average in Europe without three overlapping pieces of*

data. In the United States that limit was four, and so we set the global standard to be four". Such findings, in accordance with intuition, lead to the following related proposition to the previous:

Proposition E: *Platform adopters are heterogeneous in the information they possess*

Specifically, it is interesting to consider adopters which possess no information about a platform's previous level of adoption. In addition to findings from paper 1, the case study from paper 4 provides additional evidence that in such cases, platform entry may still be possible. Methodologically, again, the empirical findings that underpin proposition C thus also imply proposition E, as for Poption, the platform's initial participants (companies) were buying a different service (a candidate management software). Only later did the firm leverage such early participants' participation in order to attract students, which in turn attracted more companies, now based on a different value proposition (a platform for on-campus recruiting for students). Chronologically, it would have been impossible for the customers of the first value proposition (prior to the establishment of a two-sided platform) to have been informed of the level of participation at the time of their adoption. As such, heterogeneity in terms of adopters' level of information, too, may be enable entry in two-sided markets.

5.1.6 The Chicken-and-Egg Problem

As we have read, the 'chicken-and-egg' problem has spurred a multitude of highly cited studies in the extant literature on entry in two-sided markets. Indeed, in both acclaimed peer reviewed academic journals (Rochet & Tirole 2003, Caillaud & Jullien 2003, Hagiu 2006, Spulber 2010, Hagiu & Spulber 2013), trade publications (Hagiu 2015, Cusumano & Gawer 2002) and popular science books (Parker et al. 2016, Evans & Schmalensee 2016, Cusumano et al. 2019), considerable emphasis is placed on the importance of overcoming a 'chicken-and-egg' problem on entry. In fact, as Hagiu (2006) claims, "*perhaps, the main characteristic of two-sided markets is the presence of bilateral indirect network effects giving rise to a 'chicken-and-egg' problem*".

Although theoretically interesting and intuitively a (seemingly) relevant phenomenon, the empirical verification of the relevance of a 'chicken-and-egg' problem still remains nascent. That is, the phenomenon described and interpreted above has yet to be investigated in the 'real world beyond the model', except for studies which *a priori* assume its existence. The most relevant results from empirical research thus far were provided by Kyprianou (2018) who studied how value creation occurs in nascent platform firms, emphasizing the need for governance of producers' and consumers' participation. Her findings were that platform firms may create value either from the "outside-in" (transitioning from low to high levels of control of supply-side heterogeneity and cross-platforms interactions) or from the "inside-out" (continuously balancing low and high levels of control). A less established study was provided by Schirmacher et al. (2017) who, through qualitative interviews with 14 founders and CEOs of digital platforms observed preliminary that platforms with switching sides tend to implement a simultaneous entry strategy, whereas platforms without switching sides implement a sequential entry strategy. Also related is Kim (2018), who via a diffusion model investigated the entry of RecordFarm, a social audio platform. He found that the nature of users' activities and the relationships between the platform firm and its users on the platform are critical elements to successful entry. Neither described findings which may be interpreted as empirical verification that the 'chicken-and-egg' problem is a relevant obstacle to entry in two-sided markets. Reviews of the present state of literature on strategies for overcoming the chicken-and-egg problem are provided in McIntyre & Srinivasan (2017), Stummer et al. (2018) and de Reuver et al. (2018).

The key findings of this dissertation thus suggest the following:

1. Proposition A suggests that market-level factors alone may be sufficient to permit entry;
2. Proposition B suggests that service-level factors alone may be sufficient to permit entry;
3. Proposition C suggests that firm-level factors alone may be sufficient to permit

entry;

Proceeding abductively, it is further claimed that propositions A–C imply the following:

1. Proposition D, which suggests that platform adopters should be considered heterogeneous in their motivations;
2. Proposition E, which suggests that platform adopters should be considered heterogeneous in the information they possess;

Which in turn, lead to the following conclusion with implications for future research:

Proposition F: *The 'chicken-and-egg' problem is a theoretical red herring*

The colloquial term 'red herring' is here specifically chosen because it refers to phenomena which on their surface appear novel and interesting, but which when studied further in fact are the opposite, 'misleading or a distraction from the real question'⁸. Like deduction from Zeno's 'Dichotomy Paradox' "*That which is in locomotion must arrive at the half-way stage before it arrives at the goal*" lead Zeno to the conclusion that all travel over finite distance can never be completed (and so that 'all motion must be an illusion') (Skyrms 1983), the 'chicken-and-egg' problem is a theoretical paradox which arises as a result of the assumptions and limitations of conceptual models, but whose empirical implications may ultimately be trivial.

5.2 Implications for Practice and Policy

In addition to the implications for research outlined in propositions A–F above, findings from the studies included in the four research papers and cover essay additionally feature important implications for managers of platform firms and policy makers. While the implications of propositions D–F are most obviously relevant for research, propositions A–C in particular features important managerial implications, while proposition E additionally has implications for policy makers.

⁸From the the Oxford English Dictionary. Available at <https://www.oed.com/view/Entry/160314?rskey=TLFa16&result=2#eid>

5.2.1 Implications for Managers

The findings presented in Section 5.1 imply that managers looking to enter two-sided markets should both look for and strategize towards maximizing the enabling factors summarized in propositions A–C. In particular, with regards to proposition A this implies looking for vertical markets in which the demand for new solutions is high (e.g. as the result of a lack of transparency) and there is a lack of efficiency (making way for a platform to lower both search- and transaction costs). Superficial characteristics of such markets, based on findings from the studies, may be that there is willingness to enter into discussions with the firm prior to entry, such as e.g. potential participants answering sales calls, accepting meetings and clicking on/engaging with digital advertising and content. As was described by Patrik Berglund of Xeneta, managers should look for industries in which potential participants experience a "*pain*" which is "*interesting enough that it should be possible to persuade them*".

With regards to proposition B, the findings of the dissertation imply that managers should actively seek out technology factors which are likely to generate a significant number of 'innovative adopters' who may be willing to adopt based solely on the technology itself, independent of participation by others. In many cases, such technology factors may be factors which e.g. lower search costs for sellers or workers, in that they perform a marketing function, as was the case at LearnLink, TikkTalk and WeClean. As summarized by Gautam Chadna of TikkTalk, sometimes "*They are all looking for jobs*" and so this function alone may be sufficient to enable successful entry.

Finally, with regards to proposition C the findings imply that managers should formulate a first-party strategy which features first-party participation both as a (typically, temporary) substitute for third-party participation (in order to spur adoption) and/or first-party participation which is complementary (in order to stimulate further adoption). In the cases of Graphiq, Konsus, LearnLink, Tise and Uninite, first-party participation as a temporary substitute during entry enabled the firms to attract buyers which in turn helped attract third-parties. In Poption's

case, complementary first-party participation through the offering of a candidate management software enabled the firm to establish and leverage an installed base and so successfully enter the market for on-campus recruiting.

5.2.2 Implications for Policy Makers

Although not the primary focus on the dissertation, the findings of the four papers and cover essay also has implications for policy makers. Herein, in particular related to the role of information in two-sided markets. Proposition E suggests that potential adopters in two-sided markets possess different information and so differ in their abilities to formulate optimal adoption strategies. Such information may regard the level of participation (which is the emphasis in extant literature) but also the *level of benefit* an adopter can expect to derive from participation. In the previous section, it is argued that managers of platform firms should work to optimize the perceived level of both such that potential participants' expectations about future benefits are as favorable as possible.

Several of the firms included in the first study employed low-wage workers whose willingness to join platforms appeared to stem from a lack of steady employment. Indeed, the overlap between factors leading to proposition A and B and high unemployment is likely considerable. Herein, again, the incentives of platform firms are to share the necessary information such that expectations are favorable and positive network effects are maximized. Said differently, this also includes not sharing information which may lead to unfavorable expectations and diminished network effects. In cases where such information regards the long-term benefits of working through an intermediary versus full-time employment, for instance, such information asymmetry between platforms and participants may decrease social welfare for platform workers over time. As such, policy makers should ensure that platform firms are required to disclose the necessary information about participation, expected benefits and risks/liabilities in such a way that workers' interests are internalized and accounted for in the pricing structures platform firms employ.

5.3 Scope and Limitations

The findings and propositions of the dissertation presented in this chapter, as the studies they are based on, feature several limitations. The goal of this section is to outline these limitations in order to provide the necessary context from which to interpret the findings and their summarized implications.

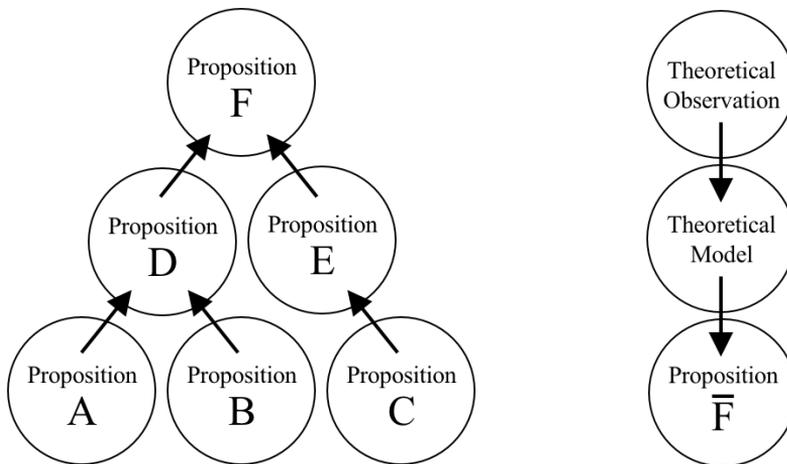
5.3.1 Limitations of an Ampliative Approach

"Every truth claim, either positive or negative, has a burden of proof" – Paul Chamberlain

The findings summarized in propositions A–F generally follow from inductive/abductive studies based on qualitative, empirical observations gathered in the studies featured in papers 1 and 4. As such, they are claims based on findings observed in specific contexts, at specific times, but based on which it is difficult to formulate general rules which apply in all contexts. As such they may in a sense be considered 'existence proofs' (Siggelkow 2007) which warrant the attention of both researchers and managers, due to their empirical origin and novel characteristics. In order for propositions A–F to be shown to apply in more than the specific contexts from which they were discovered, additional deductive research is needed. In particular, deductive quantitative studies (such as that provided in paper 2) are needed which determine the circumstances in which each proposition holds, as well as contextual- and firm-specific enabling factors.

The structure of the reasoning leading to proposition F is illustrated in Figure 5.6a. The first row of propositions (A–C) are based on findings from studies which purport to show so-called 'evidence of absence'. From these, via abductive reasoning, further propositions (D and E) have been formulated according to the principle of Occam's razor, attempting to derive the most likely implications based on the information available, without including further assumptions. Finally, based on the strength of these propositions, contrasted with extant theoretical perspectives, the

final proposition (F) is formulated. Notice that propositions A–E are structured in such a way that proposition F still holds if either of the propositions A–E are refuted. The robustness of proposition F, given the findings of the study, thus relies on the truth of either propositions D or E, or both, which in turn rely on the propositions A and B, and/or C. While proposition D relies on the truth of either proposition A or B, proposition E relies only on the truth of proposition C. There are thus two distinct paths that lead to support for proposition F in the argument. These paths are illustrated in Figure 5.6a. Although certainly not definitive, the structure of the argument thus assists in underpinning the claims of propositions D–F.



(a) *The reasoning leading to proposition F* (b) *The reasoning leading to proposition \bar{F}*

Figure 5.6: *Inductive (Fig. 5.6a) and deductive (Fig. 5.6b) arguments concerning the relevance of the 'chicken-and-egg' problem*

5.3.2 Epistemological Challenges

Attempting to deductively show proposition F ('The 'chicken-and-egg' problem is a red herring') amounts to proving a negative claim i.e. asserting the non-existence of a proposed phenomenon. From the perspective of a scientific realist this is problematic, as we cannot immediately know whether or not we even have epistemic access to showing F. This problem is succinctly illustrated by philosopher Bertrand Russell

and his analogy now known as 'Russell's Teapot' (Russell 1952):

"If I were to suggest that between the Earth and Mars there is a china teapot revolving about the sun in an elliptical orbit, nobody would be able to disprove my assertion provided I were careful to add that the teapot is too small to be revealed even by our most powerful telescopes." — Russell (1952)

What researchers can do, however, is show that its negation \bar{F} is true, namely the statement of "not F":

Proposition \bar{F} : *The 'chicken-and-egg' problem is **not** a theoretical red herring*

Colloquially, proposition \bar{F} may be interpreted as the statement 'the 'chicken-and-egg' problem is novel, interesting and is a relevant/important question'. Thus far, the evidence to support this claim have, as Figure 5.6b implies, been limited to deductions from extant theory. Examples of such studies and their claims may be found in Section 2.2.7. Logically, a deductive study showing the proposition \bar{F} would refute proposition F, but it would not follow necessarily that propositions A–E have been negated.

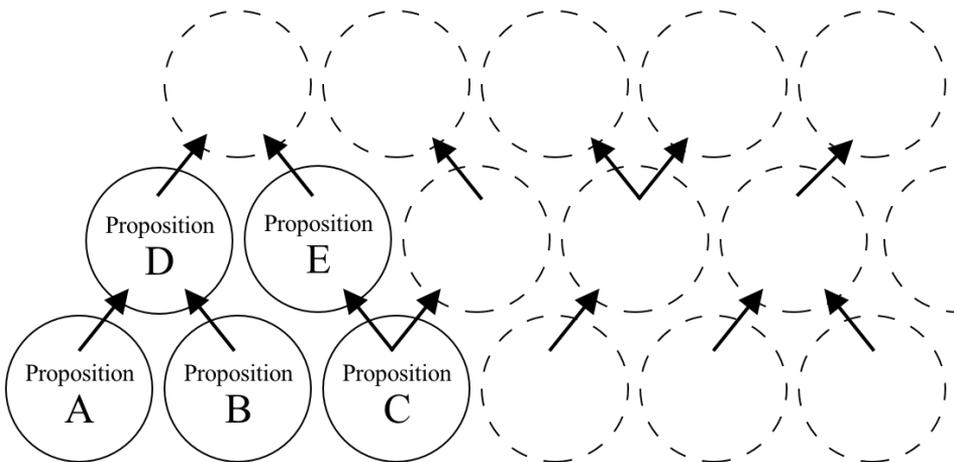


Figure 5.7: *The proposed method of strengthening the abductive argument for proposition F*

5.3.3 Strengthening Abductive Arguments

Occam's razor suggests that the simpler theory with fewer assertions (rather than the more complex theory) should be the starting point in any inquisitive discussion. Thus, one might propose, that rather than attempting to deductively show proposition F , it is perhaps more efficient to show the 'black swan' proposition \overline{F} . However, limited to the observations contained in papers 1-4, our abductive reasoning reaches its methodological limit in that, absent further observations and/or additional assumptions (violating Occam's razor) we're unable to pose further claims. However, in the interest of completeness, it is prudent to mention the role of further ampliative, empirical work in order to support propositions D-F in the absence of confirmation of \overline{F} . The potential role of such studies is depicted in Figure 5.7. This task, however, will have to be left for future studies.

With the addition of further studies featuring additional propositions of higher and higher degrees of accuracy and detail, propositions such as D-E may be strengthened to a point where only a deductive study is sufficient to assert the negation of proposition F , \overline{F} .

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Part II

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Research Paper 1

The Dynamics of Entry for Digital Platforms in Two-Sided Markets: A Multi-Case Study

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The Dynamics of Entry for Digital Platforms in Two-Sided Markets: A Multi-Case Study

Abstract

Motivating buyers and sellers to join an empty platform is thought to be a key challenge for firms attempting to launch digital platforms in two-sided markets. According to predictions from extant literature, 'no one joins until everyone joins'. The phenomenon is often referred to as the 'chicken-and-egg' problem. This study investigates the phenomenon in an exploratory multi-case study of ten startup technology firms operating digital platforms in two-sided markets. The study finds that the firms entered their markets using a variety of strategies distinguishable by strategic, relational and temporal factors. A conceptual framework is proposed which distinguishes the firms' strategies along these dimensions. In addition, a cross-case discussion of the dynamics of the firms' strategies is provided. Deductively, the findings contribute to establishing an empirical grounding for predictions from extant literature. Abductively, the findings contribute preliminary managerial implications as well as propositions for further research on entry strategies for digital platforms in two-sided markets.

Introduction

"We didn't have anything to offer, but at least they had a pain that was interesting enough that it should be possible to convince them" - Patrik Berglund, CEO of Xeneta

Many of the largest and most influential firms in today's economy operate digital platform businesses in two-sided markets dominated by network externalities, so-called "network effects" (Katz & Shapiro, 1985; Rochet & Tirole, 2003). Acting as intermediaries between two or more groups of participants with interdependent demands, such firms' main market function is typically described as the facilitation of interactions and transactions between producers of goods on one side and buyers or users on the other (e.g. Hagiu, 2006; Boudreau & Jeppesen, 2015). Examples of various types of platforms range from the two-sided platforms of Amazon's Marketplace (sellers and buyers), Apple and Google's "app" stores (developers and users), services such as Airbnb (hosts and guests) and Uber (drivers and passengers) to multi-sided platforms such as those offered by Facebook, Google Search and YouTube (content providers, users and advertisers).

The successful entry of a digital platform provider in a two-sided market is said to rely on that firms' provision of products and/or services which increase the platform's attractiveness to buyers/users (McIntyre & Srinivasan, 2017; Alt & Zimmermann, 2019). In providing a valuable transportation service to passengers, a ride-sharing platform such as Uber is reliant on its ability to first attract a sufficient number of drivers, which in turn are more likely to join platforms with already established demand from passengers. Because of this, firms looking to establish platform businesses in two-sided markets can prior to entry be faced with a 'chicken-and-egg' problem (Caillaud & Jullien, 2003; Kyprianou, 2018), the so-called 'circular conundrum' (Spulber, 2010) if the expectations among potential end-users and suppliers/complementors are unfavorable (Hagiu, 2006).

Historically, researchers have focused on the size of the so-called 'installed base' as

the most strategically valuable asset in networked industries (Evans & Schmalensee, 2007). Related, there has been a tendency in extant research to consider the availability of products and/or services to a platform as an exogenously determined fact rather than a construct that is susceptible to (and ultimately dependent on) strategic manipulation. This should be considered a key limitation to our current understanding of how platforms launch (McIntyre & Subramaniam, 2009; McIntyre & Srinivasan, 2017). Thus far in research that has investigated platform entry, one seeming consensus has been that platform owners should pursue aggressive monetary strategies for attracting buyers in order to motivate potential suppliers to join (Boudreau & Jeppesen, 2015; Cennamo & Santalo, 2013). Examples of such strategies often highlighted in extant literature include 1) setting low prices to one side of the market first and making money on the other side later (e.g. Tirole & Rochet, 2003; Armstrong, 2006) and 2) using licensing strategies and/or exclusive contracts (e.g. Armstrong & Wright, 2007; Hagiu, 2009). Additional strategies often discussed include offering first-party content (Hagiu & Spulber, 2013), ensuring compatibility with the preferences of suppliers/an installed base on existing platforms (Schilling, 2002) and manipulating the expectations of potential participants by pre-announcing the service before it is actually viable (Bhargava, 2014).

This paper examines the phenomenon of supplier recruitment to platforms in two-sided digital markets prior to their establishment of network effects. This is done through an abductive, exploratory multi-case study. The goal of the study was to provide an overview of how two-sided platforms can emerge as the consequence of platform firms' supply-side recruitment strategies, and so expand of the scope of non-pricing related research on entry strategies in markets ultimately dominated by network effects. The primary source of data for the study was interviews with managers of established start-up firms operating digital platforms in two-sided markets. The research question guiding the investigation was:

How do managers of nascent digital platforms in two-sided markets strategize to recruit early suppliers?

The paper makes three contributions to the literature. Primarily, it provides a grounded empirical overview and framework describing the dynamics of non-pricing related entry strategies employed by firms to attract suppliers to platforms prior to the establishment of network effects. Secondly, as a result of the preliminary analysis of the firms' entry strategies, an analysis of the dynamics of early supplier recruitment is provided, highlighting relevant managerial considerations as well as contextual and firm-specific factors affecting the success of the firms' strategies. Finally, given these findings, the paper provides preliminary managerial implications as well as motivates an agenda for further theory building on non-pricing related entry strategies for newly established platforms in two-sided markets.

In the following section, the theoretical context in which the findings of the study were interpreted will be presented. In the next sections, the methodology used to capture and analyze the data is outlined, along with the findings and the analysis that emerged from this process, respectively. The discussion section that follows re-examines novel observations from the findings contrasted against the relevant theoretical context. The paper concludes with a summation of the findings of the study, preliminary managerial implications and an agenda for further research.

Theoretical Context

“Most often prospective users of new services will not know how much utility they can obtain from the service until after they start using it.” - Halaburda et al. (2013)

In traditional value chains, firms acquire inputs from suppliers and bundle them into products and services, which are offered to buyers through activities such as marketing, distribution and customer service (Porter, 1985). In two- and multi-sided markets, platform firms operate businesses which act as intermediaries between multiple groups of participants who are looking to benefit from interacting with other participants with complementary needs. While the definition of what constitutes a 'platform' in two- and multi-sided markets varies, two general forms have previously

been identified in the literature: two-sided and multi-sided platforms (Otto & Jarke, 2019). Whereas two-sided platforms mediate transactions and/or interactions between two groups of users (e.g. buyers and sellers), multi-sided platforms (MSPs) intermediate between at least three groups (Hagiu, 2009) such as e.g. businesses, users, software developers and advertisers.

The fundamental premise of platform-mediated networks is that users place a higher value on platforms with a larger number of participants (Cennamo & Santalo, 2013) with whom they can interact. In extant conceptualizations of both two- and multi-sided platforms, prospective participants' level of uncertainty about the usefulness of a new platform is in other words thought to be highly dependent on the level of adoption by other participants with complementary interests (Halaburda & Yahezkel, 2013). For instance, in a two-sided market, a new platform offering contactless payments may increase merchants' profitability, but merchants will only become aware of this increased utility when a significant number of buyers adopt the platform and begin completing transactions. Likewise, buyers may find a new payment service more efficient and easier to use but be unaware of this fact until merchants accept the new service as a valid method of payment. The archetypal initial strategic challenge in two-sided markets is hence breaking this initial 'circular conundrum' (Spulber, 2010) by convincing one group to join first, before approaching the other group with a proposition which highlights the value of interacting and/or transacting with members of the first group who are already on the platform.

An alternative way of breaking the circular conundrum is for a platform owner to add additional groups whose participation decisions are not wholly contingent on the existing number of participants in the market (Boudreau & Jeppesen, 2015), i.e. creating a multi-sided platform. For our example above, the contactless payment platform may implement third-party software which allows buyers to browse the merchant's goods online, which on its own may attract enough merchants to the solution so that the circular conundrum is broken. Providers of such third-party services are commonly referred to as "complementors" (De Reuver et al., 2018). In both two- and multi-sided markets, the link between the actions of participants from

one group (such as buyers) on the expected utility of participants from another group (such as merchants) is what is commonly referred to as indirect “cross-group” network externalities (“effects”) (Caillaud & Jullien, 2001; 2003).

The two core groups of participants in both two- and multi-sided markets are commonly referred to as demand- and supply-side participants. In most markets, demand-side participants are the receivers of services provided primarily by supply-side participants. Conversely, supply-side participants are the receivers of some other (often monetary) value provided by demand-side participants. In multi-sided markets, third-party participants (“complementors”) provide services which complement the services provided by either demand- or supply-side participants, or both. In our example above, the third-party software service complements the offering of the supply-side (merchants), helping to attract demand-side participants (buyers). On advertising-supported platforms such as YouTube, third-party advertisers complement (subsidize) the value of the attention provided by demand-side participants (viewers) for supply-side participants (uploaders). From the perspective of participants, platforms act as independent, third-party intermediaries of interactions and/or transactions between the various groups.

In extant conceptualizations, the decisions of suppliers of goods and services to join a platform are thought to mainly be the function of their expectations about the level of participation on the other side(s) of the market (Fuentelsaz et al., 2015). Much of the focus of platform research has thus far therefore revolved around formulating strategies for ensuring that potential participants’ expectations are favorable (Hagiu & Spulber, 2013). The formalized economics literature has here mainly emphasized the role of pricing strategies (e.g. Rochet & Tirole, 2003; Armstrong, 2006; Caillaud & Jullien, 2003; Hagiu, 2006; Weyl, 2010). Other related literature dealing with how to ensure favorable expectations have included investigations of openness decisions (Boudreau, 2010; Eisenmann et al., 2009), content strategies (Boudreau & Jeppesen, 2015; Carlton et al., 2010; Farrell & Katz, 2000; Hagiu & Spulber, 2013) and expectations from the point of view of neoclassical economic theory (e.g. Rochet & Tirole, 2003; Spulber, 2003; Hagiu, 2006; Halaburda & Yahezkel, 2013; Hagiu &

Halaburda, 2014). Critics of this “IO” (industrial organization) approach to platform research have emphasized the tendency of such studies to 1) assume the presence of network externalities and other two-sided market characteristics exogenously (McIntyre & Subramaniam, 2009); and 2) treat the relationships between participants and platform firms as “black-boxes” (Srinivasan & Venkatraman, 2010), and so tend to focus mainly on the impact of available supply on market outcomes; and 3) overlook process dynamics and governance activities beyond pricing (Gawer, 2014; Wareham et al., 2014). This despite a seemingly strong consensus among management scholars that the management of supply is particularly beneficial in network markets (Kapoor & Lee, 2013). Much of extant research hence effectively excludes the possibility of strategic positioning and other phenomena commonly studied in management research (McIntyre & Srinivasan, 2017). As a result, extant literature holds limited value for managers attempting to strategically design and govern platform businesses for and during entry (Gawer, 2014). Although a nascent stream of strategy research has begun tackling this deficit, including studying the competitive advantage of entry timing (Eisenmann, 2006; Schilling, 2002), incumbent advantages such as firm size, platform features and relative quality (Liebowitz & Margolis, 1994; McIntyre, 2011; Zhu & Iansiti, 2012), as of yet, much still remains to be known about how firms go about successfully entering two- and multi-sided markets (McIntyre & Srinivasan, 2017).

Methodology

Research Design and Context

In an effort to contribute to the nascent theoretical context presented above, an abductive, exploratory multi-case study design was chosen. Multi-case studies are particularly appropriate when there is relatively little theoretical precedent for a deductive study (Eisenhardt, 1989; Yin, 2009). They allow the researcher to recognize and evaluate relationships among constructs, and therefor gain new theoretical insights (Eisenhardt & Graebner, 2007; Yin, 2009). An exploratory

multi-case study is particularly relevant for answering the research questions explored in this paper, as they relate to "how questions" such as how managers of firms went about formulating entry strategies for their respective markets (Eisenhardt, 1989).

Ten established start-up firms from Norway participated in the study. The sample was chosen across multiple industries in order to allow for investigations into industry-independent constructs. The sample was chosen exclusively among Norwegian firms in order to limit the impact of variance stemming from macroeconomic and regulatory factors, and in order to make use of the summarized accounting records of the firms, which in Norway are publicly accessible. Established start-up firms were chosen in order to be able to examine the properties and relative effectiveness of the strategies employed by the firms *post hoc*.

Inclusion Criteria

For a firm to be considered for inclusion in the study, its platform had to be sufficiently 'established' so as to indicate that it had likely established a liquid enough market to permit sustainable growth (Ondrus et al., 2015) i.e. had overcome the potentially unfavorable expectations of early demand- and supply-side participants (Hagiú & Spulber, 2013) and reached a so-called 'critical mass' (Ondrus et al., 2015). This in order to ensure that some combination of what ever strategies the firms pursued had been successful. In practice, firms were considered 'sufficiently established' if they had either 1. Generated revenue from their platform business in the preceding year (i.e. began monetizing their service on one or both sides of their platform) or 2. The scope of the firms' operations included 20 or more employees at the time of the sampling. Fulfilment of either criteria qualified firms for inclusion in the study. The decision to not require both criteria was made in order to enable inclusion of platforms who had yet to monetize their services, and/or had experienced rapid growth with a small organization. Fulfilment of either criteria was verified prior to sampling using data from the Norwegian financial database Proff ¹.

¹Proff AS, 2019. Available at <http://www.proff.no>

Additional criteria applied during sampling were:

- The firms' only major business activity had to be 'operating a platform in a two-sided market'. This in order to eliminate spillover effects from other business activities;
- The managers interviewed had to be working in the firms at the time of their founding. This to ensure that statements were first-hand accounts of what occurred;

Additionally, firms included had to be in a "start-up phase", in this study determined to mean that it was less than five calendar years since the founding of each firm. This in order to ensure quality in the data collected from managers during the interviews.

Selection Process

After determining the research design and inclusion criteria, a search process commenced. First, a list of Norwegian start-up firms operating platforms in two-sided markets was compiled. The initial list contained 37 firms. After applying the inclusion criteria and completing a superficial financial review to ensure that each firm could be considered as sufficiently 'established', 19 firms remained. Managers in each firm were contacted via email for participation in the study. Of those contacted, five did not respond to the inquiry, two declined to participate and twelve agreed. Of the twelve that agreed, ten were available for interviews in the data collection period from December 2017 - February 2018.

Sample

The ten firms included in the study are listed in Table 6.1. All ten firms included in the study offered especially favourable settings for data collection. This because, of the eleven managers interviewed (one firm was represented by two managers for the interview), ten were also co-founders and so significantly involved in the firms' operations prior to, during and after the launch of their services. Nine of the managers interviewed were also CEO of their firm at the time of the interview. Other

Firm	Est.	Value proposition	Supply-side participants	Demand-side participants	
Graphiq	GQ	2015	Design services	Freelance designers	SMEs
Konsus	KS	2016	Marketing and design tasks	Freelance marketers and designers	SMEs and large enterprises
LearnLink	LL	2014	Private tutoring services	Freelance private tutors	Parents of students in secondary school
Nabobil	NB	2015	Car rental service	Car owners	Consumers
NyBy	NY	2015	Community tasks	Public employees	Recipients of welfare services
TikkTalk	TT	2016	Interpretation service	Freelance interpreters	Organizations and SMEs
Tise	TI	2014	Social marketplace	Consumers	Consumers
Uninite	UN	2016	Shared housing matching	Property owners	Young adults
WeClean	WC	2015	Cleaning service	Freelance cleaners	SMEs
Xeneta	XE	2012	Freight price benchmarking	Buyers of freight services	Buyers and suppliers of freight services

Table 6.1: *Overview of firms included in the sample*

commonalities include nationality, as of the eleven managers interviewed all but one were native Norwegian citizens. Differences among the firms included the educational- and professional background of their founders. Six of the ten founders interviewed had university degrees in strategy, business and/or economics at a graduate-level, two in computer science and two had not pursued higher education. Four founders had experience from working in start-up companies, three from management consulting and two had no prior relevant work experience. Three founders had worked as suppliers in the same industry their firm operated in. The ten firms mostly operated in different industries, with the exception of two firms which both recruited graphic designers. All firms' main offices were located in Oslo at the time of the study. Two of the firms had international operations at the time of the study and eight had taken investments from angel investors, venture capital firms and/or corporate investors.

Data Collection

The primary source of data gathered for the study was semi-structured interviews, which is the most common method of data collection used in case-based research (e.g. Eisenhardt, 1989). The interviews were conducted face to face in the firms' offices. Each interview lasted approximately 45 minutes and was recorded. Every

interviewee was informed about the purpose of the study and gave consent that the findings could be published. Prior to conducting the interviews, an interview guide was composed. The guide consisted of a list of formal questions about the firms and their history, as well as open-ended questions about the founding of the firms and their operations. In addition to interviews, field notes documenting observations, insights, ideas and impressions were also recorded prior to, during and after the interviews. These were later used to supplement interview transcripts and to help confirm and reject emerging theoretical perspectives during the data analysis process.

To supplement the primary data source, secondary data from other sources was also collected. This for the purposes of triangulation (Yin, 2009), which refers to the process of 'self-consciously setting out to double check findings, using multiple sources and modes of evidence' to confirm qualitative findings (Miles & Huberman, 1994 p. 234-235, cited in Patzelt et al., 2014). In practice, triangulation involves subjecting potential findings to 'an onslaught of a series of imperfect measures' (Webb et al., 1965, cited in Patzelt et al., 2014) to corroborate findings generated from the primary data source(s). In this study, triangulation involved investigating the validity of verifiable findings relating to the firms entry strategies using information gathered from Internet searches, such as articles in publications about the firms and/or its co-founders, press releases/blog- and social media posts as well as archived versions of the firms' websites using the WayBack Machine on Archive.org². In practice, these secondary sources of information were used mainly to supplement and corroborate information about the firms' communication to potential supply-side participants around the time of their platform's entry.

Data Analysis

The overall analysis was structured according to the established procedures for grounded, theory-building research (Locke, 2001; Miles & Huberman, 1994; Strauss & Corbin, 1990), following guidelines for constant comparison techniques (Glaser &

²Archive.org, 2019. WayBack Machine. Available at <http://web.archive.org>

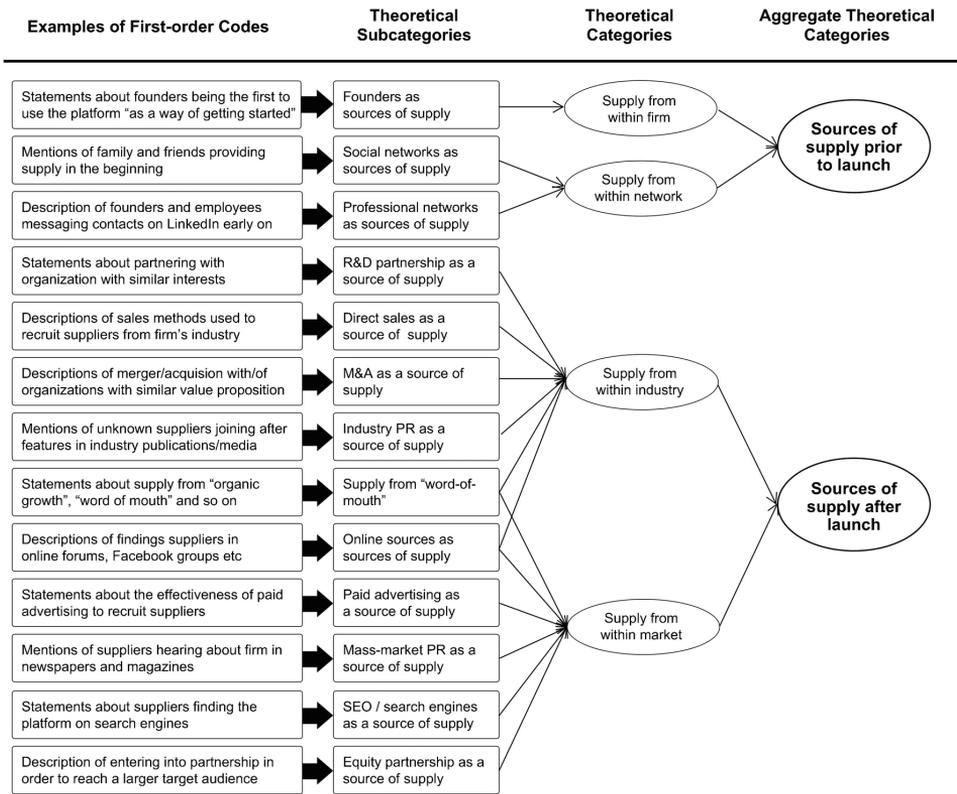


Figure 6.1: *Examples of how the theoretical constructs evolved using the so-called 'Gioia-method' of data analysis*

Strauss, 1967) and working recursively back and forth between the data and emerging theory (Patzelt et al., 2014). The core procedural guideline for the data analysis was to try to remain open-minded and "let the data speak" (Suddaby, 2006). The audio recordings of each interview were first transcribed by the author and a research assistant. The analysis process consisted of three steps, using the so-called "Gioia-method" (Corly & Gioia, 2013; Gioia et al., 1994, 2013; Pratt et al., 2006). First, first-order codes consisting of statements and descriptions were delineated from the texts. Next, the codes were grouped into sub-theoretical, then theoretical dimensions. Finally, the theoretical dimensions were grouped into aggregate theoretical dimensions which made up the core tenants of the findings of the study.

Identifying First-Order Codes

The first step of the analysis process consisted of a superficial analysis of each statement made in the interviews, so-called 'open coding' (Locke, 2001), looking to identify first-order codes (Van Maanen, 1979) related to managers' descriptions of how and why they established their platforms, as well as managers' impressions of how and why early suppliers joined. Segments (sentences, paragraphs) of text were coded individually by hand and combined with other potentially relevant data such as field notes and information gathered from secondary sources (Yin, 2009). At this initial stage, focus was on identifying consistent issues, strategies, relationships and other themes that appeared across cases (Corley & Gioia, 2006), using constant comparison techniques (Glaser & Strauss, 1967). Examples of first-order codes uncovered during the initial analysis were "early supply-side recruitment strategy", "early value proposition for demand side" and "preferences of early suppliers". A total of 136 first-order codes containing 1188 references emerged from the coding process. As with all steps in the analysis process, the coding process should be described not as linear but as a 'recursive, process-oriented analytic procedure' (Patzelt et al., 2014) which continued until the codes were deemed satisfactorily representative of the content of the primary data source.

Defining Subcategories and Categories

The next step involved raising the level of abstraction by moving from coding of transcripts to a more conceptual aggregation of codes into theoretical subcategories, referred to as axial coding (Locke, 2001; Strauss & Corbin, 1990; Patzelt et al., 2014). For instance, for the purposes of isolating origins of early suppliers, codes relating to the theme 'sources of suppliers' were grouped together under subcategories such as "founders as source of supply", "suppliers from word-of-mouth", "equity partnership as a source of suppliers" and so on, see Figure 1. Having subcategorized and categorized all the codes deemed relevant for the purpose of the study, the data was next organized into summary tables where the rows represented each subcategory, the columns represented the cases (the ten firms) and the cells specified which case

the subcategory was relevant to. By relevant here is meant that the case contained one or more codes which fit into that subcategory. The summary tables allowed for comparison of the differences and nuances between codes within subcategories across the cases in which the codes appeared. For example, under the theoretical subcategory "suppliers from personal networks" the codes represented three different firms' relationships with suppliers from founders' personal networks, with variance in managers' perceptions of early supplier relationships, strategies, motivations and so on. Here, instances of within-case variance were compared on a case-by-case basis both from the primary data (interviews and field notes) and secondary data (the Proff financial database and information acquired from Internet searches).

Aggregating Theoretical Dimensions

The final step of the data analysis process raised the level of abstraction further, from subcategories and categories into so-called 'aggregate theoretical dimensions' (Gioia et al., 2013), combining constructs into larger themes. This process involved evaluating each theoretical concept and iterating again between the data and the emerging dimensions to examine fit (Glaser & Strauss, 1967; Locke, 2001; Patzelt et al., 2014). Figure 6.1 provides a visual summary of the three-step data analysis process, showing examples of first-order codes, theoretical subcategories (sources) categories (relationships) and aggregate theoretical dimensions (timing).

Limitations

Interviews as a source of data is susceptible to limitations relating to bias due to poorly articulated questions, response bias, reflexivity (saying what the interviewee thinks the interviewer wants to hear) and inaccuracies due to poor recall. The use of semi-structured interviews and open-ended questions worked to mitigate the effects of some of these limitations. Given that the focus of the interviews were on events from as far back as five years prior to the interviews, managers' ability to recollect and recount events with a high degree of accuracy should for this study also be considered a limitation (Yin, 1994). Although articles, press releases/blog-

and social media posts as well as archived versions of the firms' websites were used to attempt to verify the validity of the statements gathered during interviews, a better source of data might have been interviews with early participants. This would also have made the findings more robust and of higher resolution, as factors such as motivations and preferences could have been examined more deeply. Such interviews were however not feasible as a consequence of the design of the study and its 'post-hoc nature', a consequence of wanting to capture data from firms whose platforms were likely to have reached 'critical mass', i.e. had created a liquid enough market to permit sustainable growth (Ondrus et al., 2015). The fact that coding and analysis was performed by a single researcher should be considered an additional potential limitation to the validity of the analysis. In particular, the process of moving from statements to first-order codes, to theoretical sub-categories and so on, 'raising the level of abstraction', would likely have benefitted from an additional researcher whose interpretations and categorizations may have differed. Other limitations unique to the study included those associated with the objects of study (start-up companies), which inhibited the researcher's ability to review potentially useful quantitative data on the effectiveness of the firms' purported strategies, as most of this data was either never captured by the firms, or since lost.

Findings and Analysis

The findings of the study shed light on the question 'How do managers of nascent intermediary platforms in two-sided markets strategize to recruit early suppliers?'. The following analysis explores three fundamental questions: 1. How were suppliers recruited? 2. What were suppliers' relationships to the firms they were recruited to? and 3. When did suppliers join? The findings are presented in a conceptual model according to the timing of when suppliers joined, prior to and post launch, in Figure 6.2. As several of the managers described a "slow rollout", "multiple launches" and "a beta period", the term 'prior to launch' in this setting is meant to generalize the concept 'prior to having established recurring demand'.

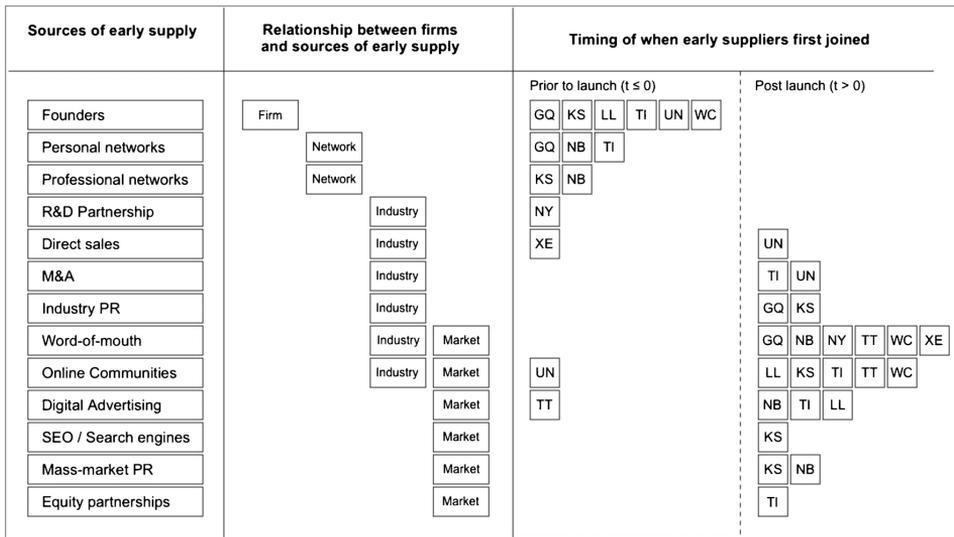


Figure 6.2: Overview of firms’ strategies for recruiting suppliers in terms of sources, relationships and the timing of when suppliers joined

Suppliers Prior to Launch

Managers of six firms mentioned a role for within-firm, ‘first-party’ supply of goods and services prior to launch. In two of these cases, at Tise and Uninite, this was motivated mainly by founders’ desire to ensure that as their services launched, the platforms *“wouldn’t be empty”*. The manager of the former, a social marketplace for buying and selling used goods, describes *“starting with us and everyone around us downloading and starting to list items so there would be some content”*. At the latter firm, which provides a roommate matching service, the manager described *“I put my own apartment up for rent. [The] person we ended up choosing would get one month free rent. We made a contest out of it, and were buried in requests”*. In other cases, the identification of founders as potential early suppliers occurred prior to the founding of the firms themselves. For managers of the graphic design platform Graphiq, part of the motivation for choosing to start a design service came as a result of the observation that one of the founders himself could provide the initial supply in order to get the platform started. The manager describes the use of a within-firm early supply strategy as successful, stating that it was *“critical for us to get our first*

sale”, adding that even before the firm was founded “*in the design industry, we saw a very short path to getting the first sale*”. In terms of motivation, at the private tutoring service LearnLink the founder similarly explained how his own first-hand experiences with the deficiencies of existing tutoring services inspired him to start a better platform where he himself could tutor students more effectively, and that this was how the firm successfully launched. The manager also reported a requirement for employees to also teach, that “*everyone has to have at least one student in order to get paid*”, and that he himself as CEO “*have had students continuously for five years now, [...] sometimes up to 9-10 students at once*”. The same manager also expressed great personal motivation from tutoring for its own sake. At the other platform for graphic design/marketing services, Konsus, managers’ reasoning for utilizing within-firm supply was different: founder-provided supply was described as a means of meeting peak demand, a secondary “*backup*” source used when the firm was unable to adequately match demand from its primary source of early suppliers (freelancers from their professional networks), stating that in the beginning, “*we always tried to find freelancers, but if you have short deadlines then sometimes you have to do it yourself*”. Yet again different, at WeClean, having founders provide supply to the platform (for cleaning services) was described as a part of the company ethos i.e. that the founders believed strongly in the principle that everyone at the firm needed to experience suppliers’ role in order to gain valuable first-hand experience with the business they were in. Elaborating on this, the founder added that in the beginning “*We did the majority of the cleaning ourselves*”, and even during the time of the interview (when other suppliers had joined), “*everyone who is an owner in the company is out there cleaning*” because “*cleaning is the backbone of what we do, and we never want to forget that, it’s what grounds us*”.

Managers of four firms mentioned early supply of goods and services originating from the founders’ personal- and professional networks prior to launch. At all four firms (Graphiq, Konsus, Nabobil and Tise), recruiting suppliers from network-level sources was described as part of the firms’ primary strategy for acquiring early suppliers. At the design service Graphiq, the founders early on reached out to freelance designers

in one of the co-founders' personal network, whom the founder said he *"knew I could get on board early"*. At the design/marketing service Konsus, the platform was first launched by one of the co-founders manually intermediating communication between interested clients (SMEs) in Norway and freelancers in the Philippines whose services the manager himself had used in the past. *"Mostly, I'd guess about 20 percent we were unable to match in the beginning"*, the manager stated. Similar to the reasoning provided by the founders of the social marketplace Tise, the CEO of the car sharing service Nabobil described how everyone in the firm reached out both to people in their personal and professional networks via Facebook and LinkedIn asking for a favor to *"help us get started"* and *"build up some volume"*. Regarding the effectiveness of the strategy, the manager stated that it *"got us started"*.

Four firms recruited suppliers from industry- and market-level sources prior to launch. These were NyBy, Xeneta, Uninite and TikkTalk. At Nyby (the platform for organizing community tasks) the firm's sole entry strategy was to enter into research and development partnerships (R&D) with a municipality and a church mission which both *"wanted to join right away"* and so agreed to license the platform once it was developed and provide both suppliers and users from their organizations and professional networks. Speculating about why the organizations decided to join at such an early point, the manager stated that they *"had for ten years been talking about needing to think different, the health care system of tomorrow, municipalities 3.0 and so on"*, suggesting that NyBy's initial suppliers were in the market for a solution similar to that which they were proposing, prior to being approached. The manager describes using an *"R&D loophole [. . .] which allowed us to get paid ahead of time, over the regular threshold, as long as we are solving a problem the organizations needed to get solved"*. At the freight price benchmarking platform Xeneta, prior to launch the founder described entering their first meeting with *"nothing"*, adding *"you're selling the story, right?"*. Despite this, the manager describes being able to recruit firms to both provide supply (in the form of prices disclosed in confidential contracts) and to eventually use their service, exclusively from *"traditional"* sales methods such as cold-calling and sales meetings. The firm built web scraping software

to generate leads among users of the social network LinkedIn who worked for firms who might be interested in the platform they were building. The manager explains *"in the beginning, we cold-called. [...] Within two weeks, I had booked meetings with approximately eight of the ten largest [firms] we had picked out, and then just traveled around. More or less all of them provided some [pricing] data"*. Regarding suppliers' motivations, the manager said *"I think the pain they were feeling was pretty severe"*, adding *"What made it interesting was the fact that this was confidential data, which is both what made it valuable and extra hard to get"*.

At the roommate matching service, Uninite, in addition to founder-provided supply, the manager describes *"building up a database of property owners, who we would call"*. When asked how they established the database of suppliers, the manager responded *"They were people who had ads in other places, who we approached"*, summarizing their value proposition to landlords as akin to *"You'll get twice the exposure"*. Finally, at TikkTalk, the manager described supplier recruitment as somewhat of a trivial pursuit using a strategy consisting exclusively of paid digital advertising, stating *"Translators we found quite easily. We tried some Facebook Ads and it was super easy to attract them onto the platform. They are all looking for jobs"*.

Suppliers Post Launch

After having established recurring demand from their early sources of suppliers, in addition to/replacement of existing sources, nine of the ten firms describe recruiting additional suppliers from industry- and market-level sources. Firms that continued their existing strategy of recruiting suppliers through direct sales methods were Xeneta (cold calling and sales meetings) and NyBy (R&D partnerships with municipalities, charities and other non-profit organizations). Having established *"a foundation to build off"* from suppliers originating from within firm- and network-level sources, six firms described recruiting from industry-level sources to expand their service further. At the social marketplace Tise, the firm supplemented its initial group of firm- and network-level suppliers by *"working from Facebook buy-and-sell groups for a while"*, some of which *"had over two hundred thousand members"*. The strategy eventually

led to Tise merging its platform with the owner of two popular groups, who in return received *"a stake in the company"*. In order to maximize the value provided by these early suppliers, Tise's CEO noted how they deliberately chose to hide the publication date of when items for sale were posted, so that the platform wouldn't *"feel dead"*. The roommate matching service Uninite utilized a similar strategy of working from Facebook groups, but rather than giving up equity ownership chose to acquire two groups outright from their owners in order to expand the reach of their service.

At both of the graphic design services (Graphiq and Konsus) managers mentioned exposure in industry publications as valuable sources for recruiting additional suppliers post launch. Regarding its feature in an industry magazine, Graphiq's manager stated *"That hit the nail on the head. After that suddenly a bunch of designers we didn't know started signing up"*. About the motivations of these designers, the manager stated *"They are typically young, fairly sophisticated technically, using the newest tools. They work freelance 100%, which they do because they want to be free, they love what the freelance-lifestyle has to offer"*. By a similar mechanism, at Konsus the manager described how the firm received *"a lot of attention in the media"*, stating *"people wrote blog posts about the best freelancing-websites, why and whatnot"*. About freelancers' motivations for choosing to join their platform, the manager stated *"They without a doubt love the flow of already-defined, incoming already-priced projects that they can just start working on"* and added *"it wasn't that hard to get them to sign up because it really just gives them an optional way of landing work. Most freelancers have a very multi-channel approach. [...] When requests come in, it's sort of like 'Okay. If available, say yes. If not, say no.'"*. The manager described the additional incentive of a *"career-path"* that *"leads to ownership of shares of Konsus Inc"*. Among firms recruiting suppliers from online communities such as internet forums, blogs, job listing boards and so on, Konsus' manager described *"Having lots of ads on job boards around the world for all the positions [...] we recruit for"* and similarly at the tutoring service LearnLink, where the manager stated that by the time of the interview *"It's very easy for us to get tutors, they're just [university] students. We post on online class groups, buy-and-sell"*

groups for books", adding however that *"There is a limit to how much we can keep spamming these groups"*. The manager also highlighted that even though there were *"plenty who are interested, we then have some requirements like police certificate of conduct and so on, which leads many to 'fall off'".* Then there's the interview, and getting students. *A fair amount fall off along the way"* adding *"We're obviously working on lowering the friction, but we also think that [friction] can kind of work to sort out those who aren't that interested, because they're not going to be very good tutors anyway"*. In addition to the translation service TikkTalk, among the firms utilizing paid digital advertising, Tise's manager mentioned using Instagram Ads early on as a way of *"letting some volume build up"* among suppliers who have a *"passion for reuse"* and who enjoy the social activity of following, buying and selling used items from *"people whose style they relate to"*. At the car sharing service Nabobil, paid advertising as a source of recruiting suppliers was described as being part of a *"sophisticated marketing-run"*, which included *"Facebook [which] worked well as a push-channel"*. The manager at Nabobil also highlighted the value of being *"lucky to get a lot of PR, which helped a lot"*. Other firms which recruited early suppliers through PR at the market-level included Konsus, whose the mentioned *"having a fair bit of PR in Business Insider, Wall Street Journal, TechCrunch and so on"*, however also pointing out that *"Actually now most of the left side of the funnel comes through SEO, we have a hundred thousand visitors to our website every month"*. The final identifiable market-level source of early suppliers mentioned by managers was the equity partnership Tise entered with a Norwegian public figure who *"went out and talked about us in her channels [...] which helped a lot"*.

Finally, six of the firms mentioned eventually recruiting suppliers from 'word-of-mouth' specifically, potentially as the consequence of emerging direct and/or indirect network effects. Two firms mentioned word-of-mouth in their industry as an important way of recruiting additional suppliers post launch, including at Graphiq where it was described that *"We do very little marketing but new designers keep signing up"*, and at NyBy where *"several other [organizations] heard about it and came to us to be development partners"*. Three firms mentioned general/market-level word-of-mouth

as an important source for recruiting early suppliers. Nabobil's manager vaguely described that early on, their main task was *"telling Norway that now it's possible to rent a car right where you live"*, and that as suppliers began completing transactions *"then people start talking about it"*. By the time of the interview, the manager stated that *"the primary source of growth is [now] organic, that car owners talk about it, that they are happy, that car renters talk about it, that they're happy"* adding about preferences and motivation that in the beginning, suppliers had a general attitude of *"if it works, it works, if it doesn't, it doesn't"*, but that after a while, more and more began expecting to make money off renting out their car, indicating that suppliers' expectations about demand on the service could change over time. At the cleaning service WeClean, the founders described how word-of-mouth/organic recruitment of suppliers accrued from *"the soft communication we're doing [which] maybe only hits four people, but it hits those four"*, adding *"they become ambassadors for us"*. Finally, at the translation service TikkTalk the manager described eventually *"shutting down Facebook Ads"* and *"still getting about 5-10 sign-ups per week, [...] organically"*, and that *"we [also] had people online just finding us, and creating accounts, [...] just random people somewhere on the Internet, I don't know where they heard about us, but they found us"*. About suppliers' preferences, TikkTalk's manager highlights that *"interpreters love the steady stream of jobs because they [generally] don't know where next month's rent is coming from"*.

TABLE 6.2
Early supplier recruitment strategies by timing and relational proximity to firm

	Prior to launch	Relationship	Post launch	Relationship
Graphiq	Supply from founders and personal network example: <i>"The main reason we chose [to start a platform for designers] was that here we had some domain-specific knowledge and at least, I was a designer and could potentially do projects myself and I knew people I could get onto the platform immediately."</i> [In response to the question "Who were the first designers on your platform?"] <i>"It was me, hehe. It was me and friends of mine from design school."</i>	Firm Network	Graphiq Supply from industry PR example: <i>"I think the first external was a local designer who I had never met before. [...] Early on we got an article in Gratill, which is an industry publication for graphic designers. [...] That hit the nail on the head. After that suddenly a bunch of designers we didn't know started signing up."</i> Supply from word-of-mouth example: <i>"We've rarely had problems getting enough designers. [...] So now, it's really just word-of-mouth, we do very little marketing but new designers keep signing up."</i>	Industry
Konsus	Supply from professional network example: <i>"I sort of had my own freelancers that I had worked with in the past. Not very many, but I knew two women who used to help me with PowerPoint [...] from the Philippines. We used them in the beginning. [...] I would say like 'Hey, can you help a friend with this job?'. Eventually we started doing it in a more structured way."</i> Supply from founders example: <i>"I mean, I did a fair bit of PowerPoint and various other boring data-gathering and stuff in the beginning. Of course we tried all the time to find freelancers, but if you have short deadlines and such, you have to do it yourself."</i>	Network	Konsus Supply from online sources example: <i>"What we do is that we have lots of ads on job boards around the world for all the positions. For all six categories we recruit for. Then they come to our website."</i> Supply from industry PR example: <i>"We do get a lot of attention, people write blog posts about the best freelancing-websites, why and whatnot"</i> Supply from mass-market PR example: <i>"People read about us in blogs and newspapers, and we've had a fair bit of PR in Business Insider, Wall Street Journal, TechCrunch and so on"</i> Supply from SEO / search engines example: <i>"Actually, now most of the left side of the funnel comes through SEO, we have one hundred thousand visitors on our website every month."</i>	Industry
LearnLink	Supply from founder: <i>"I eventually just thought 'okay, I'll just out something up on the web and start my own thing'. I ended up getting lots of requests, which made me think 'okay, there's room for a new solution here'. [...] I've been a tutor continuously now for five years [...] right now I only have one, but there have been periods when I've had 9-10 students simultaneously"</i>	Firm	LearnLink Supply from online sources example: <i>"It's very easy to get tutors. They're students. [We] post on class groups, buy-and-sell groups for books, and get a lot of visitors [from this]"</i> Supply from paid advertising example: <i>[In response to the question "Are you using paid advertising?"] "We're starting somewhat now because there's a limit to how much we can keep spamming these groups, we get kicked off eventually."</i>	Industry
Nabobli	Supply from personal and professional networks example: <i>"The first thing we did was that everyone at Nabobli sent out a message on LinkedIn and Facebook to everyone we knew and said 'Hi, I'm starting a new firm and need your help to get started'"</i>	Network	Nabobli Supply from paid advertising example: <i>"We use the digital channels and have a very sophisticated marketing-run, where think in terms of a funnel. We know who is in the funnel, where they are [...] Facebook has worked well as a push-channel [for recruiting suppliers]"</i> Supply from mass-market PR example: <i>"We were lucky to get a lot of PR which helped a lot. We've also been lucky because Airbnb succeeded and now people get what it is, easily."</i> Supply from word-of-mouth example: <i>"Nabobli pulled off what Airbnb pulled off, which is having the primary source of growth being organic. That our car owners talk about it, that they are happy, that our car renters talk about it and that they're happy."</i>	Industry
NyBy	Supply from R&D partnership example: <i>"I made an ugly PowerPoint presentation and started in Asker, because that's where I'm from. They signed up immediately. Both the political side and the city administration were super excited. Next I went to Oslo Church city mission and they also wanted to join. So then we had 22, amazing! And they were willing to pay in advance."</i>	Industry	NyBy Supply from word-of-mouth example: <i>"We didn't do any marketing, because we already had two partners and wanted to work with them. But then Baerum county heard about it as well, several other boroughs heard about it. The Church City Mission heard about it, Gensidige heard about it, and came to us to be development partners. They financed our development up until the point where we could raise external funding"</i>	Industry

(Table continues)

TABLE 6.2 (continued)
Early supplier recruitment strategies by timing and relational proximity to firm

	Prior to launch	Relationship	Post launch	Relationship
TikTalk	Supply from paid advertising example: "Translators we found quite easily. We tried some Facebook Ads and it was super easy to attract them onto the platform. They are all looking for jobs."	Market	TikTalk Supply from word-of-mouth example: "We actually shut down Facebook Ads seven months ago [...] and we still get about 5-10 signups per week on its own." Supply from online sources example: "Actually, we [also] found people just online finding us, and creating accounts. [...] Those were not even Facebook ads, those were just random people from somewhere on the internet. I don't know how they heard about us but they found us."	Market
Tise	Supply from founders and personal networks example: "We started with us and everyone around us downloading and starting to list items so that there would be some content [...]".	Firm Network	Tise Supply from paid advertising example: " [...] We then got some more through advertising. Then we left it alone for a while and let some more volume build up, then went ahead with more advertising. At the end we had around 10 000 users." Supply from equity partnership: "We launched, and at the same time as we spent a fair amount of money on advertising, Jenny went out and talked about us in her channels, which led to us converting a fairly large number of users quickly." Supply from online sources and M&A examples: "At one point we tried to work from Facebook buy and sell groups. [From this] we've acquired a huge reach [...] [We did it] in order to get their target audience, these groups had 200,000 members all put together. [...] We merged. The manager who owned those groups joined Tise at an early point [...]. He became part of the company, he owns a stake in the firm."	Market
Uninite	Supply from founder example: "It started with me using it myself, so I put my apartment up for rent. The [renter] we ended up choosing would get one month free rent. So we made a contest out of it and were buried in requests."	Firm		Market
WeClean	Supply from founder example: "We did most of the cleaning. [...] Cleaning to us is the backbone of what we do, and we never want to forget that. It's what grounds us."	Firm	Uninite Supply from direct sales example: [In response to the question "How do you recruit landlords?"] "Landlords are hard. It's a target group that isn't very digital. That often is of the older guard. So. Sales meetings." Supply from M&A example: "We own the group for [rental apartments in Bergen, the Facebook group with something like twelve thousand users. [...] We bought it [...] and own two. We own the largest both in Bergen and Trondheim." Supply from online sources example: "We [also] built up a database of landlords over time, that we called - who we knew had ads in other places. We basically just called them [...] and said 'Hey, you'll get more exposure'"	Industry
Xeneta	Supply from direct sales example: "In the beginning we cold-called. The approach that's always worked fairly well is to first get a hold of the right person and [...] tell them that you've built something they can offer a qualified opinion of. [...] Within two weeks I had booked meetings with approximately eight of the ten largest [firms] we had picked out, and then just traveled around. More or less all of them provided some data"	Industry		Industry
			WeClean Supply from word-of-mouth example: "I think it's the soft communication we're doing. It's not a call to action, we just put it out there. Maybe everyone isn't reading what we're writing, maybe only four people, but it hits those four. They understand what we're talking about, what we're trying to say, what we're working with. Then they become ambassadors for us. [We think] that's much more valuable than two hundred likes on a superficial [...] photo."	Market

Discussion

Firms looking to establish platform businesses in two- and multi-sided markets are said to face the initial challenge of recruiting buyers and sellers whose participation decisions are mutually dependent (Spulber, 2010). And so, to overcome this ‘circular conundrum’ (Spulber, 2010), at launch managers of platform firms invest to create an ecosystem of ‘complementors’ who commit their resources to support one or more platforms over time (Venkatraman & Lee, 2004; De Reuver et al., 2018). The goal of such initial entry strategies is hence thought to be to assemble sufficient numbers of participants to reach a so-called ‘critical mass’ (Evans & Schmalensee, 2010) to enable a liquid enough market to permit sustainable growth (Ondrus et al., 2015) via word-of-mouth and other mechanisms fueled by positive network externalities.

Findings from ten established two-sided platform firms in Norway suggest that the viability of nascent platform firms’ entry strategies is reliant on both organizational and contextual factors, whose details vary on case-by-case bases, but whose underlying managerial considerations have much in common. The discussion below grounds these findings to predictions from extant literature and where appropriate, highlights empirical findings which have yet to be explored theoretically. The discussion is structured according to the strategic considerations expressed by managers of the firms included in the study. These considerations include 1) The management of expectations and 2) The governance of supply.

The Management of Expectations

Users’ expectations about the level of participation in two-sided markets have previously been shown to be an important antecedent of direct (same-side) network effects (Fuentelsaz et al., 2015). That is, before a dominant platform emerges, potential participants in two-sided markets are assumed to be more likely to prefer the platform they believe will be the market leader in the future (Caillaud & Jullien, 2003; Katz & Shapiro, 1994). Extant literature hence predicts that new entrant platform firms have strong incentives to signal and condition potential participants’

expectations about their future dominance (Chintakananda & McIntyre, 2014). Accordingly, pre-announcing a new platform before it is functional may catalyze initial adoption by raising expectations among a sufficiently large number of people to where, once the platform does launch, participants' expectations are favorable (Bhargava, 2014).

Managers of several of the firms included in the study discussed strategies aimed at raising the expectations among potential supply-side participants prior to launch. For instance, at both Graphiq, Konsus and Nabobil, approaching industry- and mass-market publications allowed the firms to announce the existence of their platforms early on to a wide audience, which according to the managers resulted in increased recruitment of suppliers. In the cases of Graphiq and Konsus, the strategy was described as viable due to context-specific factors, in that they operated in industries populated by freelancers who *"are always looking for work"* and *"have a very multi-channel approach"*. Viewed in the context of extant literature, the managers' view was hence that sufficient numbers of (typically) designers were willing to join their platforms despite having no, neutral, or even unfavorable expectations about their future dominance. A similar dynamic was expressed in the market for translation services by the manager at TikkTalk, who described *"trying some Facebook Ads"*, which was sufficient to attract enough early suppliers for the platform to launch, again because the participants the platform catered to *"are all looking for jobs"*. Similar contextual factors were also described as enabling in the markets for personal tutoring- (LearnLink) and cleaning services (WeClean), also both catering to markets populated largely by freelancers looking for work on their supply-side. In the cases of Konsus and Nabobil, their strategies of raising expectations through mass-market publications were additionally enabled by firm-specific factors, namely participation in the renowned start-up accelerator program Y Combinator (Konsus) and the CEO's notoriety from his previous employment as a country-manager at Airbnb (Nabobil), which both helped garner the attention of mass-market media outlets.

Perhaps most uniquely, though, were the findings from interviews at Xeneta and NyBy whose managers both testified to approaching their initial sources of early supply

without necessarily raising expectations, but rather simply ‘offering an alternative to existing solutions’. When the CEO of Xeneta for instance approached the platforms’ first prospective suppliers with “*nothing*”, except merely “*selling the story*”, he was indeed able to book “*meetings with approximately eight of the ten largest [firms]*” they had approached, “*more or less all of [whom] provided some data*”. Similarly, when the manager of NyBy approached their first two potential suppliers, he described both agreeing to “*join right away*”, and to getting “*paid ahead of time, over the regular threshold*” due to what he described as an “*R&D loophole*”. Neither manager described exaggerating the platforms’ current status in terms of viability, as extant theoretical predictions have at times warranted (Bhargava, 2014). In both cases however, the managers described the existence of contextual factors which enabled their strategies to work, namely pronounced demands for new solutions among the firms they were approaching, described by the manager of Xeneta as a certain “*pain they were feeling [which] was pretty severe*”. At Xeneta, a firm-specific factor potentially enabling the success of the strategy was the CEO’s previous six years of experience working on the supply-side of the firm’s industry.

In extant literature, the managerial challenge of overcoming unfavorable expectations among potential participants is often addressed as a signaling problem (Fuentelsaz et al., 2015) which may be framed as either quantitative (Evans & Schmalensee, 2007; Brynjolfsson & Kemerer, 1996) or qualitative (Katz & Shapiro, 1994). Underlying—but rarely addressed—in such theoretical debates is however the more fundamental dynamic of two-sided demand in platform-based markets. That is, that although in traditional markets conceptualized as a one-sided phenomena, in two-sided markets the demand ‘for the platform itself’ can be two-sided phenomenon. In several of the cases described above, managers less so expressed needing to ‘raise expectations about the future dominance of their platform’ (Bhargava, 2014) but instead simply ‘offering an alternative to existing solutions’, a function of the level of demand among the individuals, firms and organizations they were approaching. The mere existence of the potential of their proposed service (on one or both sides of their markets) seems to have been an adequate signal to garner sufficient

interest and participation among such participants. At Graphiq, Konsus, LearnLink, TikkTalk and WeClean, properties of the participants on the supply-side of their markets—populated by freelancers—enabled them to rather easily attract sufficient numbers of applicants to ensure that any potential ‘chicken-and-egg’ problem had been overcome. Similarly, as a function of their demand for new solutions, buyers of freight services and organizers of community tasks were willing to buy into Xeneta and Nyby’s respective value propositions prior to their establishments of viable platforms, enabling them to overcome any potential ‘chicken-and-egg’ problems which theory may have predicted could occur (e.g. Caillaud & Jullien, 2003; Hagiu & Spulber, 2014).

In relation to extant literature, the implications of these findings are that in addition to the quantitative signaling of e.g. the size of an installed base (Evans & Schmalensee, 2007), the early achievement of a large market share (Brynjolfsson & Kemerer, 1996) or the qualitative signal of brand value or reputation (Katz & Shapiro, 1994), in markets featuring certain contextual characteristics related to the demand for new solutions, the signaling of a new platform in itself may be sufficient to successfully enter such markets.

The Governance of Supply

Increasingly, there seems to be consensus among management scholars that emphasis on the management of supply is particularly beneficial in network markets (Kapoor & Lee, 2013). The technology management literature has here previously focused on how the decisions of platform owners regarding the ‘openness’ of their platform influences innovation through the platform’s ability to attract supply-side participants (e.g. Boudreau, 2010; Eisenmann et al., 2009). Herein, various topics studied include the level of access to information a platform allows for its participants, as well as the cost of this access and the rules governing its use (Gawer, 2014). Studies have for instance highlighted the trade-offs between open and closed platforms (Gawer & Cusumano, 2008; Eisenmann et al., 2009). As some researchers have argued that a small lead in attracting early customers could tip the market in the favor of an early

entrant with an inferior product or service (Shapiro & Varian, 1999), the degree to which managers choose to open their platform could be an important factor in its ultimate success.

As such, much of the theoretical debate surrounding the effectiveness of entry strategies in two- and multi-sided markets has thus far revolved around the rapid building of a large network of supply- and demand-side participants (Evans & Schmalensee, 2007; Ondrus et al., 2015). This because, as traditionally conceived, an increase in network size increases the value for all users in the network (Katz & Shapiro, 1985; Farrell & Saloner, 2000).

Availability/Specificity

Some researchers have gone as far as claiming that the size of the installed base is the most strategically valuable asset in network industries (Evans & Schmalensee, 2007) because users value platforms with a larger user base more than those with fewer users (Cennamo & Santalo, 2013). Interestingly, nascent previous research has however also suggested the opposite, that installed base is not a necessary condition but rather, that even at low levels of participation from suppliers, demand-side participants were responsive to effective recruitment strategies (Shankar & Bayus (2002). The findings of this study, perhaps by the nature of its design, tend to lend more credence to the latter claim than the former.

Intuitively, one would think a key consideration for managers formulating effective entry strategies would be to make note of the relationship between the specificity of the platform's value proposition to its demand-side participants and the availability of necessary supply needed to enable such a service. That is, inherently, higher degrees of specificity of supply certainly correlates to lower availability of such supply, as 'suppliers fulfilling higher degrees of specificity' is a subset of 'suppliers fulfilling lower degrees of the same specificity'. A ride-sharing service requiring suppliers to 'own a car' is able to recruit from a larger pool of potential drivers than a ride-sharing service requiring suppliers to 'own a Tesla Model S which is newer than two years and has leather seats', for instance. From the findings of the study, on the one hand, Tise's

value proposition as a marketplace where demand-side participants can purchase second-hand fashion goods or WeClean's value proposition as a cleaning service where demand-side participants can hire independent cleaners, put few limitations on their availability of supply. Xeneta's demand-side value proposition as a freight price benchmarking service or Uninite's value proposition as a roommate matching service, on the other hand, put more limitations on availability. Stated more colloquially, platforms operating in niches have fewer potential supply-side participants available for recruitment.

Interestingly, in this study this inherent contextual factor (specificity vs availability of supply) seemed to correlate poorly with predictions about the eventual success of the firms' entry strategies. Managers of platforms which arguably recruited from large pools of potential supply-side participants (Graphiq, Konsus, LearnLink, Nabobil, Tise, WeClean) described many of the same challenges related to the formulation of successful entry strategies as managers of platforms with smaller pools of potential supply-side participants (NyBy, TikkTalk, Uninite, Xeneta). In fact, one might argue that if evaluated based on this parameter alone, managers of platforms such as Xeneta, NyBy and TikkTalk were even more effective, only needing to recruit from one or two sources of supply per firm versus typically three to four for firms such as Graphiq, Konsus, LearnLink and Nabobil. Speculating about reasons why, here too, it seems prudent to emphasize the role of the 'demand for new solutions' among participants in the markets the former firms were operating in, in the cases of Xeneta and NyBy on the demand-side (among buyers of freight services and community tasks) and for TikkTalk on the supply-side (of interpretation services).

Quantity/Quality

Moving beyond the previous—purely quantitative—consideration of the relationship between the specificity and availability of supply, it is prudent to also address the managerial consideration of the qualitative nature of supply. Despite researchers' previous particular emphasis on the size of an installed base (Evans & Schmalensee, 2007) and the need to rapidly achieve a critical mass of participants (Evans &

Schmalensee, 2010; Ondrus et al., 2015), increasingly researchers are also turning their attention to the qualitative aspects of supply. Research on this topic has thus far, in line with intuition, predicted that dominant platforms tend to be those that exhibit the highest quality (Liebowitz & Margolis, 1994; Schilling, 2002; McIntyre, 2011). Even in competition with a platform featuring a large installed base, research has for instance shown that new entrants can threaten incumbents' position if the perceived quality of the incumbent's service is not comparable (Zhu & Iansiti, 2012). Recent calls have therefore been made for the further research into what 'quality' is in the context of platform-mediated networks, as well as when quality matters (McIntyre & Srinivasan, 2017). The following observations aim to address parts of these calls.

From the findings of this study, quality-specific issues relating to the effectiveness of the firms entry strategies were most prominent in interviews with managers catering to freelancers, such as Graphiq, Konsus, LearnLink, TikkTalk and WeClean. Such managers emphasized the need to not only measure and govern their supply-side participants based on qualitative performance, but also in some cases actively offer training (WeClean, Konsus) and certification programs (TikkTalk, Konsus) to ensure that their demand-side value proposition was of high quality, as this was perceived to have an impact on the platforms' ultimate success. Speculating about the relationship between the quality of supply and successful entry, the manager at Graphiq for instance described initially launching the platform as a marketplace optimized "*for choice*" but quickly realizing that the managers "*weren't quite aware of the size of the market [of designers]*", namely that the demand to supply among freelancers was so high, and so that a 'matchmaking service' (Evans & Schmalensee, 2016), rather than a marketplace might be more attractive to demand-side participants. "*As time passed, we realized more and more how large the "freedom" domain is, the freelance movement*" and so the firm revised their value proposition to instead offer a curated platform where as a demand-side participant "*you aren't met with ten thousand choices. Instead, you're presented only those which are appropriate for you*". The same sentiment was echoed at the platform with a similar value

proposition, Konsus, whose manager stated that *“we try to put ourselves a level above the quality found on the ‘open’ freelance platforms”*, emphasizing *“the bottleneck in our recruiting is [...] assessment and onboarding, including training”*. At Konsus, more so than Graphiq, the additional firm-specific consideration was its enterprise (rather than SME³) focus, due to their *“extremely high willingness to pay”* despite having qualitative requirements which *“aren’t necessarily that much higher”*. In other words, the managers observed that on their demand-side, in the enterprise market, there was a willingness to pay for quality, but only to a certain point. The manager at the tutoring service LearnLink described a recruitment process for private tutors involving similarly qualitative considerations, including both a review of the candidate’s academic performance as well an interview in order to ensure that the person had sufficient pedagogical skills, stating that *“We actually added more governance as we went along”*. Here too, the contextual factor at the heart of the consideration was the manager’s perception that among demand-side participants, a wide variety of potential tutors was less so desired than a handful of high-quality alternatives and so that the quantity of suppliers would likely not be the ultimate determinant of the platform’s eventual success.

Conclusion

This study’s abductive exploration of platform firms’ entry strategies in two-sided markets confirm many of the observations and predictions of extant literature while simultaneously uncovering avenues for future theory building and further research.

Interviews with managers of ten established platform firms in Norway revealed that managers consider both firm-specific and contextual factors when formulating entry strategies. Most prominently, it was found that new entrant platforms may successfully overcome the predicted ‘chicken-and-egg’ problem with supply-side participants originating from sources within or close to the firm, such as the managers themselves and employees as well as suppliers from the managers’ social

³SME = Small and medium enterprises

and professional network. Further, it was found that most of the firms studied employed multiple recruitment strategies, and that managers' initial considerations regarding the need for a certain level of supply often gradually shifted to instead emphasizing the quality of supply, as predicted in some of the nascent literature. In such cases, managers described rather easily being able to attract suppliers to their platforms, in cases even in the absence of recurring demand. Speculating about reasons why, it is suggested that in such cases the demand for new solutions was so great among potential participants that even the potential of the firms' value proposition was sufficient to stimulate adoption.

Implications for Managers

The findings of the study in particular imply three important managerial considerations. First, in accordance with predictions from existing literature it is essential for managers to measure and evaluate the demand for 'the platform itself' among its potential participants prior to entry in order to be able to gauge the expectations of its intended participants, and so be able to formulate effective entry strategies. Second, if the demand for the platform itself is high among one or both groups of potential participants, the hypothesized 'chicken-and-egg' problem upon entry can potentially be discounted as sufficient numbers of e.g. suppliers may be willing to join regardless of their expectations among demand-side participants, or visa versa. Finally, if the demand for the platform itself is high among one or both groups of potential participants, rather than formulating entry strategies aimed at maximizing the number of suppliers, managers should instead put in place mechanisms aimed at maximizing the quality of its supply, as this appears to be a more important factor in such scenarios.

Agenda for Further Research

This study's abductive exploration of platform managers' entry strategies in two-sided markets has both helped confirm certain predictions from extant literature, in addition to revealing avenues for further research. In particular, the study motivates

further work in two nascent fields of platform research.

Expectations from a Strategic Perspective

Extant research emphasizes the role of expectations in two-sided markets, evaluating the potential of new entrant platforms according to potential participants' expectations about the future participation of others. Findings from multiple firms in multiple industries in the study suggested a willingness among both supply- and demand-side participants to join platforms despite having either no, neutral, or perhaps even unfavorable expectations about the future adoption by other participants. Speculating about contextual or firm-specific reasons why this might be so, the discussion in particular emphasizes the role of 'demand for new solutions' among one or multiple groups. However, as the investigation of the expectations of potential participants in multi-sided markets was not within the scope of this study, the topic will need further inductive exploration by future researchers.

The Nature of Quality in Platform-Based Markets

The second nascent field of platform research which the study contributes to, is that which questions the previous considerable emphasis which has been placed on investigating the correlation between platforms' level of adoption and its level of participation. Although important in some markets, in others, such as those with considerable demand for new solutions, the level of participation appears to be less so important than the quality of participation. However, as the purpose of this study was not to determine the role of quality in two-sided markets, this too requires further inductive research.

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Research Paper 2

Value Perceptions of First-Party Content on Digital Platforms in Two-Sided Markets

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Value Perceptions of First-Party Content on Multi-Sided Platforms

Abstract

In the context of multi-sided platform literature, the strategic use of first-party content has previously been studied from the perspectives of entry, rent extraction, integration and governance. In these contexts, consumers' perceived value of first- and third-party content has been thought to be the same. However, given well known results from research on retail and supermarkets, it is generally accepted that—among consumers—the perceived value of products from store brands is significantly lower than products from manufacturer brands. This study investigates whether the same difference in perception persists in a two-sided market where consumers can choose to buy products either from third-party sellers or the platform itself. The study finds that consumers perceive products sold by the platform as delivering significantly less value than functionally and aesthetically equivalent third-party substitutes and that this difference persists independently of price. The study hence contributes nuance to extant two-sided market research by introducing value perception as a relevant factor in research concerned with the use of first-party content strategies on multi-sided platforms.

Introduction

In 2009, e-commerce behemoth Amazon inc introduced the first assortment of original products to its marketplace, which up until this point had been served exclusively by third-party sellers¹. Marketed using the private label 'AmazonBasics', this early line of products consisted primarily, as its name suggests, of near-commodity items such as batteries, power cords and other low-cost, mass-produced items². Since, Amazon has grown to become one of the world's most valuable companies by market capitalization, valued at over \$1 trillion dollars as of 2018³. Its initial line of first-party products has been expanded to include over 1500 items and its first private label 'AmazonBasics' has been joined by 69 other brands also owned by Amazon⁴, selling first-party products in a marketplace originally served exclusively by third-party sellers.

Platform owners' decision to enter their own market by offering first-party content is in the literature often framed as an aspect of platform governance, a strategy aimed at stimulating participation from buyers, which in turn can be used to attract third-party sellers (Hagiu & Spulber, 2013; Tiwana et al., 2010). Examples of well-known firms which have successfully employed first-party content as a strategic tool in this a way include Nintendo and Sony in the console gaming market (Hagiu & Wright, 2015), Microsoft in operating systems, Google and Bing in search and Facebook in social media (Hagiu & Spulber, 2013).

In the context of the retail industry and supermarkets, 'first-party' private labels (also known as store brands) is a well-known phenomenon which was first studied in

¹Business Insider, 2009. 'Amazon Launches Private-Label 'AmazonBasics' Electronics Brand'. Available at <https://www.businessinsider.com/amazon-launches-private-label-amazonbasics-electronics-brand-2009-9?r=US&IR=T&IR=T>

²New York times, 2018. 'How Amazon Steers Shoppers to Its Own Products'. Available at <https://www.nytimes.com/2018/06/23/business/amazon-the-brand-buster.html>

³CNBC, 2018. 'Amazon reaches \$1 trillion market cap for the first time'. Available at <https://www.cnbc.com/2018/09/04/amazon-hits-1-trillion-in-market-value.html>

⁴Recode, 2018. 'Surprise! Amazon now sells more than 70 of its own private-label brands'. Available at <https://www.recode.net/2018/4/7/17208804/amazon-private-label-brands-list>

the 1960s and 70s (e.g. Bettman, 1974; Coe, 1971; Myers, 1967). The primary finding of these early studies was that consumers were more reluctant to buy products from private brands because they perceived such products to be less expensive (Rubio et al., 2014) and of relatively poor quality (e.g. Bellizzi et al. 1981; Cunningham et al., 1982) compared with manufacturer brands. Later studies have found that there has been a clear evolution of private brands' positioning from focusing largely on price to quality-based value propositions (Cuneo et al., 2012; Kumar & Steenkamp, 2007). Yet, other studies suggest that in the context of retail and supermarkets (Semeijn et al., 2014) private brands are still viewed by consumers as delivering less value than third-party substitutes (Rubio et al., 2014). Although platform owner entry and the role of first-party content strategies have previously been studied in the contexts of entry strategies (Hagiu & Spulber, 2013), rent extraction (Farrell & Katz, 2000; Huang et al., 2013; Zhu & Liu, 2018), integration (Adner & Kapoor, 2010; Liu & Agerwal, 2017) and general governance (Eaton et al., 2015; Gawer & Henderson, 2007), the literature has yet to investigate how platform-branded products and services are perceived by consumers in relation to third-party substitutes on multi-sided platforms.

This study aims to shed light on this question by investigating how consumers perceive the value of first-party content as compared to equivalent 'switchable' third-party alternatives. This is done by comparing average ratings and rating distributions of 250 first-party products with functionally and aesthetically equivalent third-party alternatives on Amazon's Marketplace. The study thus makes several contributions to the literature. Firstly, it provides empirical grounding to substantiate the claim that value perceptions among consumers of first- and third-party products differ. Secondly, it provides an investigation into the impact of price- and popularity-value inferences of such perceptions as well as a study of how the variance of product ratings affect mean differences. Finally, as a result of these findings the paper introduces 'value perception' as a relevant strategic parameter for managers looking to strategically employ first-party content strategies in multi-sided markets.

The study is outlined as follows. First, a literature review is provided, summarizing

the most important relevant findings from two theoretical streams: 1. First-party content in multi-sided markets and 2. Private brands/store brands in retail and supermarkets. Second, the methodology for the paper is outlined, including how the data was gathered and how equivalence between products is established. Third, the findings of the study are outlined and a discussion of the findings in relation to extant research is provided. Finally, conclusions from the study are provided alongside implications for managers and an agenda for future research.

Theoretical Context

Immediately it is useful to establish the meaningful differences that distinguish multi-sided platforms such as e-commerce marketplaces from supermarkets and retail stores. Hagiu & Wright (2015) here propose the key feature that multi-sided platforms enable 'direct interaction between two or more distinct sides'. By *direct* interaction is meant that the two sides retain control of the key terms of the interaction. For a marketplace, such terms may include pricing, bundling, marketing, presentation and delivery of the goods/services traded. Whereas for re-sellers such as supermarkets and retail stores the pricing, placement and presentation of goods, repairs and customer service are the responsibility of the supermarket or store, on a multi-sided platform such key decisions and responsibilities are to a much a larger degree left up to each individual seller (Hagiu & Wright, 2015).

First-Party Content in Two-Sided Markets

Within industrial organization and strategic management, several disjoint streams of research have previously investigated the use of so-called 'first-party' content strategies in multi-sided markets. As an entry strategy, Hagiu & Spulber (2013) studied the use of first-party content as a strategy for overcoming the so-called 'chicken-and-egg' problem (Caillaud & Jullien, 2003). Their analytic approach found that the strategic use of first-party content is driven by two key factors: 1. The nature of buyer and seller expectations and 2. The nature of the relationship between

first- and third-party sellers. Using first-party content as an entry strategy for a platform is in their paper described as a 'buyer attraction strategy'. Firms employing such a strategy invest in developing or buying content which is either complementary or in competition with the content that the platform hopes to eventually attract from third-party sellers. Other related investigations into platform owners' entry decisions are provided in Gawer & Cusumano (2002) and Zhu & Liu (2018). Related research in the same stream of literature includes work on tying and vertical constraints (Foerderer et al., 2018). Tying refers to the practice of making sale on a platform conditional on the purchase of a (typically first-party) complement (Carlton et al., 2010; Choi & Stefanadis, 2001), such as Microsoft's decision to sell its Windows platform with Internet Explorer included and Nintendo's strategy of shipping gaming consoles in bundles with first-party games such as "Super Mario" and "Zelda". Vertical integration refers to the practice of making (typically first-party) content a central feature of a platform (Farrell & Katz, 2000) such as Apple and Google's decision to ship iOS and Android devices with first-party camera-, photo- and messaging software included. Related investigations of the same phenomenon include studies into whether platform owner entry in complementary markets either fosters (Gawer & Henderson, 2007; Liu & Agerwal, 2017) or curbs (Choi & Stefanadis, 2001; Farrell & Katz, 2000) innovation among complementors. In terms of research yet to be done, calls have been made for further investigations both on the effects of platform involvement on buyer and seller participation (Sriram et al., 2015; Zhu & Liu, 2018) and consumer reviews and ratings in the context of two- and multi-sided markets (Sun, 2012).

Private Labels/Store Brands in Retail and Supermarkets

Perceived value is considered an important contributor to the satisfaction a consumer experiences in shopping contexts (Woodruff, 1999). Consumers' perceptions of products sold under first-party/private labels have previously been studied in the contexts of retail and supermarkets (Rubio et al., 2014). Private labels in these contexts generally refer to products sold under a store's private label displaying either

the store's own name or a brand name created by and associated with the retailer (Kumar & Steenkamp, 2007). Historically, private brands were typically thought of as 'value labels', where price was the main attractor for consumers. Later studies however suggest that the quality gap between manufacturer- and private brands has been decreasing (Apelbaum et al., 2003).

In markets such as e-commerce where the true value of a product is not readily observable, it is known that consumers often rely on product-related cues as proxy measures to evaluate the quality of a product (e.g. Kirmani & Rao, 2000; Rao & Monroe, 1987). Perceived quality usually differs from, yet is influenced by the actual quality of a product (Akdeniz & Calantone, 2017; Golder et al., 2012). The use of product-related cues stems from consumers' feelings of uncertainty (Erdem & Swait, 1998; Jacoby et al., 1971). According to cue-diagnostics theory, consumers tend to prioritize cues based on their diagnostic ability in differentiating between product alternatives (Jacoby et al., 1971; Skowronski & Carlston, 1987). Diagnosticity in this context refers to the perceived reliability of a cue in distinguishing between alternative categorizations of products, such as high- or low value (Akdeniz et al., 2013). Consumers in other words tend to evaluate quality as a relative measure rather than in terms of absolute value (Richardson et al., 1996). Scitovszky (1944-45) was the first to suggest that consumers tend to use price as a cue for quality, the so-called price-quality inference (Rao & Monroe, 1987). In more recent studies, the various such cues consumers use to evaluate the true value of products have been categorized as either intrinsic or extrinsic (e.g. Miyazaki et al., 2005). These attributes help consumers form their own evaluation of quality (González et al., 2006; Wernerfelt, 1988). Intrinsic cues are attributes consumers evaluate about the product itself, such as ingredients, materials and textures. Extrinsic cues may be information and attributes about the store, manufacturer or brand that have nothing to do with the physical product itself. Extrinsic attributes have traditionally been thought to be valued more highly in manufacturer brands than in private brands (Rubio et al., 2014) and is therefore thought to be the one of the main explanations for why consumers tend to evaluate private brands as being of lower quality than manufacturer brands

(González et al., 2006). In addition to such cues, it has been observed that store image acts as an important indicator of private label quality. Traditionally, store image is thought to be reflected in the store's physical environment (Richardson et al., 1996), perceptions related to its merchandise, and perceived service quality (Baker et al., 1994; Zimmer & Golden, 1988). In addition to the effects of store image, it has also been theorized that the power of a private label, even for a powerful retailer, varies dramatically across product categories (Steenkamp & Dekimpe, 1997), indicating that consumers infer quality from private labels differently depending on which product(s) they are evaluating.

Methodology

Empirical Context

Data for the study was gathered from the Amazon Marketplace, the largest e-commerce platform in the United States at the time of the study. A number of past studies have used data about products from Amazon's Marketplace for the purposes of studying phenomena such as *price competition* (Chevalier & Goolsbee, 2003), *algorithmic pricing* (Chen et al., 2016), *product cannibalization* (Ghose et al., 2006), *online review systems* (Hu et al. 2006; Sun, 2012) and *entry decisions* (Zhu & Liu, 2018). Data for the study was obtained at three measurement times, in August and November of 2018 and February of 2019. This to ensure that the data was representative of actual prices and not observed during a discount or sales period. At the time of the data collection, Amazon's share of the U.S. e-commerce market was approximately 49%, substantially larger than any other e-commerce platform in the U.S.⁵.

⁵Techrunch, 2018. 'Amazon's Share of the US E-Commerce Market is Now 49% Available at <https://techcrunch.com/2018/07/13/amazons-share-of-the-us-e-commerce-market-is-now-49-or-5-of-all-retail-spend/>

Inclusion Criteria

In order to ensure that the sample was representative of the population of first-party products offered on Amazon's platform, the following inclusion criteria were determined prior to the data collection:

- The products in each pair had to be functionally and aesthetically equivalent, determined based on product descriptions, images and item weights;
- Each product had to have been reviewed by consumers at least five times. This to ensure that each average rating was representative of a mean value among the population of buyers;
- Each product had to be available through Amazon's Prime service. This to exclude variability stemming from shipping and handling;

Data Collection

Step one of the data collection process was to randomly sample 250 first-party products. The first-party label sampled from was 'AmazonBasics', Amazon's largest private label at the time of the study. The setup for the sampling was done by assigning numbers to each of the 20 departments that featured products from the brand. A random number generator was next used to generate two integers, one for department and one for a list item within a department. Modular arithmetic was used to account for varying numbers of products within each department. The selection criteria were next applied manually. To avoid sampling the same items twice, the random number generator excluded numbers for products already reviewed. 250 unique Amazon Standard Identification Numbers (ASINs) of the form "B012345678" were collected, one for each first-party product included.

Step two consisted of searching for functionally and aesthetically equivalent products from third-party brands. This was done manually by search using the keywords Amazon listed for each first-party product (e.g. 'hiking bag', '67mm polarizing filter' and so on). In selecting matching products, side-by-side comparison of pictures of

the items, as well as written product descriptions were evaluated. As with first-party products, Amazon's Standard Identification Numbers (ASINs) were collected. 250 products from 200 third-party brands were included.

Step three consisted of gathering the relevant data to be analyzed. For the study, for each product, the variables collected were: 'Brand', 'Item', 'ID', 'Department', 'URL', 'Price', 'Avg. Rating', 'Number of ratings', 'Item weight', 'Shipping weight', 'Date captured', 'Keywords' and 'Ratings Distribution'. Web scraping software was used to collect the data which was saved in JSON format.

Step four consisted of evaluating the quality of the data collected, in particular in relation to the variable 'item weight'. The data for each product pair $N = 250$ was qualitatively assessed. 59 product pairs had missing and/or incomplete data for 'item weight'. Here, 'shipping weight' was used as a proxy. In cases where weight was given in different units (lbs, oz) for the two products in a pair, one of the numbers was converted to match the unit of the other. The data collection process was repeated twice, at two month intervals in August and November of 2018 and February of 2019. For products that were missing prices in later data collections, prices from the previous data collection were used. This was the case for 18 products in November and 13 products in February.

Data Analysis

In investigating influences of price and popularity on the relevant direct variable 'perceived value', immediate (as opposed to list) prices were used for price comparisons and the number of ratings used as a measure of popularity. Consumer perceptions of value was assessed from Amazon's consumer generated five-star rating system⁶. The data analysis process consisted of investigating differences in mean prices, average ratings and mean rating distributions using paired "student" t-tests.

⁶Amazon (2018). 'About Customer Ratings'. Available at <https://www.amazon.com/gp/help/customer/display.html?nodeId=200791020>

Evaluating the Equivalence of Product Pairs

In order to establish that the products in each pair of the sample could be considered to be functionally and aesthetically equivalent substitutes, in addition to a qualitative assessment of product images and descriptions, item weights were used as a quantitative comparison parameter. For product pairs where 'item weight' was missing, 'shipping weight' was used as a proxy. Since no product pairs could be expected to weigh exactly the same (given that they were made and sold by different manufacturers) it was determined that variability of +/- 10% of mean weight would be sufficiently similar for products in a pair to be considered as equivalent, given the additional qualitative assessments of product descriptions and images. Equivalence in this study was thought of in terms of *switchability*, which in medical literature has traditionally been related to the concept of individual equivalence, i.e. if two drugs are equivalent and a patient is switched from one drug to another, there will be no adverse effects (NCSS, 2018). In this study, switchability may hence be thought of as 'if two products in a pair are switchable, a consumer unaware of the label of the product would be unaware of any functional or aesthetic differences'.

To evaluate the quality of the pairings based on weight, a paired-sample test of equivalence was conducted. Equivalence tests are used when the objective is to find that two or more samples are nearly equivalent on some measurement, such that any difference is inconsequential (Mara & Cribbie 2012). Tests of equivalence have been used to assess the equivalence of different medications in biopharmaceutical studies and psychology for several decades (Cribbie et al., 2004; Rogers et al., 1993; Seaman & Serlin, 1998). The test used in this study was the Nonparametric Two One-sided Test of Equivalence for Paired Samples (NPAR) described in Mara & Cribbie (2012), chosen because it is the most appropriate procedure for dealing with non-normal distributions. The test borrows its logic from the Wilcoxon (1945) signed ranks procedure and is less susceptible to outliers than the Wellek (2003) and TOST-P (Mara & Cribbie, 2012) procedures, which are based on mean differences. The NPAR procedure works by first ranking the differences $d_i = x_i - y_i - \delta$ and

$d_i = x_i - y_i - (-\delta)$ separately for each pair $i = 1, \dots, 250$ by first ranking the absolute value of each difference and then attaching the original sign to the computed ranks.

z_1 and z_2 for $i = 1, 2$ in the NPAR test are next computed by

$$z_i = \frac{sr_i - \left(\frac{N(N+1)}{4}\right)}{\sqrt{\frac{N(N+1)(2N+1)}{24}}} \quad (7.1)$$

where sr_1 and sr_2 represent the sum of the absolute value of the negative ranks associated with $x - y - \delta$ and the sum of the positive ranks associated with $x - y - (-\delta)$.

The two null hypotheses H_{01} and H_{02} in the NPAR test state that the difference between the group medians M_1 and M_2 fall outside of a pre-determined equivalence interval $(-\delta, \delta)$ and therefor cannot be equivalent. Rejection of the null hypotheses in turn implies that the difference between the medians M_1 and M_2 lies within the equivalence interval. The equivalence interval in this test was prior to the test set to be a percentage of the mean weight of the sample. The mean weight of all products was $\bar{x} = 8.02$. In order to be considered equivalent, a tolerance of 10% was accepted, giving an equivalence interval of $(\delta, -\delta) = (-0.802, 0.802)$. The null hypotheses for the NPAR test are:

$$H_{01} : M_1 - M_2 \geq \delta \quad (7.2)$$

$$H_{02} : M_1 - M_2 \leq -\delta \quad (7.3)$$

The median weights of first- and third-party products was both $M_{1,2} = 4.8$. After removing pairs with equal weight ($N = 15$) and ranking the observations separately regardless of sign, next the original signs were attached to the computed ranks which were summed separately for each sample (sr_1, sr_2). Satisfaction of the two equivalence tests

$$z_1 \geq z_{1-\alpha} \quad (7.4)$$

$$z_2 \geq z_{1-\alpha} \quad (7.5)$$

with $\alpha = 0.05$, $z_{0.95} = 1.6449$ for $z_1 = 2.242$, $z_2 = 7.955$ reveals that both hypotheses H_{01} and H_{02} could be rejected, implying that the difference between the medians $\Delta M = |4.8 - 4.8| = 0.00$ of the two samples falls within the equivalence interval $[-\delta, \delta] = [-0.802, 0.802]$ and so that the two samples in terms of weight could be considered to be statistically equivalent.

Comparing Differences and Variances

Paired t-tests were chosen for comparisons of prices, average ratings and rating distributions, as the size of the sample made it possible to assume that sample means could be treated as normally distributed. All calculations were conducted using the software package GraphPad Prism 8. Potential inferences between perceived value (average rating) and 1. Price (list price) or 2. Popularity (number of ratings) were investigated by analyzing subsets of product pairs where the 1. Price and 2. Number of ratings for first-party (FP) products were equal to or higher than third-party (TP) substitutes. The subsets meeting the former criteria contained 77, 70 and 81 product pairs in August, November and February respectively, whereas the subsets fulfilling the latter criteria contained 83, 99 and 102 product pairs at the same times.

Assumptions and Limitations

In the study, Amazon's 'average product star rating' was assumed to correlate to a measure of buyers' perceived value of a product. Of the rating system itself, Amazon's description as of March 2019 stated: *"Amazon calculates a product's star ratings based on a machine learning model instead of raw data average. The model takes into account factors including the age of a rating, whether the ratings are from verified purchasers, and factors that establish reviewer trustworthiness"*. In this study, it was assumed that buyers as a group have homogeneous preferences in terms of their value assessments and that buyers of first- and third-party products come from

the same population. The fact that only one first-party brand was compared should be considered a limitation to the generalizability of the findings. Potential limitations associated with the equivalence factors include 1) Potential biases of the person conducting the qualitative assessments of product images and descriptions and 2) Potential inaccuracies of equating shipping-, rather than item weights when item weights were missing or inaccurate in one or both products in a pair. The study does not account for the influences of extrinsic attributes other than price, number of ratings and average rating. Relevant such omitted parameters include *level of brand awareness* (Aaker, 1991; 1996; Dewar & Parker, 1994; Keller & Lehmann, 2003), *marketing efforts*, *consumer reviews* and *warranty cues* (Srivastava & Mitra 1998).

Findings

Table 7.1: *Summarized mean values and standard deviations (SD) for the full sample of first- and third-party products (N = 250 product pairs) at the three measurement times.*

Variables	Aug 2018		Nov 2018		Feb 2019	
	Mean	SD	Mean	SD	Mean	SD
<i>Price</i>						
First-party products	22.28	(20.15)	22.43	(19.90)	22.18	(19.63)
Third-party products	25.49	(22.91)	26.40	(24.29)	26.21	(23.40)
<i>Number of Ratings</i>						
First-party products	1291	(4316)	1239	(2878)	1366	(3045)
Third-party products	1742	(3400)	1683	(3495)	1774	(3812)
<i>Average rating</i>						
First-party products	4.289	(0.29)	4.255	(0.32)	4.245	(0.31)
Third-party products	4.430	(0.31)	4.386	(0.32)	4.375	(0.33)

Descriptive statistics for the pairs in the sample are found in Table 7.1. The sample consisted of 500 products from 17 product categories. Among these, products from the departments 'Home & Kitchen', 'Electronics' and 'Office Products' were the most represented with 156, 88 and 82 products, respectively. Products from these three departments hence made up 65.2% of the sample. The concentration stems from a skew in the offering of products from the brand 'AmazonBasics'. The mean

price of a product in the sample was \$24.2. The mean number of ratings was 1516 and the mean average rating was 4.33 (out of 5.00). In terms of effect on mean values, products from the most highly represented department (Home & Kitchen) decreased the mean value for all three parameters of price (\$22.9), number of ratings (1323) and average rating (4.32). The mean price of products from 'Electronics' was significantly lower than the mean of the sample (\$15.4), but both more popular in terms of number of ratings (2311) and more highly rated (4.40). 'Office Products' were more expensive (\$32.6) and significantly less rated (813), but negligibly higher rated (4.34) than the full sample.

Investigating Differences Between First- and Third-Party Products

The analysis investigating differences between first- and third-party products is summarized under the first headline of Table 7.2. For the full sample of 250 product pairs, the price of first-party products was found to be substantially lower than third-party substitutes, ranging from -\$3.22 in August to -\$4.03 in February. With mean prices of first-party products ranging from \$22.18 to \$22.43, they were in other words found to be between 12.6% and 15.4% less expensive than functionally and aesthetically equivalent third-party substitutes. The difference between the average rating of first-party branded products and third-party substitutes ranged from -0.130 to -0.142, or approximately 3.1% to 3.3% lower rated. Although Amazon's rating scale theoretically ranges from 1.0 to 5.0 stars, Amazon removes products consistently rated below 3.5 stars⁷. The data in the sample largely confirmed this, having only nine data points below 3.5 stars (out of 1469 for the 250 product pairs at three times). The lowest rating found in the sample was 3.2 stars for one first-party product in February. Accounting for observed scale (3.2, 5.0), first-party products in other words were found to be between 12.4% and 12.9% lower rated than equivalent third-party products. First-party products in the sample were however also found to

⁷As of March 10th 2016, 96.06% of AmazonBasics products were rated between 3.5 and 5.0 stars (Rubin, 2016).

have substantially fewer ratings than third-party substitutes, by between -408 and -451 or 29.9% and 35.8%.

Table 7.2: Summarized results of the 18 paired *t*-tests for the three samples at three times, investigating two dependent variables (price and average rating).

	Aug 2018	Nov 2018	Feb 2019
1. Full Sample (N = 250)			
<i>Price</i>	-3.22**** (6.35)	-3.97**** (8.19)	-4.03**** (8.09)
<i>Avg. Rating</i>	-0.142**** (0.340)	-0.132**** (0.361)	-0.130**** (0.367)
2. Sample where Price(FP ≥ TP) (N = 77, 70, 81)			
<i>Price</i>	1.47**** (3.04)	2.36**** (3.53)	2.12**** (2.82)
<i>Avg. Rating</i>	-0.131*** (0.350)	-0.129*** (0.356)	-0.091** (0.352)
3. Sample where Number of Ratings(FP ≥ TP) (N = 83, 99, 102)			
<i>Price</i>	-2.67**** (5.60)	-3.52**** (7.41)	-3.91**** (8.35)
<i>Avg. Rating</i>	-0.076** (0.323)	-0.064* (0.356)	-0.063* (0.379)

Significance: **** $p < 0.001$, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$
Standard deviations in parentheses

Investigating Price Inferences

To test for price-quality inferences, from the full sample the subset of product pairs where the price of first-party products were equal to or higher than third-party substitutes was analyzed for the same differences as the full sample. The summarized findings are listed under the second headline in Table 7.2, 'Sample with Price(FP ≥ TP)'. The samples in the subset contained N = 77, 70 and 81 product pairs for the three measurement times. For these samples, first-party products were more expensive than third-party substitutes, on average ranging from +\$1.47 to +\$2.36 or 7.2% to 12.3%. The difference between average ratings remained largely the same at the first two times (-0.131 and -0.128) and decreased somewhat in the third measurement (-0.091). Accounting for observed scale length (3.2, 5.0), first-party

products more expensive than third-party substitutes in other words were rated lower, by an average of between 8.5% and 12.1%. In August and November, first-party products had significantly fewer ratings than third-party products (-264 and -301, respectively), however in February the difference was negligible (-9) but the difference in average rating persisted.

Investigating Popularity Inferences

The role of popularity was also investigated, by looking at those product pairs in which first-party products had equal to or higher numbers of ratings than third-party substitutes. The summarized findings are listed under the third headline in Table 7.2, 'Sample with Number of ratings(FP \geq TP)'. The samples in the subset contained N = 83, 99 and 102 product pairs in August, November and February, respectively. First-party products were on average found to be rated by approximately 1806, 1469 and 1567 more people than their third-party substitutes. For these pairs, differences in average ratings between first- and third-party products decreased substantially to -0.076, -0.064 and -0.063 or between 6.3% and 7.2%. Price differences were approximately equal as for the full sample, ranging from -\$2.67, to -\$3.92.

Investigating Ratings Variances

In addition to paired t-tests comparing the ratings produced by Amazon's 'average product star rating' system, the mean rating distributions of the products in each pair were also investigated. The summarized findings are listed in Table 7.3 for both the full sample, the sample accounting for price inferences and the sample accounting for popularity inferences. The findings show that for the full sample, products from each pair were perceived approximately equally in terms of one-, two-, three- and four-star ratings. First-party products were however rated as worthy of five stars significantly less frequently (-5.53%). This finding largely persists for the sample accounting for price inferences (-4.56%) but partially disappeared in the sample accounting for popularity (-2.9%). For the full sample, there was found a slightly higher propensity for consumers to rate first-party products as worthy of one-star

ratings (+1.23%), but this finding was reversed when accounting for price- (-2.47%) and popularity (-2.55%) inferences. In other words, the propensity for consumers to perceive a first-party product as worthy of a one-star rating seemingly correlates strongly with inferences from both lower price (third-party products in the sample where $\text{Price}(\text{FP} \geq \text{TP})$) and lower numbers of ratings (third-party products in the sample where $\text{Popularity}(\text{FP} \geq \text{TP})$).

Table 7.3: Summarized statistics and results of the 15 paired t-tests evaluating rating variances

	Rating Distribution				
	1	2	3	4	5
1. Full Sample (N = 250)					
First-party products	6.50	4.16	6.47	15.29	67.58
Third-party products	5.27	3.20	5.20	13.30	73.11
Difference	+1.23****	+0.96****	+1.27****	+1.99****	-5.53****
2. Sample with Price(FP \geq TP) (N = 51)					
First-party products	3.1	4.0	6.2	14.3	69.2
Third-party products	5.6	3.2	5.0	12.5	73.7
Difference	-2.47***	+0.76	+1.22**	+1.77***	-4.56**
3. Sample with Number of Ratings(FP \geq TP) (N = 93)					
First-party products	2.8	3.8	6.3	14.7	69.5
Third-party products	5.3	3.3	5.1	13.9	72.4
Difference	-2.55****	+0.56*	+1.19****	+0.72	-2.90***

Significance: **** $p < 0.001$, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Discussion

Although frequently studied as a phenomenon relevant to entry (Hagiu & Spulber, 2013), rent extraction (Farrell & Katz, 2000), integration (Adner & Kapoor, 2010; Huang et al., 2013) and/or governance (Eaton et al., 2015; Gawer & Henderson, 2007) extant research investigating the role of first-party content on platforms in multi-sided markets does not address brand-related attributes such as *perceived value* (Calvo-Porrall & Lévy-Mangin, 2017), *brand loyalty* (Semeijn et al., 2014) and *awareness* (Rubio et al., 2014). This despite the fact that it is generally accepted

that although first-party products' objective quality has substantially improved over time (Apelbaum et al., 2003), perceived quality among consumers continues to be significantly lower than for third-party substitutes (Méndez et al., 2008; 2011).

Consumer Perceptions of First-Party Content

Perceived value is formed as the result of consumers' experiences purchasing and consuming a brand (Cronin et al., 2000). In the context of retail and supermarkets it is known that private brands' perceived quality affects their perceived value and so the purchase intentions among consumers (Rubio et al., 2014). Traditionally, private labels are thought to be evaluated as being lower quality, more risky alternatives (González et al., 2006) and manufacturer brands as more safe brands with less variation in the quality of their products (Montgomery & Wernerfelt, 1992). If the same finding persists in the context of two-sided markets, consumers perceive first-party products and services associated with the platform as being of lower value than products sold by and associated with third-party brands.

Although it is true that on average both first- and third-party products in the sample of the study were perceived by consumers as delivering fairly high value (approx. 4.26 and 4.40/5.00, respectively), the findings of this study confirm the established result from research on retail and supermarkets that there is a meaningful difference in consumers' perceptions of products from first-party brands such as 'AmazonBasics' and third-party brands such as those sold on Amazon's Marketplace. Accounting for observed scale (3.20, 5.00), the difference between mean first- and third-party ratings was on average -0.134, approximately 12.6% over the three measurements. Investigating potential sources of the difference, cues from warranty, shipping and handling were controlled for in the data collection, and so may be excluded. Potential extrinsic attributes (González et al. 2006; Rubio et al. 2014) accounting for the difference may stem from the existing average rating of products, which consumers on Amazon's marketplace have access to and which may influence their assessments of the value of the products they rate and review (Book et al., 2016). However, given that ratings are available for both first- and third-party products equally, if there

were no differences stemming from other attributes (such as brand perception), one would expect the impact of existing rating differences to diminish over time and average ratings to converge as products were rated more often. For this sample, this was only partially found to be the case, as the difference between average ratings did partially disappear when only investigating those first-party products which were equally or more rated than third-party substitutes.

The availability of average consumer ratings and reviews is one of several factors that differentiate two-sided e-commerce platforms from traditional, vertically integrated marketplaces such as retail, supermarkets and e-commerce re-sellers. It is known that the search for information and well-known brands are main risk-reduction strategies used by consumers (Mitchell & McGoldrick, 1996) and that consumers want to see user ratings and reviews on the e-commerce websites they visit (Kee, 2008). In the full sample it was found that consumers generally found third-party products to be more worthy of five-star than four-star reviews (73.1% and 13.3%, respectively) than they did first-party products (67.6% and 15.3%). Indeed, this was the largest difference between consumer perceptions of first- and third-party products found in the sample.

The rating distributions of third-party products also showed higher variance than did first-party products. In the context of entertainment, a survey conducted by Martin et al. (2007) previously found that individuals choosing between two movies with pre-given ratings found that consumers preferred the high-variance movie. A similar finding by Clemons et al. (2016) showed that beer brands with higher variances of ratings grow fastest in terms of sales. In the context of the findings of this study, a similar plausible explanation for the higher average rating of third-party products could be that in rating products, consumers are influenced by rating distributions and so more likely to give five-star ratings to products with existing rating distributions of higher variance. Contrasting this hypothesis however, Meyer (1981) showed that consumers discount average critic ratings to adjust for critic disagreement, indicating that in some contexts consumers may also view higher variance as an indicator of lower value.

Given that consumers are traditionally thought to view private labels as 'value brands' (Rubio et al., 2014), a trivial potential explanation for the difference in consumer perceptions of first- and third-party products could be a positive price-quality inference (Scitovszky 1944-45). Of course, first- and third-party brands are generally thought to consolidate the value they deliver to consumers through different ways, traditionally via price and quality, respectively (Rubio et al., 2014). Although there has been a clear evolution of private labels' positioning from focusing mainly on price to more quality-based value propositions (Kumar & Steenkamp, 2007) price-related factors appear to remain be the most common determinants for consumers' purchase decisions (Jin & Suh, 2005) when considering buying products from first- or third party brands. Price is also a key driver influencing the perceived value of first-party brands (Beneke et al., 2013; Snoj et al., 2004). Calvo-Porrall & Lévy-Mangin (2017) for instance found support for the hypothesis that private label price has a positive influence on perceived value.

Although on average significantly lower priced, the findings of this study do not find support for the hypothesis that price is what primarily leads consumers to perceive first-party products as delivering less value than third-party substitutes. When investigating the sample containing only equally or higher priced first-party products, the difference between average ratings largely persisted. Price in other words had a negligible effect on consumers' assessment of the value of first- and third-party products on Amazon's Marketplace at the time of the study.

What did show an appreciable effect was the influences of popularity, in this study measured by the number of ratings products had. Findings from the analysis of those product pairs where first-party products were rated equally or a higher number of times indicate that in this sub-sample, the perceived value of first- and third-party products was more equal, although still appreciably lower for first-party products. In practice, popularity essentially accounted for half of the difference in consumers' skewed perceived value in favor of higher rated third-party products.

Conclusion

The findings of this study largely confirm the well-known proposition from literature on supermarkets- and retail that consumers perceive platform/marketplace-branded products as delivering less value than products from third-party manufacturer brands. In particular, the study finds that this phenomenon is largely unaffected by price differences, only partially diminished by popularity differences and found to stem largely from consumers' higher willingness to award third-party products with five-star ratings than they do first-party alternatives.

Implications for Managers and Research

In the context of multi-sided markets, awareness of how the value of first-party products and services are perceived by consumers has important implications for managers looking to pursue first-party content strategies. For instance, first-party content is often thought to be a useful tool for overcoming the so-called 'chicken-and-egg' problem (Caillaud & Jullien, 2003). In extant research, first- and third-party products are largely treated as perfect substitutes. According to extant research, platforms should invest more when facing unfavorable expectations of adoption and decrease (or increase) investment over time if first- and third-party content are strong substitutes (or complements) (Hagiu & Spulber, 2013). Introducing non-equivalence of first- and third-party products' perceived value, managers here should note that other dynamics may be relevant. For instance, should first-party content be considered a strong substitute yet be perceived as delivering significantly less value than that provided by a third-party, effects from price anchoring (Green et al., 1998) and decoy pricing (Schwartz & Cohen, 1999) may appear. In such cases, decreasing investments in first-party content may lead to adverse effects if consumers perceive that the third-party option delivers even more value when compared to a strong first-party substitute than when evaluated in isolation. The introduction of non-equivalence of perceived value of first- and third-party in other words implies that investment strategies in first-party content depend not only the nature of buyer

and seller expectations and the relationship between first- and third-party content (Hagiu & Spulber, 2013), but also on buyers' level of perceived value from first-party content *as compared to third-party substitutes*. One clear implication of this for managers looking to implement first-party content strategies is that, depending on their motivation, it may be advantageous to avoid affiliating first-party brands with the platform. In fact, this appears to be what Amazon has chosen to do for 68 out of its 69 other first-party brands⁸, only associating the name 'Amazon' with one other brand (Amazon Essentials) after the introduction of "AmazonBasics" in 2009.

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Research Paper 3

The Role of Innovators in Two-Sided Markets

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The Role of Innovators in Two-Sided Markets

Abstract

Extent conceptualizations of how intermediation platforms such as Uber and Airbnb can emerge in two-sided markets implicitly assume that the participation decisions of potential adopters (drivers/passengers, hosts/guests) are made exclusively based on the level of direct and/or indirect network externalities in such markets. As such, a tenant of strategy research in two-sided markets has thus far regarded the formulation of managerial strategies for overcoming a initial 'chicken-and-egg' problem platform firms may face upon entry. Empirical studies have simultaneously however argued that platforms may also emerge despite an initial lack of direct and/or indirect network externalities, given certain contextual and firm-specific prerequisites. In this paper, we propose a model of platform adoption which shows how the presence of so-called 'innovators' may describe how such entry is possible. Reviewing the implications of the model we find that platform entry in such cases are enabled by the level of demand for new solutions. The paper concludes by proposing a trilemma governing which contextual prerequisites are sufficient to make platform entry in two-sided markets viable.

Introduction

Extant conceptualizations of how platform firms enter two-sided markets assume that potential participants (users/providers, buyers/sellers and so on) make participation decisions exclusively based on the level of direct and/or indirect network externalities already present in the market (e.g. Caillaud & Jullien, 2003; Rochet & Tirole, 2003; Spulber, 2010). As a consequence, in extant literature the so-called “chicken-and-egg problem” has come to be thought of as a key challenge for firms attempting to launch intermediation platforms in two-sided markets (Caillaud & Jullien, 2003; Rochet & Tirole, 2003; McIntyre & Srinivasan, 2017). That is, it is thought that absent network externalities, in two-sided markets, ‘nobody joins until everybody joins’.

Formulating appropriate entry strategies is especially crucial for managers of platform firms because if a new entrant platform fails to attract sufficient numbers of participants on each side of its market, a so-called ‘critical mass of users’, the platform can fail to launch (Evans & Schmalensee, 2010; Ondrus et al., 2015). Taking the existence of the ‘chicken-and-egg’ problem in two-sided markets as a given, researchers have thus far investigated the role of expectations among potential participants about the future adoption decisions of other potential participants with whom they may interact or transact with (e.g. Hagiu, 2006). Herein, various authors have investigated strategies managers may pursue to alter such expectations, including 1) subsidizing the cost of participation for one or both sides of the market (e.g. Rochet & Tirole, 2003; Armstrong, 2006; Hagiu, 2006), 2) using licensing strategies and/or exclusive contracts to entice participation (e.g. Armstrong & Wright, 2007; Hagiu, 2009), 3) “seeding” the platform by offering first-party content until participants join (Hagiu & Spulber, 2013), 4) ensuring compatibility with an installed base on existing platforms (Schilling, 2002) and 5) manipulating the expectations of potential participants by pre-announcing the platform before it is actually viable (Bhargava, 2014).

In this study, we adopt the perspective that participation decisions in two-sided markets are not made solely on the basis of participants’ expectations about the

adoption decisions of other potential participants (i.e. the level of direct and/or indirect network externalities), but also based on technology factors. As Sheremata (2004) writes, "*in network markets [...] consumers derive utility from two distinct sources: product attributes and network size*". That is, we assume that adopters in two-sided markets may be characterized according to the same adopter categories as is assumed in most other branches of strategy, innovation and marketing research. As such, a model is proposed which segments participants on new-entrant platforms into two groups: innovators and imitators, a categorization first introduced in Bass (1969). In the model, innovators are assumed to make adoption decisions based solely on technology factors whereas imitators are assumed to make adoption decisions based on the level of direct and/or indirect network effects in the market. The key findings of the study are the conditions under which platform entry is possible, as a function of technology factors and direct/indirect network effects.

The paper is outlined as follows. First, extant literature addressing entry strategies in two-sided markets is presented, alongside an overview of the established literature on new product adoption. Second, the "Bass model" of new product adoption is presented, alongside its assumptions and limitations. Next, an extended Bass model for two-sided markets is introduced, alongside the necessary conditions under which platform entry is possible, given the assumptions of the model. Finally, a discussion of the implications of the extended model are provided, alongside a conclusion and implications for further research.

Theoretical Context

In their original treatise on two-sided markets with network externalities, Rochet & Tirole (2003) introduce their paper by emphasizing that 'platform owners or sponsors [...] must address the celebrated 'chicken-and-egg' problem and be careful to 'get both sides on board', pointing out the lack of theoretical development surrounding the seeming paradox. The authors proceed to 'start fillings this gap' by describing how 'price allocation between two sides of a platform is affected by platform governance,

differentiation, end-user costs of multi-homing, network externalities and platform compatibility' (McIntyre & Srinivasan, 2017). Similarly, the "other" renowned 2003 paper on platforms in two-sided markets by Caillaud & Jullien (2003) similarly takes aim at addressing the seeming paradox that 'indirect network externalities give rise to a 'chicken-and-egg' problem: to attract buyers, an intermediary should have a large base of registered sellers, but these will be willing to register only if they expect many buyers to show up'. The authors tackle the paradox by developing 'a model of optimal pricing by platform providers, including subsidizing one side while profiting from the other side' to propose one potential solution to the issue.

Indeed, a relatively large amount of attention has since these early days of platform research been spent on addressing the issue of platform entry, namely how firms manage to create intermediation businesses in two-sided markets and in the process, overcome the hypothetical 'chicken-and-egg' problem. In this stream one now finds a handful of entry strategies described, including, as mentioned, 1) subsidizing the cost of participation for one of both sides of the market (e.g. Rochet & Tirole, 2003; Armstrong, 2006; Hagiu, 2006) and 2) using licensing strategies and/or exclusive contracts to entice participation (e.g. Armstrong & Wright, 2007; Hagiu, 2009).

These studies are however also scrutinized for overemphasizing the role of pricing strategies, critical mass, transactional efficiencies and pecuniary incentives (McIntyre & Srinivasan, 2017), suggesting that the sources of value and early stage value creation process in two-sided markets still remains poorly understood (e.g. Boudreau & Hagiu, 2009; Gawer, 2014; Hagiu & Jullien, 2011). This has given rise to a more nascent focus on alternative entry strategies such as 3) "seeding" the platform by offering first-party content until participants join (Hagiu & Spulber, 2013), 4) ensuring compatibility with an installed base on existing platforms (Schilling, 2002) and 5) manipulating the expectations of potential participants by pre-announcing the platform before it is actually viable (Bhargava, 2014). In the book chapter 'Solving the Circular Conundrum: Communication and Coordination in Internet Markets', Spulber (2010) discusses the topic of entry as it relates to the 'chicken-and-egg' problem (referred to as the 'circular conundrum' by Spulber) extensively.

Thus far only a handful of studies have thoroughly investigated the qualitative nature of platform entry in two-sided markets for the purposes of uncovering how the 'chicken-and-egg' problem manifests empirically. Notable exceptions include the works by Gawer & Henderson (2007), Kyprianou (2018) and Veisdal (2020). Through interviews with platform owners, Gawer & Henderson (2007) explored Intel's strategies regarding supply-side participation, uncovering how the firm's entry decisions are formulated. Their study finds that managers of Intel are incentivized to encourage the participation of third-party suppliers on their technology platforms, in lieu of simultaneously potentially offering first-party content in order to overcome 'chicken-and-egg' problems, which third-party suppliers may *post hoc* view as entry by a strong incumbent. From a value creation perspective, Kyprianou (2018) found that in addition to overcoming the 'chicken-and-egg' problem, managers of nine European internet platforms emphasized having to deal with the additional initial challenge 'the uncertainty surrounding individuals' behaviors when transacting with one another'. Veisdal (2020) found that depending on the two-sided demand for the platform firms' services, managers of ten platform firms were able to recruit both supply- and demand-side participants prior to the establishment of viable services and/or manifest network externalities. Speculating about potential enabling factors, managers highlighted context-specific factors such as operating in industries with low wages and high unemployment where suppliers are accustomed to using multiple channels and/or industries with low degrees of transparency and high levels of market concentration.

Regarding the state of empirical studies, McIntyre and Srinivasan (2017) posited that inconsistencies in the findings reported thus far may be related to the empirical difficulty of parsing the correlated benefits of installed base size and availability of complements. They additionally posited that, because the 'chicken-and-egg' problem and indirect network effects in particular has thus far been treated as a "black box", an important avenue of future research should be to focus on more nuanced conceptualizations of indirect network effects, including emphasizing the variety of suppliers (complementors) (McIntyre & Srinivasan, 2017) upon entry.

New Product Adoption and Diffusion of Innovations

Preceding the literature stream on the entry of platform firms in two-sided markets is a much richer literature on the more general topic of new product adoption (Bass, 1969; Rogers, 2010). Herein is included the popular stream of research on the 'diffusion of innovations' described by Rogers (2010) as 'the process by which an innovation is communicated through certain channels over time by members of a social system'. Since its introduction in the field of marketing in the 1960s (Arndt, 1967; Bass, 1969; Frank et al, 1964; King, 1963; Robertson, 1967; and Silk, 1966) a variety of perspectives on how to describe and interpret innovation diffusion theory have sparked considerable attention among consumer behavior-, management- and marketing scholars (Mahajan et al, 1990; Peres et al, 2010).

The objective of a diffusion model is to 'present the level of spread of an innovation among a given set of prospective adopters over time' (Mahajan & Muller, 1979). That is, the goal of such models is to approximate how many adopters a new product or service has, as a function of time and the number of potential ultimate adopters in the market. In traditional first-purchase diffusion models (such as the "Bass model", 1969), one assumes that there are no repeat buyers and purchase volume per buyer is one unit. Mahajan et al (1990) argue that the three best-known models featuring this assumption are those of Bass (1969), Fournier & Woodlock (1960) and Mansfield (1961). Arguably, the "Bass model" (Bass, 1969) of diffusion is the single most popular model in the field of marketing (Bass, 2004), even being voted one of the 'Top 10 Most Influential Papers' published in the 40-year history of *Management Science*. The main impetus for this claim is that Bass' model in a sense subsumes the models of Fournier & Woodlock (1960) and Mansfield (1961) in that it assumes that potential adopters of an innovation are influenced by two means of communication: 1) Mass media and 2) Word-of-mouth. This unlike the former model which assumes that the diffusion process is driven primarily by mass media communication (Fournier & Woodlock, 1960) or the latter which assumes that the diffusion process is driven primarily by word-of-mouth (Mansfield, 1961). In Bass' model, both means of

influence are brought together and adopters are instead separated based on their source(s) of influence leading to adoption, as either *innovators* (influenced by mass media) and *imitators* (influenced by word-of-mouth). In his book 'Diffusion of innovations' Rogers (2010) famously—albeit in a less formal manner than Bass and his contemporaries—distinguishes adopters by the timing of their adoption into five groups (innovators, early adopters, early majority, late majority and laggards). Bass' work collapses the latter four categories into one ('imitators') and posits that the timing of their adoptions differ only by the 'pressures of the social system', i.e. that 'the pressure increas[es] for later adopters with the number of previous adopters' (Bass, 1969). The most related work to that presented in this paper is Goldenberg et al (2010) who studied whether a 'chilling effects' may result from network externalities. In their paper, an agent-based model is presented in order to show that in addition to spurring growth, network externalities may have a substantial chilling effect on the net present value associated with new products. Colloquially, this may be interpreted as 'early adopters wait for further adoption who will may them with more utility, before they adopt' (Goldenberg et al, 2010).

Adoption in One-Sided Markets

The Bass model of new product adoption (Bass, 1969) is derived from a hazard function¹, and may be informally stated as depicting the 'probability that an adoption will occur at a time T given that it has not yet occurred' (Mahajan et al., 1990). Bass defines it as follows:

$$\frac{f(T)}{1 - F(T)} = p + qF(T) \quad (8.1)$$

Where $f(T)$ is a 'density function' describing the 'likelihood of adoption at time T' and the term $1 - F(T)$ is a so-called 'survival function', where $F(T)$ is a cumulative 'failure distribution function' that describes the probability of adoption (at least) up

¹A "hazard function" is typically used to calculate the failure rate for ever smaller intervals of time, $h(T) = f(T)/[1 - F(T)]$

to and including time T . The coefficient p represents an influence that is independent of previous adoption and the coefficient q an influence that is dependent on the cumulative fraction of previous adopters, $F(T)$. If $A_{potential}$ is the potential number of adopters in the market, the *number of adopters who join at time T* , $A(T)$, is given by the density function giving the likelihood of purchase at time T , $f(T)$, multiplied by the total number of adopters in the lifetime of the product, $A_{potential}$:

$$A(T) = f(T) \times A_{potential} \quad (8.2)$$

Hence, the *cumulative number of adopters at time T* , $A_{cumulative}(T)$, is given by the cumulative distribution function in the $(0, T)$ time interval, $F(T)$, multiplied by the same factor, $A_{potential}$:

$$A_{cumulative}(T) = F(T) \times A_{potential} \quad (8.3)$$

Rewritten, eq. 8.1 can be input into eq. 8.2 to yield an expression for the number of new adopters at time T , $A(T)$, as a function of the cumulative distribution function in the $(0, T)$ time interval, $F(T)$:

$$A(T) = \left(p + qF(T) \right) \left(1 - F(T) \right) \times A_{potential} \quad (8.4)$$

Substituting for a rewritten form of eq. 8.3, this expression may be further rewritten to yield an expression for the 'number of new adopters at time T ', $A(T)$, as a function of the cumulative number of adopters at time T , $A_{cumulative}(T)$:

$$A(T) = p \left(A_{potential} - A_{cumulative}(T) \right) + q \left(\frac{A_{cumulative}(T)}{A_{potential}} \right) \left(A_{potential} - A_{cumulative}(T) \right) \quad (8.5)$$

This expression consists of two terms. The first term $p(A_{potential} - A_{cumulative}(T))$

expresses the number of adoptions at time T ‘not influenced by the number of people who have already adopted’. The second term $q\left(\frac{A_{cumulative}(T)}{A_{potential}}\right)(A_{potential} - A_{cumulative}(T))$ expresses the number of adoptions at time T ‘due to being influence by the number of people who have already adopted’, respectively (Mahajan et al., 1990).

Adoption in Two-Sided Markets

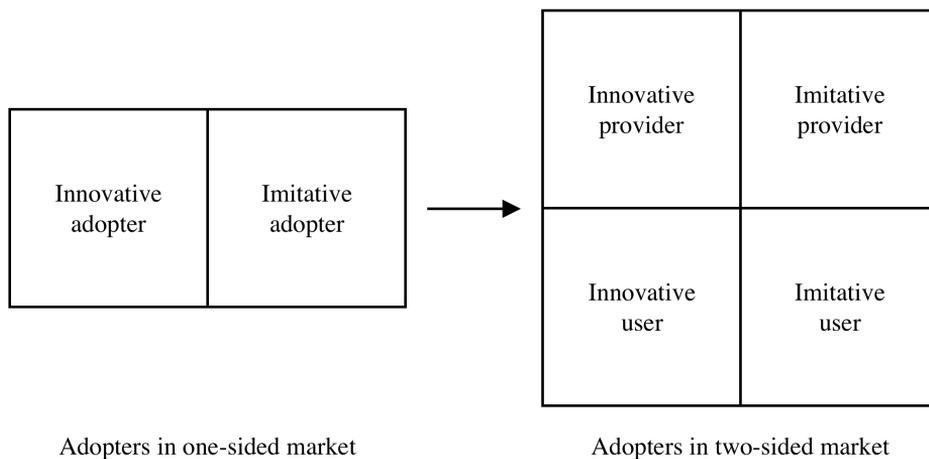


Figure 8.1: *Adopter categories in the Bass model (left) and the extended model presented in this paper (right)*

In the following extension to Bass’ model, we will consider a two-sided market such as e.g. a ride-hailing service featuring two distinct groups of participants: 1) Providers, (P), e.g. drivers and 2) Users (U), e.g. passengers. We will assume that potential participants in two-sided markets may be characterized as either an “innovator” or an “imitator”. Participants of the former type make adoption decisions based solely on so-called ‘external influence’ (Mahajan et al, 1990; Peres et al, 2010), typically thought to be advertising in mass media (first proposed in Fourt & Woodlock, 1960), but which may also include other sources of influence, see Veisdal (2020). For innovators, in other words, technology factors are sufficient to spur adoption. Imitators on the other hand, make adoption decisions based on both external and *internal* influence,

typically thought to be word-of-mouth communication (first proposed by Mansfield, 1961). For imitators, technology factors are a necessary but not sufficient condition, as network effects are also needed in order for adoption to occur.

Like Bass we will be concerned only with the timing of adoption and assume that adoption by innovators decreases monotonically over time, as they comprise a fairly small percentage of the overall number of potential adopters (Rogers, 2010). As more innovators adopt, fewer are hence “available” to adopt in the future. Unlike Bass (1969), in our extended adoption model we will assume that initial adoption of the platform is made only by innovators and only after a time period $[0, T]$ will these initial adoptions lead to additional adoption by imitators, in the time period $[T, n]$. As in Bass’ model, imitators hence “learn” from those who have already chosen to join the platform, via word-of-mouth communication (network effects).

For innovators, we import Bass’ “coefficient of innovation” p denoting the willingness of potential adopters to join the platform based solely on the basis of technology factors. Similarly, we further the use of a “coefficient of imitation” from Bass (1969) but need to augment its definition in order to distinguish between influences from direct and indirect network effects. That is, we need separate coefficients for adoption influenced by word-of-mouth influence from same-side participants and word-of-mouth influence from participants on the other side of the market. We hence define coefficients of “direct imitation” and “indirect imitation”, respectively, and ensure to use subscript index notation to denote which group of participants are exerting influence, e.g. q_{PP} for word-of-mouth influence among providers on other providers (direct network effects) and q_{UP} for word-of-mouth influence among users on providers (indirect network effects), and *visa versa*.

Innovative Providers (Influenced by Technology Factors)

As in the original Bass model, we represent innovative providers (or users) by the first term in eq. 8.5, denoting ‘the number of supply-side (or demand-side) participants who have joined at time T but who were not influenced in the timing of their adoption

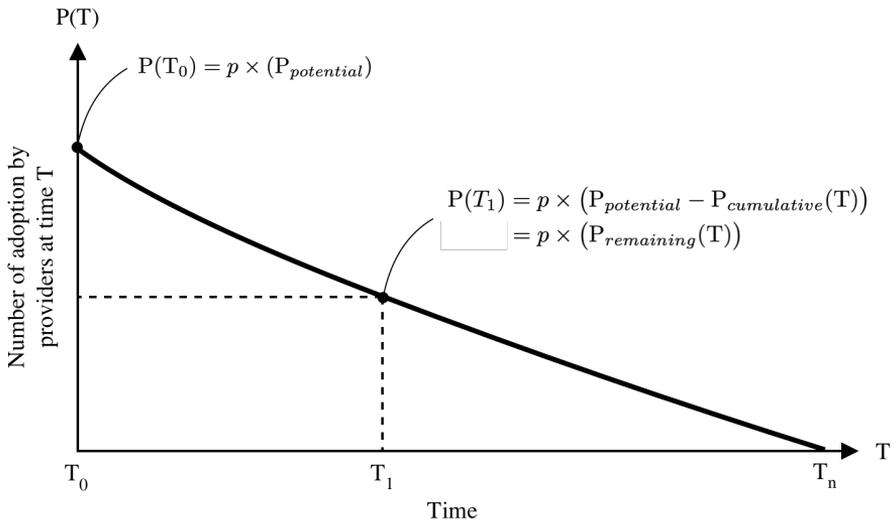


Figure 8.2: *Adoptions by innovators over time*

by the number of other providers (or users) who had already adopted', here for providers (P):

$$p(P_{potential} - P_{cumulative}(T)) \tag{8.6}$$

where p denotes the Bass' 'coefficient of innovation', $P_{potential}$ the potential number of adoptions by providers and $P_{cumulative}(T)$ the cumulative number of providers who have adopted at a time T . In an imagined market with insufficient information or lack a of communication such that imitators are unable to make adoption decisions, the number of providers who adopt at time T , $P(T)$, would hence consist exclusively of innovators and so be expressible by:

$$P(T) = p(P_{potential} - P_{cumulative}(T)) \tag{8.7}$$

At $T = 0, P(0) = p \times P_{potential}$. The cumulative number of adopters at time T_1 would then be found by taking the integral of the expression from $T = 0$ to 1:

$$P_{cumulative}(T) = \int_{T_0}^{T_1} P(T)dT \tag{8.8}$$

and the number of potential adopters in the market in the lifetime of the platform by the same integral from $T = 0$ to n :

$$P_{potential} = \int_{T_0}^{T_n} P(T)dT \tag{8.9}$$

Input into (8.7), the two integrals (8.8) (8.9) allow us to derive an equation giving the coefficient of innovation p as an expression of the relationship between the number of adopters at time T divided by the number of remaining potential adopters at time T (who have yet to join):

$$p = \frac{P(T)}{\int_{T_0}^{T_n} P(T)dT - \int_{T_0}^{T_1} P(T)dT} \tag{8.10}$$

Imitative Providers (Influenced by Other Providers)

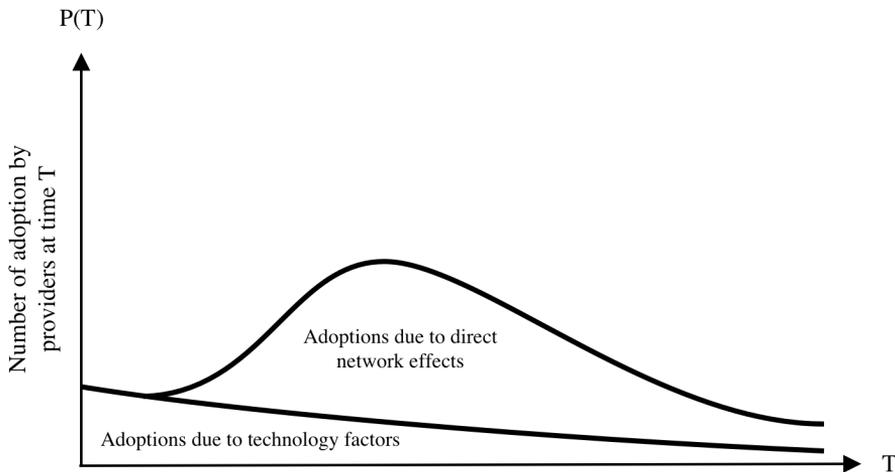


Figure 8.3: *Adoptions by innovators and imitators influenced by direct network effects over time*

As in Bass' original model, we need to account for adoption influenced by word-of-mouth among imitative providers. In the Bass model, this influence is represented by the factor 'the coefficient of imitation' q . In the context of our extended model in two-sided markets, we will distinguish between two coefficients of imitation, namely 'direct' and 'indirect', depending on which group the influence is exerted to and from. Imitative providers who join at time T from being influenced in their adoption by other providers (direct network effects) may hence be represented by the second term in eq. 8.5:

$$q_{PP} \times \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) \left(P_{potential} - P_{cumulative}(T) \right) \quad (8.11)$$

where q_{PP} denotes the 'coefficient of direct influence' from word-of-mouth among providers (P) on other providers (P). As above, we can imagine a hypothetical market in which the only driver of adoption is word-of-mouth among providers (the so-called "bandwagon effect", see Jullien, 2011), in which *the number of adopters at time T* , $P(T)$ is given by:

$$P(T) = q_{PP} \times \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) \left(P_{potential} - P_{cumulative}(T) \right) \quad (8.12)$$

Similarly as above, we may rearrange (8.12) to derive an equation for q_{PP} :

$$q_{PP} = \frac{P(T) \times \int_0^n P(T) dT}{\int_0^T P(T) dT \times \left(\int_0^n P(T) dT - \int_0^T P(T) dT \right)} \quad (8.13)$$

Imitative Providers (Influenced by Users)

In our extension of Bass' model to two-sided markets we additionally need to account for those imitative providers (P) who have joined at time T from being influenced by the adoption of users on the other side of the market (indirect network effects). At time T they may be represented by:

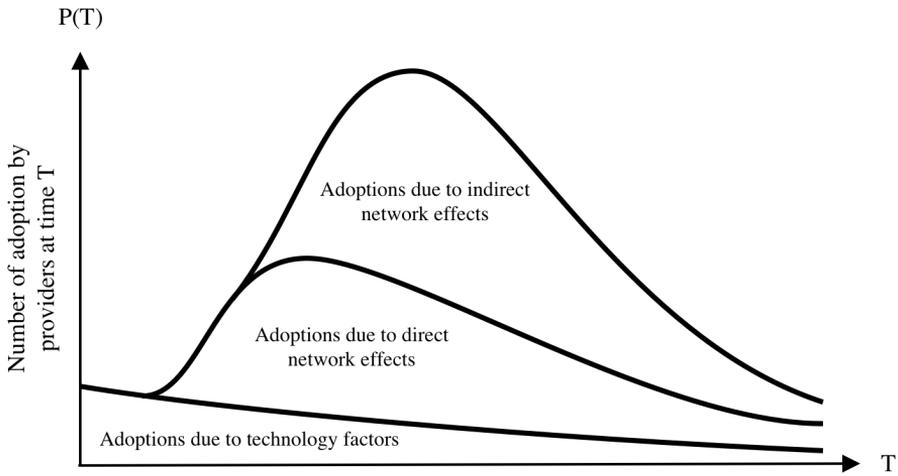


Figure 8.4: *Adoptions by innovators and imitators influenced by direct and indirect network effects over time*

$$q_{UP} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) (P_{potential} - P_{cumulative}(T)) \tag{8.14}$$

where the “coefficient of indirect influence” q_{UP} regards the influence word-of-mouth among users has on providers. The term $\frac{U_{cumulative}(T)}{U_{potential}}$ represents the fraction of all potential users that have adopted at time T , and the sum $P_{potential} - P(T)$ represents the fraction of potential providers who have yet to adopt, and so may be influenced by word-of-mouth among users.

The number of providers and users, both innovative and imitative who have adopted at time t , $P(T)$ and $U(T)$ respectively, may hence be represented by sums of the three expressions (8.7), (8.12) and (8.14), respectively:

$$\begin{aligned}
 P(T) = & \\
 & p_P \left(P_{potential} - P_{cumulative}(T) \right) \\
 + q_{PP} \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) & \left(P_{potential} - P_{cumulative}(T) \right) \\
 + q_{UP} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) & \left(P_{potential} - P_{existing}(T) \right)
 \end{aligned} \tag{8.15}$$

$$\begin{aligned}
 U(T) = & \\
 & p_U \left(U_{potential} - U_{cumulative}(T) \right) \\
 + q_{UU} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) & \left(U_{potential} - U_{cumulative}(T) \right) \\
 + q_{PU} \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) & \left(U_{potential} - U_{cumulative}(T) \right)
 \end{aligned} \tag{8.16}$$

Sums which consist of three terms, for adoptions (A) at time T resulting from:

$$\begin{aligned}
 A(T) = & \\
 & \text{Technology Factors } (p_P) \\
 & + \text{Direct Network Effects } (q_{UU}, q_{PP}) \\
 & + \text{Indirect Network Effects } (q_{UP}, q_{PU})
 \end{aligned} \tag{8.17}$$

Limitations

Mahajan et al. (1990) argue that nine core assumptions underlie the original Bass model (Bass, 1969), which still apply in the context of the following analysis. They are: 1) The market potential of the new product remains constant over time; 2) The diffusion process of an innovation is independent of all other innovations; 3) The nature of an innovation does not change over time; 4) The geographic boundaries of the social system do not change over the diffusion process; 5) The diffusion process is binary; 6) The diffusion of an innovation is not influenced by marketing strategies; 7) Product and market characteristics do not influence diffusion patterns; 8) There

are no supply restrictions; and 9) There is only one adoption by an adopting unit.

Assumption 3 has previously been interpreted as an assumption that each new generation of a product is considered a new product, i.e. the introduction of multiple generations of e.g. the iOS mobile operating system should be considered as independent new product launches. This interpretation has been accounted for in adjusted models such as that by Norton & Bass (1987). In our adjusted model for two-sided markets, the more accurate interpretation of the assumption is that “the value proposition of an innovation remains constant over time”. In this interpretation, the assumption is arguably violated in the adjusted model, as the usefulness of a platform increases over time in accordance with increased adoption by participants on the other side of the market (indirect network effects). However, this is adjusted for in the model by the addition of an extra term to account for such influences, and so the assumption indeed remains the same.

Platform Entry in Two-Sided Markets

In the following section, we will derive the necessary conditions under which platform entry in two-sided markets is viable, given the assumptions and limitations of our extended Bass model presented above. The only additional factor we need to include is a lower bound on the coefficient of innovation. That is, we define a level at or above which technology factors are sufficiently strong as to attract innovators on at least one side of the market, $p_{min} > 0$. In terms of the original models of Fourt & Woodlock (1960) and Bass (1969), we can think of such a lower bound as the required impact of mass media communication in order to drive adoption solely among innovators.

Let us first assume that at time $T = 0$, a platform is announced such that all potential providers and users are informed of its technology factors. Let us further assume that at $T = 0$, no providers or users have yet signaled that they have or will join the platform announced.

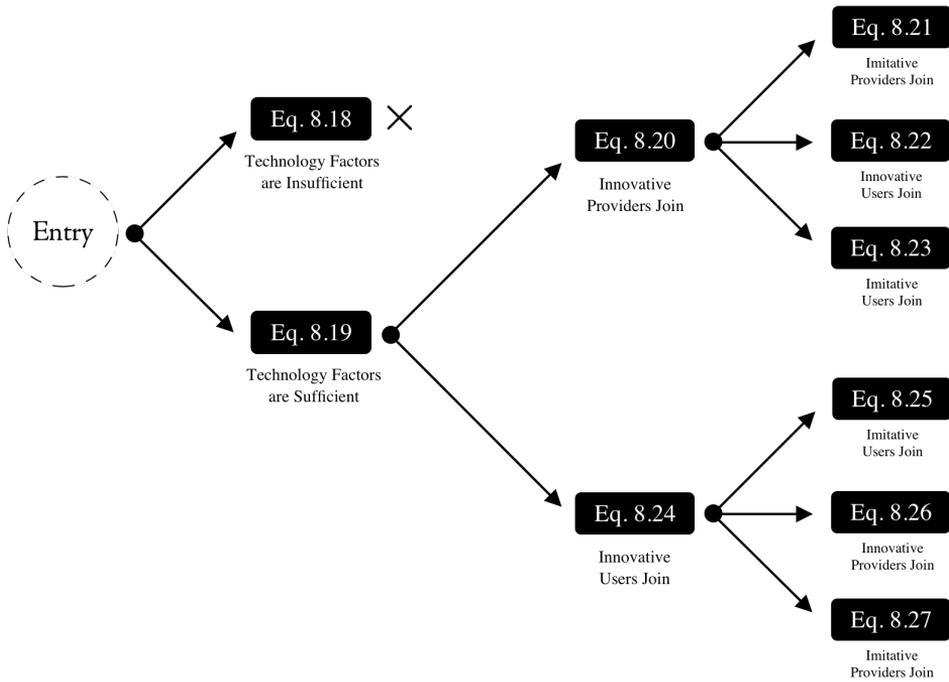


Figure 8.5: Necessary conditions for six entry scenarios for a new platform in a two-sided market

Neither Innovative Providers or Users Join First

In the case that neither innovative providers or users join at $T = 1$, one of two scenarios is possible:

Technology Factors are Insufficiently Strong

If technology factors are insufficiently strong and so unable to attract either providers or users, the following condition is met:

$$p_P, p_U < p_{min} \tag{8.18}$$

Proposition A: If the technology factors of a new-entrant platform in a two-sided market are insufficiently strong to attract either innovative providers or users, the

platform is not viable in that market.

For the remainder of the analysis, we will assume technology factors are sufficiently strong, i.e. that:

$$p_P, p_U \geq p_{min} \quad (8.19)$$

Innovative Providers Join First

At $T = 1$, providers who only care about technology factors (so-called “innovative providers”) will join first if the following inequality is fulfilled:

$$p_P(P_{potential}) > p_U(U_{potential}) \quad (8.20)$$

Namely, if the attractiveness of the announced technology factors among providers (captured by p_P) multiplied with the number of potential providers is greater than the attractiveness of technology factors among users (captured by p_U) multiplied with the number of potential users.

Imitative Providers Join Second

If eq. 8.20 is fulfilled, innovative providers will join and at time $T = 2$, imitative providers will join next if the following inequality is fulfilled²

$$\begin{aligned} p_P \left(P_{remaining}(T) \right) + q_{PP} \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) \left(P_{remaining}(T) \right) > \\ p_U \left(U_{potential} \right) + q_{PU} \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) \left(U_{potential} \right) \end{aligned} \quad (8.21)$$

Namely, if the influence of technology factors and the direct network effects from innovative providers on imitators together are greater than the influence of technology

²Here, $P_{remaining}(T)$ represents those providers who have yet to join at time T , given by $P_{potential} - P_{cumulative}(T)$

factors and indirect network effects on users.

Innovative Users Join Second

If the inverse situation is to occur, i.e. innovative users are to join at time $T = 2$ (eq. 8.19 is not fulfilled), the following condition must be met:

$$p_U(U_{potential}) > p_P(P_{remaining}(T)) + q_{PP} \left(\frac{P_{existing}(T)}{P_{potential}} \right) (P_{remaining}(T)) \quad (8.22)$$

Namely, the influence of technology factors among innovative users must be greater than the influence of both technology factors and direct network effects among providers.

Imitative Users Join Second

If neither of the inequalities (8.19) or (8.20) are met, imitative users join at time $T = 2$ if the following condition is met:

$$p_U(U_{potential}) + q_{PU} \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) (U_{potential}) > p_P(P_{remaining}(T)) + q_{PP} \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) (P_{remaining}(T)) \quad (8.23)$$

That is, if the influence of technology factors and indirect network externalities from the presence of innovative providers is greater among imitative users than the influence of technology factors and direct network externalities are among imitative providers.

Innovative Users Join First

By considerations of symmetry, if the inverse condition of (8.18) is fulfilled, innovative users will join at time $T = 1$ if:

$$p_P(P_{potential}) < p_U(U_{potential}) \quad (8.24)$$

In such a scenario, at time $T = 2$ only innovative users will have joined. As such, imitative users will experience direct network effects and imitative providers will experience indirect network effects. As such, the following scenarios are possible at time $T = 2$:

Imitative Users Join Second

Imitative users join next if the following inequality is fulfilled:

$$p_U(U_{remaining}(T)) + q_{UU} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) (U_{remaining}(T)) > p_P(P_{potential}) + q_{UP} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) (P_{potential}) \quad (8.25)$$

Innovative Providers Join Second

Innovative providers will join next if the following inequality is fulfilled:

$$p_P(P_{potential}) > p_U(U_{remaining}(T)) + q_{UU} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) (U_{remaining}(T)) \quad (8.26)$$

Imitative Providers Join Second

Imitative providers will join with the highest probability if the following inequality is fulfilled:

$$p_P(P_{potential}) + q_{UP} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) (P_{potential}) > p_U(U_{remaining}(T)) + q_{UU} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) (U_{remaining}(T)) \quad (8.27)$$

Innovative Providers or Users Join First

The third and final entry scenario is where innovators on both sides are equally likely to join at time $T = 1$, because the following equality holds:

$$p_P(P_{potential}) = p_U(U_{potential}) \quad (8.28)$$

Then both join simultaneously and at time $T = 2$, innovative users and providers are both present on the platform. If imitative providers are to join next, the following inequality must be fulfilled:

$$\begin{aligned} p_P(P_{remaining}(T)) + q_{PP} \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) (P_{remaining}(T)) \\ + q_{UP} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) (P_{remaining}(T)) \\ > \quad (8.29) \\ p_U(U_{remaining}(T)) + q_{UU} \left(\frac{U_{cumulative}(T)}{U_{potential}} \right) (U_{remaining}(T)) \\ + q_{PU} \left(\frac{P_{cumulative}(T)}{P_{potential}} \right) (U_{remaining}(T)) \end{aligned}$$

Namely, the sum of the influences of technology factors, direct network effects from the presence of innovative providers and indirect network effects from the presence of users must be greater among providers than the converse among users. If the converse inequality is fulfilled, imitative users join at time $T = 2$. If the inequality is not an inequality, both imitative users and providers will join at time $T = 2$ with equal probability.

Proposition B: If the technology factors of a new-entrant platform in a two-sided market are sufficiently strong, the platform will be able to attract innovators on at least one side, solving the 'chicken-and-egg' problem.

Discussion

The so-called 'chicken-and-egg' problem is often highlighted in extant research on multi-sided platforms, two-sided markets and network effects as the prototypical initial challenge for intermediary platform firms upon entry (Shapiro & Varian, 1999). Essentially, extant research posits that sellers on platforms in two-sided markets will 'be willing to register only if they expect many buyers to show up' (Caillaud & Jullien, 2003). In relation to the model presented in this paper, extant literature argues that both supply- and demand-side participants in two-sided markets are influenced in their adoption decisions *only* by the presence of other providers and/or users. As described by Shapiro & Varian (1998) "*consumers delayed buying color TVs until the arrival of substantial content*" and so the Radio Corporation of America (RCA) "*solved the 'chicken-and-egg' problem in 1961 by subsidizing Disney's Wonderful World of Color*". A notable exception in extant literature is Bhargava (2014) who distinguishes 'first-period customers' as "*risk-takers who adopt the platform without knowing whether it will attract [participants]*", and Sheremata (2004) who writes that in network markets "*consumers derive utility from two distinct sources: product attributes and network size*". These exceptions echo the findings of more recent empirical studies which have argued that both supply- and demand-side participants may be willing to join nascent platforms prior to the establishment of meaningful network effects, given certain firm- and context-specific prerequisites (Kyprianou, 2018; Veisdal, 2020).

This paper takes aim at the fairly specific claim that the 'chicken-and-egg' problem poses about entry in two-sided markets, namely that in certain such markets there is both sufficient supply and demand for a new service available, but potential participants are uncertain about which platform to join due to an initial lack of adoption by other participants (e.g. Caillaud & Jullien, 2003; Spulber, 2010; Schmalensee, 2014). Formally, the attractiveness of a platform for potential participation is thus said to depend only on its reputation and so that 'beliefs matter' (Jullien, 2005) . A payoff matrix depicting the coordination problem is

shown in Table 8.1.

		Users	
		Join	Wait
Providers	Join	2,2	-2,0
	Wait	0,-2	1,1

Table 8.1: *Payoff matrix depicting the 'chicken-and-egg' coordination problem in extant literature*

The findings of the paper suggests that when viewed as a non-homogeneous group, potential participants (e.g. providers and users) indeed resolve the 'chicken-and-egg' problem if technology factors are sufficiently strong and so attracts at least one group of innovators, whose willingness to adopt is independent of the number of previous adopters. See Table 8.2 for a suggested payoff matrix that illustrates the role of such innovators. Expressed in relation to the example of Shapiro & Varian (1998) above, although consumers *en masse* delayed buying TVs until the arrival of Disney's Wonderful World of Color in 1961, verification of the existence of demand for the technology likely stimulated the Radio Corporation of America to commit to the subsidization.

		Users	
		Join	Wait
Innovative providers	Join	1,2	1,0
	Wait	-1,-2	0,1

Table 8.2: *Payoff matrix depicting a potential role for innovators in resolving the 'chicken-and-egg' coordination problem*

Conclusion

In this paper, we have examined the conditions under which platform entry in two-sided markets is viable. In relation to the existence of the theoretical 'chicken-and-egg' problem, we argue that our findings imply a trilemma³, namely that one (and only

³A trilemma is defined as a difficult choice from three disjoint options

one) of the following propositions must almost certainly always be true in two-sided markets:

1. *Innovative providers and/or users exist, but technology factors are insufficiently strong to attract at least one side to the market;*
2. *Innovative providers and/or users exist, and technology factors are sufficiently strong to attract at least one side to the market;*
3. *Neither innovative providers nor users exist in the market;*

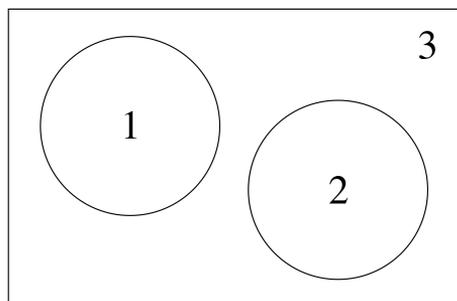


Figure 8.6: *Venn-diagram depicting the trilemma of suggested disjoint conclusions to the findings of the study*

If (1) is true, the platform is not viable, as its technology factors are insufficiently strong and so the platform firm is unable to attract either innovative providers or users. In such a case, there is no 'chicken-and-egg' problem, as there is no viable market for the platform to mediate.

If (2) is true, the platform is viable and the 'chicken-and-egg' problem is resolved, as the platform firm may recruit one or both sides based on technology factors, and advertise such adopters existence to imitators on the other side. If so, entry proceeds according to one of the scenarios outlined Figure 8.1, and there never was a 'chicken-and-egg' problem.

If (3) is true, the Bass model of new product adoption does not apply in two-sided markets.

Implications for Managers

The main implications for managers of platform firms are: 1) Prior to entry, manager should actively seek out technology factors which are likely to generate significant interest from innovative adopters who may be willing to adopt based solely on the technology itself, and 2). During entry, managers should work to minimize search and information costs such that potential early imitative adopters are able to easily verify the existence of early adopters.

Implications for Further Research

Proposed extensions to the provided two-sided adoption model includes: 1) Accounting for differing coefficients of innovations and/or differing lower bounds on each side's willingness to join based on technology factors; 2) Accounting for differing coefficients of imitation among providers and users, i.e. where $q_P \neq q_U$; 3) Accounting for differing coefficients of imitation from direct and indirect network effects, i.e. removing the assumption that e.g. users are equally willing to adopt based on the presence of other users and other providers.

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Research Paper 4

From Product to Platform: A Case Study of Poption

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Abstract

The 'chicken-and-egg' problem is often cited as the archetypal initial challenge for managers of firms looking to enter two-sided markets. Extant theory suggests that a plausible strategy for overcoming the challenge is for firms to offer especially advantageous terms to one group of participants first, before extracting and transferring the surplus from their participation to attract the other group. The strategy is anecdotally referred to as the 'single side first' strategy. Although commonly cited, the dynamics of the strategy have yet to be investigated empirically. This study provides such an investigation through a longitudinal case study of Poption, a start-up company that leveraged their existing customer relationships to successfully enter the two-sided market for on-campus recruiting. The study finds that Poption's successful entry was enabled by the organization's ability to balance its simultaneous pursuits of exploration and exploitation in the two domains of product and business development. Three enabling factors were isolated: 1. Opportunity recognition and pursuit, 2. Feedback acquisition and incorporation and 3. Swift and Decisive Decision Making. Contributions of the paper include the empirical grounding of an extant purely theoretical phenomenon from the literature, a firm-level conceptual framework for entry in two-sided markets as well as managerial and research implications.

Introduction

"Come for the tool, stay for the network" – Chris Dixon

The strategy employed by the restaurant booking site OpenTable is often cited anecdotally as a way for platform businesses to successfully enter two-sided markets (e.g. Parker et al., 2016; Bhargava, 2014). As the story goes, platform businesses are prior to entry faced with a 'chicken-and-egg' problem wherein in order to attract buyers, the firm 'should have a large base of registered sellers, but these will be willing to register only if they expect many buyers to show up' (Caillaud & Jullien, 2003). Employing what is sometimes referred to as a 'single side first' strategy, OpenTable was famously able to successfully leverage their existing business of selling booking management software to restaurants into launching a platform for restaurant bookings for consumers. From their initial (rather limited) value proposition of helping restaurants 'manage their seating inventory' the strategy enabled OpenTable to generate a two-sided market for restaurants and diners, where the firm acted as the central intermediary. By 2017, OpenTable's platform was seating more than 23 million diners a month in 43,000 restaurants across the world. *"No more waiting on the phone and pleading with snooty receptionists. With just a few clicks of a mouse, a diner could secure a table at prime times in the hottest dining spots. Who you were or knew would no longer matter. Restaurants would benefit, too, handing off the job of juggling tables and recording reservations in a bulky book."*¹.

Posited as a solution to the 'prototypical entry challenge for platform firms' in two-sided markets, OpenTable's 'single side first' strategy avoided the coordination problem of having to ensure that both diners and restaurants would choose to affiliate with the new platform, prior to either having done so. That is, the firm overcame the problem of having to ensure that 'agents will coordinate on the positive participation level' (Jullien, 2005), which is thought to depend on each group's beliefs about the adoption decisions of members from the other group. Unlike in traditional markets,

¹The New York Times, 2017. 'OpenTable Began a Revolution. Now It's a Power Under Siege'. Available at <https://www.nytimes.com/2017/08/29/dining/opentable-restaurant-reservations.html>

in two-sided market research 'beliefs matter, and agents participate only if they are confident in the participation of the others' (Jullien, 2005).

Although cited anecdotally as a solution to the "celebrated" 'chicken-and-egg' problem (Rochet & Tirole, 2003), research on the 'single side first' strategy is in extant literature limited to theoretical explorations of the so-called 'divide-and-conquer' strategy (Innes & Sexton, 1993; Jullien, 2011). The divide-and-conquer strategy is described as a sequential game where a monopolist first makes price offers to potential customers, which next decide whether to accept the offer or form coalitions and bargain as a group. For each individual, bargaining as a group is only profitable if the discrepancy between the price offered and each individual's benefit is larger than the organizational costs associated with forming a coalition (Innes & Sexton, 1993). Coalitions exhibit economies of scale such that the consumers who join first are more likely to accept the price offered by the firm because the costs of organizing are larger. In the context of a two-sided market, when successful, a 'divide-and-conquer' strategy allows a new entrant platform to overcome the 'chicken-and-egg' problem by offering especially advantageous terms to one side while at the same time extracting and transferring surplus from such early adopters, creating a bandwagon effect (Jullien, 2011). When employed by OpenTable, this involved offering a platform-independent subsidized value proposition to one side (booking management software to restaurants) and extracting and transferring the surplus from their participation to consumers. The key enabling attribute of the strategy is that each individual restaurant's marginal benefit from participation was strictly less than the marginal social benefit their participation generated (e.g. Liebowitz & Margolis, 1994).

Despite considerable interest among theorists, the dynamics of the 'single side first' strategy has yet to be studied in the real world. That is, extant research still lacks important empirical studies which illustrate what the dynamics are when firms successfully leverage an existing business to enable entry in a two-sided market. Aiming to provide such a perspective, this study proceeds by exploring managerial decision-making in the start-up technology company Poption AS. Data for the study was captured over the period of 16 months when the firm successfully pivoted their

existing business of offering a 'candidate management software' to business customers, to launching a platform for on-campus recruiting for students. The goal of the study was to capture a high-resolution managerial perspective on how firms may be able to successfully leverage an existing vertically integrated business to a two-sided platform business. The study is based on longitudinal data gathered through semi-structured interviews with Poption's managers in the period from February 2018 – June 2019. The research question guiding the investigation was:

What are the enabling factors for managers to successfully leverage an existing value proposition to permit entry in a two-sided market?

The paper purports to make three contributions to the literature. Firstly, the paper grounds an extant theoretical phenomenon from the literature to the real world, through the narration of an empirical case study. Secondly, the paper proposes a conceptual framework which classifies the challenges of successfully pursuing a 'single side first' entry strategy according to the theory of organizational ambidexterity. Finally, the paper explores the managerial implications of the findings and proposes an agenda for further research on the dynamics and efficacy of the 'single side first' strategy in two-sided markets. The remainder of the paper proceeds as follows. First, a theoretical foundation is outlined, which both situates the study in the nascent literature stream on entry strategies in two-sided markets and introduces the main tenants of organizational ambidexterity theory, later employed in the analysis of the case study. Next, a description of the case firm is provided alongside a presentation of the methodology used to collect and analyze the data from the study. The findings of the study are next provided, alongside a conceptual framework which emerged from analysing the study through the theoretical lens of organizational ambidexterity theory. The paper concludes with a summation of the findings of the study, their managerial implications and an agenda for further research.

Theoretical Foundation

Entry Strategies in Two-Sided Markets

In extant research on entry strategies in two-sided markets, firms looking to establish platform businesses are said to face a 'chicken-and-egg' problem on entry (e.g. Rochet & Tirole, 2003; Caillaud & Jullien, 2003). The problem is sometimes referred to as a 'circular conundrum', which may be stated as '*attracting buyers requires attracting sellers, and attracting sellers requires attracting buyers*' (Spulber, 2010). First discussed in the context of research on *network externalities* (Katz & Shapiro, 1985), *competing technologies* (David, 1985; Arthur, 1989) and so-called *network markets* (Besen & Farrell, 1994), the 'chicken-and-egg' problem is the problem described by a class of noncooperative games in which two groups of players seek to coordinate around an action which is mutually beneficial only if both sides choose the same optimal strategy simultaneously. That is, extant research holds that '*in the presence of network externalities, consumers face a coordination problem in their purchasing decision that may generate multiple equilibria*' (Katz & Shapiro, 1985). Illustrated in a payoff matrix (Fig. 9.1) in a market in which the platform firm is a monopolist, a set of strategies for overcoming the 'chicken-and-egg' problem is considered successful when it breaks coordination around the less desirable equilibrium (wait, wait) to the mutually more beneficial (adopt, adopt).

		Group 2	
		<i>Adopt</i>	<i>Wait</i>
Group 1	<i>Adopt</i>	2,2	-2,0
	<i>Wait</i>	0,-2	1,1

Table 9.1: *Payoff matrix depicting the 'chicken-and-egg' coordination problem*

In a competitive two-sided market, the pure strategies of both groups of players may be stated as 'adopt platform A' and 'adopt platform B', where coordination around the same platform is the optimal set of strategies that lead to increasing payoffs to scale due to network effects (e.g. Arthur, 1989; Rochet & Tirole, 2003).

In extant research, the 'chicken-and-egg' problem is thought to arise as a function of the unfavorable expectations of one or both sides in a two-sided market about the future adoption of a new platform (Hagiu & Spulber, 2013). As Jullien (2005) writes, *'For non-negative prices, there exists an allocation where no side registers. Whether agents will coordinate on the positive participation level or not depends on their beliefs about what the other side is doing. Thus beliefs matter, and agents participate only if they are confident in the participation of the others'*. A key determinant for the success of a network is hence consumers' confidence in the ability of a network to grow in the future (Jullien, 2011). In extant research on strategies for overcoming the 'chicken-and-egg' problem, scholars have thus far emphasized the role of *pricing strategies*, arguing that reducing transaction costs (Spulber, 2010) and being careful to 'choose a price structure and not only a price level for their service' is important for new platforms to 'get both sides on board' (Rochet & Tirole, 2003; Armstrong, 2006). Rochet & Tirole (2003) investigates the case where participants only pay when transactions occur (so-called usage fees), while Armstrong (2006) considers the alternate case where participants pay for participation (so-called membership fees). Weyl (2010) considers the case where participants pay for both membership and usage. In addition to various other aspects of pricing, scholars have also studied content strategies such as offering third-party content (Hagiu & Spulber, 2013), tying/bundling and freebies (Carlton et al. 2010; Amelio & Jullien, 2012, Farrell & Katz, 2000), as well as the value of ensuring compatibility with the preferences of the installed base of existing platforms (Schilling, 2002) and manipulation of the expectations of potential participants by pre-announcing the service before it is actually viable (Bhargava, 2014; Chellappa & Mukherjee, 2020). Although commonly cited as the 'prototypical challenge' for new entrant platform firms in two-sided markets (Rochet & Tirole, 2003; 2006), surprisingly few studies have yet to examine the managerial perspective of how firms successfully overcome the 'chicken-and-egg' problem. The exceptions are deductive studies which explored the mediating roles of *qualitative differences* (Zhu & Iansiti, 2012; Tellis et al. 2009), *entry timing* (Schilling, 2002) and *openness* (Boudreau, 2010) for platform adoption. In addition

are a handful of more recent, qualitative studies (Kyprianou, 2018; Veisdal, 2020) which through inductive studies explored entry dynamics from the perspective of platform managers. Findings from the former's setting (start-up companies in Greece) illustrated the importance of governance in value creation on nascent platforms, while the latter's setting (start-up companies in Norway) found that the level of demand for a new platform as well as the quality of participation were both important to successful entry.

Ambidexterity Theory

Organizational ambidexterity is defined as an organization's ability to be aligned and efficient in its management of today's business demands as well as being adaptive to changes in the environment at the same time (Duncan, 1976). Although used in many contexts, for the purposes of this study by the term 'ambidexterity' we refer to '*the ability to both use and refine existing knowledge (exploitation) while also creating new knowledge to overcome knowledge deficiencies or absences identified within the execution of the work (exploration)*' (Turner et al, 2013). Activities of exploration include things captured by terms such as *search, variation, risk taking, experimentation, play, flexibility, discovery, innovation*, whereas activities of exploitation include such things as *refinement, choice, production, efficiency, selection, implementation* and *execution* (March, 1991). An analogous alternate definition of ambidexterity is Gibson & Birkinshaw (2004)'s definition of ambidexterity as an attribute of firms that master both *alignment*, 'a clear sense of how value is being created in the short term' and *adaptability*, 'the ability to move quickly toward new opportunities'.

Examples from a wide variety of industries and markets highlight the benefits of ambidexterity at the firm level (Turner et al, 2013), so-called *contextual* organizational ambidexterity (Gibson & Birkinshaw, 2004). Origins for the idea of *organizational ambidexterity* was first introduced by Duncan (1976), albeit in the context of firms' sequential rather than simultaneous pursuit of opposing goals (Kollmann et al, 2009). The main development of the 'modern' theory of organizational ambidexterity is

generally credited to March (1991) who identified three main classes of models for explaining the 'exploration and exploitation' dichotomy (March, 1991):

- In evolutionary models of ambidexterity, discussions of the choice between exploration and exploitation are framed in terms of balancing the twin processes of *variation* and *selection* (Ashby, 1960; Hannan & Freeman, 1987);
- In organizational models of ambidexterity, the problem of balancing exploration and exploitation is exhibited in distinctions between the refinement of existing technologies and the invention of new ones (Winter, 1971; Levinthal & March, 1981);
- In rational models of choice, ambidexterity is framed as the balance between exploration and exploitation in the context rational search (Radner & Rothschild, 1975; Hey, 1982)

No matter the framing, there is seeming consensus around the notion that organizational ambidexterity (achieving a balance between exploration/adaptability and exploitation/alignment) can be financially beneficial for firms (He & Wong, 2004). Sarkees & Hulland (2009) for instance found that an ambidextrous firm strategy has a positive effect on four dimensions of performance: *revenue*, *profits*, *customer satisfaction* and *new product introductions*. Benefits from exploitation activities are generally thought to be limited to the short-term and often occur at the cost of long-term performance if the organization fails to adapt to the requirements of the market (Turner et al, 2013). That is, a risk successful organizations sometimes face, referred to as the 'paradox of success' or *organizational misalignment* is the risk of allowing past organizational strengths to become future organizational liabilities because they are no longer aligned with the needs of customers and/or strengths of competitors (Tushman & O'Reilly, 1996). Simultaneously (making it a paradox) excessive emphasis on exploration accompanies similar downsides such as a lack of financial sustainability (Levinthal & March, 1993). The ambidexterity dilemma managers face may hence be summarized as the need *'to engage in sufficient exploitation to ensure its current viability and, at the same time, to devote enough energy to exploration to*

ensure its future viability' (Levinthal & March, 1993).

Wan et al (2017) was the first to employ the organizational ambidexterity perspective to understanding platform strategies. Their systematic literature review of theoretical and empirical studies within management, economics and information systems found that platform strategies related to pricing, openness, integration, differentiation and envelopment can help managers achieve ambidexterity by domain, temporal and organizational separation. Related, Cenamor et al (2019) studied how the orientations of exploration and exploitation influence performance in entrepreneurial SMEs pursuing digital platform strategies. The topic of platform entry in two-sided markets has yet to be studied from the perspective of organizational ambidexterity.

Methodology

In an effort to contribute to the nascent theoretical debate surrounding entry strategies in two-sided markets, an inductive, exploratory single-case study was chosen. Single-case (as opposed to multi-case) studies are often chosen in order to maximize the "resolution" of a data sampling, if a phenomenon is considered sufficiently 'rarely observable' (Ridder, 2017) to where a multi-case study would be unfeasible. As such, the case may be described as a unique, longitudinal case study in that it describes both a phenomenon that is not commonly observed and because sampling was done at more than one point in time from several informants, using triangulation (Yin, 2009). In general, single-case studies allow for a more thorough investigation of phenomena which are sufficiently common to where they warrant attention, yet insufficiently observed to where a multi-case study is a suitable approach. The 'gaps and holes' approach for case studies—as opposed to other common approaches such as the 'no theory first' approach (Eisenhardt, 1989)—involves letting extant literature help shape and narrow the interest in a topic by looking for key studies and identifying key questions in such studies (Ridder, 2017) prior to the data collection. This was done in order to maximize the value of the data collection, whilst simultaneously aiming to avoid response bias and reflexively on the part of the interviewees.

Case Description

Firm	Est.	Employees	Value proposition	Demand-side Participants	Supply-side participants
Poption AS	2017	5	Platform for on-campus recruiting	Companies working in consulting, finance, law and IT	Students at Norwegian universities

Table 9.2: *Overview of Poption*

The case firm is Poption AS, founded in November 2017 in Trondheim, Norway under the name Candario AS. The fact that the firm was founded by three graduate students at the Norwegian University of Science and Technology (NTNU) offered an especially favourable setting for data collection. The three founders Petter (CEO), Jon (CPO) and Daniel (CTO) were all men in their early twenties, studying business and computer science. They all entered the project with practical experience, having interned in the Norwegian management consultant and IT industries. In addition, all three founders had experience from working with the student organization 'Bindeleddet NTNU' which arranged recruiting events for students of business and economics and companies looking to hire.

Data Collection

Data was collected through semi-structured interviews, which is the most common method of data collection in case-based research (Yin, 2009; Eisenhardt, 1989). Individual, semi-structured interviews with multiple managers about the same phenomenon allows for data triangulation (Yin, 2009) which helps narrow problems of construct validity, when multiple sources of data provide multiple measures of the same phenomenon (Yin, 2009). Seven interviews were conducted face to face and one over the telephone. Each interview lasted approximately forty-five minutes. All interviews were recorded and transcribed and every informant was informed about the purpose of the study and gave consent that the findings could be published. Prior to conducting the interviews, an interview guide was composed. The guide consisted of a list of formal questions about the the firms' progress, current events, milestones, practical and technical challenges and performance goals. In addition

to recording the interviews, field notes documenting relevant observations, insights, ideas and impressions were also recorded prior to, during and after the interviews. Such field notes were later used to supplement interview transcripts and help confirm and reject emerging theoretical perspectives during the data analysis process. In addition to eight interviews conducted by the author, three transcribed interviews conducted by graduate students were used as supplementary material to the primary data. The data from these interviews was used mainly for context and in order to confirm the chronology of events.

Person(s)	Date	Place	Type	Interviewer
CEO & CTO	19th of Feb 2018	NTNU	Group interview	Research Assistant
CEO & CTO	20th of Mar 2018	NTNU	Group interview	Research Assistant
CEO & CTO	24th of Apr 2018	NTNU	Group interview	Research Assistant
CEO & CPO	18th of Aug 2018	Video Call	Group interview	Researcher
CPO	9th of Jan 2019	NTNU	Semi-structured interv.	Researcher
CEO	2nd of Feb 2019	NTNU	Semi-structured interv.	Researcher
CTO	5th of Feb 2019	NTNU	Semi-structured interv.	Researcher
CEO	7th of May 2019	NTNU	Semi-structured interv.	Researcher
CPO	17th of Jun 2019	StartupLab, Oslo	Semi-structured interv.	Researcher
Business Developer	17th of Jun 2019	StartupLab, Oslo	Semi-structured interv.	Researcher
CEO	17th of Jun 2019	StartupLab, Oslo	Semi-structured interv.	Researcher

Table 9.3: *Overview of data collection*

Data Analysis

The data analysis process was structured according to the established procedures for grounded theory-building research (Locke, 2001; Miles & Huberman, 1994), following guidelines for constant comparison techniques and working recursively back and forth between the data and emerging theory. The overall guideline for the data analysis process was to 'remain open minded' and 'let the data speak' (Suddaby, 2006). Audio recordings from each interview were first transcribed by a research assistant. The analysis process next consisted of three steps, following the guideline established by Dennis A. Gioia. The first step in the so-called "Gioia-method" was to delineate first-order codes consisting of statements and descriptions from the transcribed texts (Gioia et al, 2013). Next, such codes were grouped into sub-

theoretical, then theoretical dimensions depending on their contents. Finally, the theoretical dimensions were further grouped into aggregate theoretical dimensions which made up the core tenants of the findings of the study.

In identifying first-order codes, a superficial analysis of each statement made in the interviews was conducted, in the process known as 'open coding' (Locke, 2001). Examples of first-order codes include 'statements about demand-side preferences', 'descriptions of technical limitations' and 'mentions of opportunities'. A total of 101 first-order codes containing 836 references emerged from this process. As with all steps in the analysis process, the coding process should be described not as a linear but as a 'recursive, process-oriented analytic procedure' (Patzelt et al., 2014) which continued until the contents of the codes was deemed representative of the primary data source. Next, the 'level of abstraction' (Gioia et al, 2013) was raised from the coding of transcripts to a more conceptual aggregation of codes into theoretical subcategories, which were further categorized according to their contents. Finally, theoretical dimensions were aggregated by raising the level of abstraction further, such that each categorical construct was incorporated into larger themes. This process involved evaluating each theoretical concept and iterating back and fourth between the data (first-order codes) and each category in order to examine their fit (Locke, 2001; Patzelt et al, 2014). Figure 9.1 provides a visual summary of the three-step data analysis process.

Limitations

Data collection from interviews accompanies inherent limitations related to bias associated with poorly articulated questions, response bias, reflexively (on the part of the interviewee) and inaccuracies from poor recall. The use of individual semi-structured interviews, open-ended questions, triangulation (Yin, 2009) between multiple informants and longitudinal data points work to mitigate some of these limitations. As the interviews concerned events and phenomena which were no older than six months old, managers' abilities to recollect and recount events with a high degree of accuracy should for this study not be considered an especially limiting

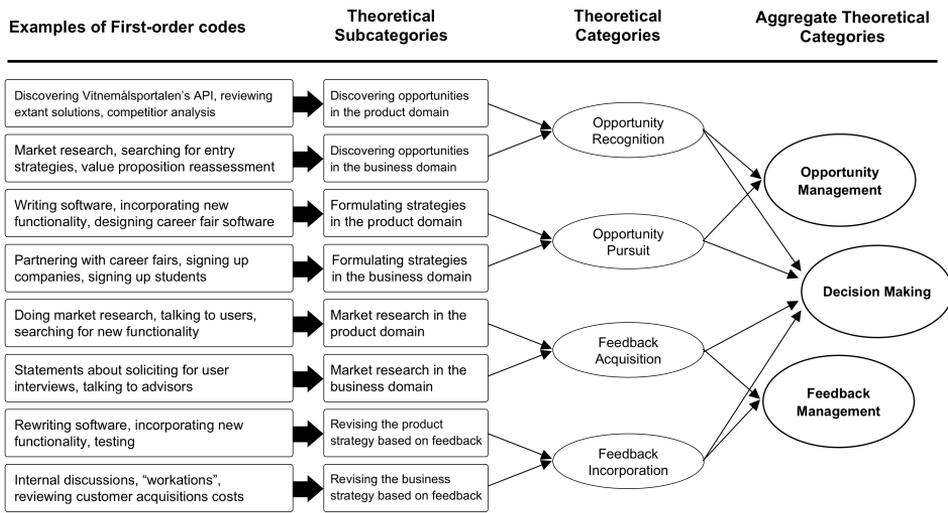


Figure 9.1: *Examples of how the theoretical constructs evolved using the so-called 'Gioia method' of qualitative data analysis*

factor. During data analysis, the fact that coding and analysis was conducted by a single researcher should be considered an additional potential limitation to the objectivity of the analysis. In particular, the process of raising the level of abstraction from first-order codes to subcategories and so on, may have benefited from dual, blind coding to account for biases and inaccuracies on the part of the researcher. This was however not practically feasible. A third and important potential limitation is associated with the object of study (a start-up technology company by inexperienced founders) which inhibited the researcher's ability to review historical, quantitative data and public documents such as quarterly reports, board meeting minutes and so on in order to confirm managers' recollections.

Case Study: Poption

Founded in the fall of 2017 and officially incorporated on the 8th of November, Poption was started under the name "Candario" by three friends who all attended the same prestigious engineering graduate program at the Norwegian University of Science and Technology (NTNU).

Market Research (Fall of 2017)

Co-founders Petter and Jon began working on the project that would later evolve into Poption in the fall of 2017. Their future co-founder Daniel was spending a semester abroad in Australia, and joined when he returned in January of 2018. In the period from August – September of 2017, the (then) two-person team were engaging in market research about the software needs of companies with substantial recruitment activities. As Petter later explained, *"I sat down with people I knew and made a list of questions about what systems they use, how their process of recruitment is organized internally and so on. At the end of every interview they talked openly about what the problems were with existing solutions. The main thing they said was: We don't have all the information [about prospective candidates] in one place and so you can't easily share access with other employees. This means that if an HR-department has access, they are typically the only department that has access"*.

The solution Poption first designed addressed this issue specifically, by allowing companies to collect, organize and easily share information about candidates across their organization. *"Our solution is a tool that focuses on this, or these problems. It gives [companies] shared access which makes it very easy for them to follow up with candidates, which was one of the problems they were having. In addition, we have features which make their days more efficient, for instance making it easier for them to extract the GPA² of a candidate and so on"*, the CEO later stated about Poption's value proposition at the time.

All three having spent semesters abroad, the founders at Poption were early to notice a European initiative lead by the Erasmus+ program which aimed to make it easier for foreign exchange students to have their ECTS credits and associated grades transferred between European universities³. The Norwegian initiative to join the network, "Vitnemålsportalen", had been commissioned in 2011 but only launched in January of 2017, six months before Poption began their market research

²GPA = Grade Point Average

³Erasmus+ is a European student exchange program

period. Using Vitnemålsportalen's API ⁴, Poption designed an import tool which made it easy for companies to request and review student's grades. The tool helped companies sort and parse through candidates via quantitative measures such as how long they had been studying, what their grade point average was and which courses they had excelled in. About the problems their tool was addressing, Petter later stated *"Recruiting is a very time consuming process which often comes in addition to an already long day of work, so it often doesn't get prioritized. In addition, there isn't enough attention paid to following up with candidates"*. In an interview in February of 2018 Daniel reiterated this view, stating *"From my perspective, it's the following up of candidates that is the most important, the direction recruiting will have to go in the future"*.

The First Customers (January of 2018)

Poption secured the first pilot customer for their candidate management software in January of 2018. Following three sales meetings over the course of a few weeks in the fall of 2017 they sold the first license to a division of Swedbank, one of the largest banks in Scandinavia. The introductory price for the license was NOK 3,500 per month. They had made the sale by first approaching a former student from their graduate program (who worked at Swedbank) while he was attending a career fair on the company's behalf in the fall of 2017. As they pitched the value proposition of their product, he echoed their belief that it filled a need Swedbank had, stating *"McKinsey does it this way, so should we"*. At the time, Poption's value proposition was stated by their CEO, Petter, as 'being able to acquire, organize and track the evolution of a candidate throughout their time as a student and keep in touch'.

Around the same time, in January of 2018 their CTO Daniel returned from his semester abroad and joined the team. In February, Petter and Daniel were interviewed together about the progress of their start-up and their current plans for further expansion. Confident following their success in reaching an agreement with Swedbank,

⁴API = Application Programming Interface

Petter then stated *"we have a goal of securing two [more] companies in February, in addition to the one we already have. By June, we hope to have ten paying customers"*. Regarding customer segmentation, at the time, the founders stated that they were focused on *"high-end talent recruiting, primarily within management consultancies and finance"* because they themselves and much of their social network knew how recruiting worked in these industries in particular. Although they early on had considered including companies recruiting within law and IT, they decided to focus on management consultancies and financial institutions because such companies often employed alumni from their own graduate program. The firm's customer acquisition strategy at the time involved *"sales meetings and cold-calls [...] Then 3-4 weeks after on-boarding we call again, if they haven't gotten in touch with us before that."*, according to Daniel.

Poption met their goal of signing two new clients in February. By April, the start-up had six paying customers, from all the three industries they were targeting, paying anywhere between NOK 18,000 - 78,000 per year for use of their software. Replying to the question 'What is the response among them?', the CEO at the end of April replied *"Finance is very hard. They work a lot and so never find the time. [...] It's not that they're uninterested, it's just that they don't focus on it all year long, only during recruitment season in the fall."* Regarding pricing, Petter later stated *"We've experimented with pricing, since we don't know exactly where the market is"*. To improve and expand the functionality of their product the founders later also conducted user interviews with existing customers, typically the head of human resources, however also stating that *"these often turned out fairly boring, as we often knew in advantage what their problems were"*.

The Wake-Up Call (March of 2018)

Although they were progressing in accordance with their own milestones, Poption in the period March – April 2018 decided to pivot away from their existing value proposition ('being able to acquire, organize and track the evolution of a candidate throughout their time as a student and keep in touch'). The founders highlight two

events as especially important to them reaching this decision.

The first was a strategy session with alumni from their graduate program at NTNU in early March of 2018. During the session, as Petter later attested *"A lot of the feedback made us begin to gradually shift our focus. We realized that we had been thinking a little bit too big and wide [...] We realized that we had to narrow in, and were given some guidance and good advice which we later deliberated on internally and agreed would be a good strategy"*. Given that the three founders were also still students themselves, they decided that focusing on candidates who were still students might be the 'narrowing' they needed. As the CEO described: *"We chose on-campus recruiting as a more targeted market [...]. It was very convenient for us to focus more on campus-events and career fairs"*. Adding to Petter's reply, Daniel stated *"I think we needed [a wake-up call] in order to confirm intuitions we already had. Although we had spent a lot of time talking about various tools for recruiting, including of more experienced candidates, the conversations always came back to students and campus events"*.

The second event that helped convince the founders that narrowing to on-campus recruiting might be a good strategy was an interview they had for the world-renowned start-up accelerator program Y Combinator⁵, which occurred in April of 2018. Later replying to the question 'How did you arrive at the decision to focus on creating more value for students?', Petter at the end of April replied *"By applying to Y Combinator. Writing that application, a lot of the questions asked us what our unique value is. [...] When you're facing people who are considering investing a million NOK, you have to be honest."* Daniel added *"We were still in the process of figuring that out. Although we offer a lot of functionality in one place, many other competitors and services offer similar things that we do."* *"We drilled each other on figuring out exactly what our unique edge should be. It was a fairly long process, some weeks of writing the [Y Combinator] application and banging our heads into the wall. Late nights."*, Daniel

⁵Y Combinator is a seed money start-up accelerator used by over 2,000 companies including Airbnb, Stripe, Dropbox, Coinbase and Instacart, whose combined valuation was over USD 155 billion at the time of the study

stated. Although the team ultimately didn't get accepted to Y Combinator, they decided to stick to the vision they have outlined in their application and interview, and build a platform for on-campus recruiting.

"So that's the plan, we're going to work on it this summer, so that we're ready for the career fairs this fall and can start capturing unique data from both companies and students." – Daniel, CTO

"It'll be a platform by this August." – Petter, CEO

Rewriting the Software (Summer of 2018)

When Petter and Jon first launched their project in the fall of 2017, the now-CPO, Jon, was the technical lead for the project. Later on, Petter referred to the product at that point as *"a cross between a recruitment tool and CRM"*⁶ whose incumbent substitute solutions (for smaller companies) included *"Excel or HR-solutions which they try to adapt to their own needs"*. By the summer of 2018, the team was committed to the idea that in order to generate more value for companies, they would need to expand their offering by generating more value for students. However, in order to do that, their technical solution would need to be largely rebuilt. As Poption's CTO Daniel in February of 2019 stated, *"For all intents and purposes, it would have been impossible to turn our existing product into a platform. It was built using unique databases for each company."* This technical limitation made it impossible to provide additional value to students, as information about each candidate was exclusive to the companies they had applied to. *"So, we had to build up a new back-end structure [...] We didn't just 'end up' becoming a platform, we deliberately chose to become one, which entailed investing in **it** instead of our former solution"*.

The rewrite of their software (using much of the functionality they already had) took 7-8 weeks, *"perhaps even less, but we did do a fair bit of planning"*. Rather than having individual databases for each company, Poption's new back-end structure

⁶CRM = Customer Relationship Management

stored companies' data about students in a shared database. To accomplish this, Poption had to ensure that the privacy and security of students' data was maintained and that each company only had access to the specific information each student had agreed to share with them, in addition to the company's own data about the students (such as notes, emails and additional information). *"We added mechanisms to ensure that, when logged in as one company, a user would never be able to retrieve data points from other companies"*. Replying to the question 'Did customers notice the change [to a platform]?', Daniel replied *"Mostly no, they didn't. What they did perhaps notice is that there is now a common login, where before they all had their own domain-specific logins"*. He also added that *"Without doing anything they now [also] have access to some additional, common data across the platform which they didn't have before, such as information about events and career fairs. That's information everyone wants to see"*. Looking back, Daniel estimated that 90% of the code written for their candidate management system had to be rewritten for the platform, adding that *"It's of course always easier to build a new system when you've already made it before. We knew we had the same classes, each candidate still had a first name and so on. The issues were more at the level of linking between the various objects in the database."*

Having successfully rebuilt their database and relaunched their service, now as a platform, Poption was—as Petter had promised—by August ready to begin matching companies and students. However, as they were aware, creating value for both sides of a two-sided market is not necessarily a trivial pursuit. As Daniel later attested:

"We are suddenly relying on the fact that we have a bunch of companies that students want to work for, if we want students to be actively using the platform. To have students think that Poption is the 'natural tool to go to as a student looking for a job', well that requires that most companies who are recruiting are also using Poption. That's the challenge we had to overcome."

Recruiting Students (Fall of 2018)

Returning to their university in the fall of 2018 with a new, two-sided platform in hand, the founders of Poption set to work on overcoming the circular challenge of attracting companies and students to their new solution. At that point, from the perspective of existing customers, their service was still a candidate management software. With less than two months to go before the first career fairs were starting, they believed they had come up with a strategy that would change that. Replying somewhat vaguely to the question 'How will you attract students?', Petter answered *"The companies will do that, at career fairs"*. The CPO Jon later described their strategy in more detail:

"We reached out to career fairs and presented a kind of value proposition, that offered value [both] to their [participating] companies and students. This led to 10–12 fairs agreeing to partner with us. The partnership agreement involved, [...] when they send out questionnaires to the participating business, they ask how many chairs and tables they want for their stand. We asked them to include a yes/no question that asks something like 'Would you like to know more about the candidates you meet at the fair?'" – Jon, CPO

That is, rather than approach companies with their former value proposition ('a cross between a recruitment tool and CRM') the founders instead devised a new value proposition, later described as 'a tool that makes it easy for companies to register information about students at career fairs'. In addition, critically, they devised a new sales strategy for on-boarding companies, through partnerships with career fairs. *"It's a win for everyone. Career fairs are able to offer more value to companies, companies receive more information about potential candidates and students can more easily share their resumes and grades"* – Petter, CEO

The team hired their first employee to help execute the strategy, another early-twenties male from Jon and Petter's graduate program named Morten. He later described how *"Petter called me and said that they needed another person to help with business development and sales. I obviously accepted"*. *"At that time, they*

had just rebuilt their service from scratch and were about to launch a new strategy of partnering with career fairs. Through these partnerships, we received lists of companies who would be attending and so might be interested in our 'sign-up tool'. The first two months consisted of calling each of these companies and convincing them to use Poption at their next career fair. Jon later concurred that "We leveraged our partnership with each career fair to offer companies Poption free of use for the fall term. About 70-80 companies agreed to this". In addition, Jon estimated, "I think we had about 200 additional companies in the pipeline by that point, although we didn't get them all, we did get a fair share". Morten later described doing "100 demos of the service in that period alone".

By participating, companies were promised an easy way for them to retrieve much richer data about potential candidates than they would ever be able to capture themselves with their typical system of Excel sheets. "They get richer data about the students in a very simple way, including name and contact information, work experience, a photo from LinkedIn, information about their graduate program, their year of graduation and so on. In addition, students can choose to share their grades with them". Business developer Morten later described the problem they were solving for companies as follows: "A company attending a career fair typically meet somewhere between 2-300 students in a day, which is 2-300 potential new hires. However, all they leave the fair with is an impression of 'we had decent traffic today'. They have no idea who these students are or whether or not they are attractive candidates. They also have no way to reach them. Despite the fact that they might spend tens of thousands to attend, they really don't know what they are gaining from it". Replying to the question 'How is Poption changing this for them?', he added "They can leave and go back to the office knowing that they have 100 potential leads, who they are, which year they graduate and which 30 might be potential candidates for internships in the coming year".

"This led to about 30-40 companies using Poption during the career fair here at NTNU. Meaning, each company had a contact form on an iPad or a laptop where interested students could enter their name and email address. Students would later

be sent an email where they could import their LinkedIn information and/or share their grades." – Jon, CPO.

Poption's solution in other words allowed companies to review each student's resume and grades (from Poption's integration with Vitnemålsportalen) and easily send out personalized emails to candidates they viewed as interesting prospects. *"Some companies used this functionality to invite candidates to an early morning informal mingling session. When 20 students showed up, they [later] said they would never have managed do this without our system".* Jon added however, that *"I don't know if they [actually] used our tools to filter through the students that had shown interest, or whether they just sent them out to everyone, but at least it enabled them to more easily follow up each student from that point on".* The manager reiterated that if they had used their old systems, most of the companies would have had chaotic Excel documents full of emails, but no easy way to request or organize resumes and grades. For the mass-email feature, he stated *"they could use the mail-merger functionality in Outlook, but it's a pain. Some poor HR-employees have to do it, but it takes a lot of time. That's one of the things we solve for them".*

By the end of the recruitment season of 2018, a year into the company's founding in November Poption had processed close to 10,000 students' applications to companies via their career fair strategy, all over Norway. They spent the remainder of the year approaching companies who were not yet paying for their software to begin doing so for the coming calendar year of 2019. By January of 2019, Petter was describing Poption's value proposition as a 'marketplace for businesses and students/new graduates', stating that *"Companies use Poption to collect information about candidates, parse through applications and do follow-up. Students use Poption to find new career opportunities, share their profile with companies and apply for jobs".* Following a successful fall semester of marketing their service towards companies through partnerships with career fairs, their service was now being used by 93 companies, with a 7-day retention rate of approximately 50%. By June of 2019, the founders were in the process of

signing term sheets⁷ for venture funding totalling NOK 3,000,000. At that point, Poption's platform was being used by approximately 12,000 students. Since the fall of 2018, an average of 10 students per week had secured job offers through Poption's platform for on-campus recruiting.

Discussion

The archetypal strategic challenge in two-sided markets is generally cited to be the 'chicken-and-egg' problem of attracting participants to a platform that is initially empty (e.g. Caillaud & Jullien, 2003; Spulber, 2010; Hagiu & Spulber, 2013). Extant theoretical literature suggests that a plausible solution is to offer especially advantageous terms to one side first, before extracting and transferring the surplus from their participation to attract the other side (Jullien, 2005). In the language of management theory, such a 'single side first strategy' hence overcomes the coordination problem by first attracting participants from one group with a value proposition that is independent of the participation of the other group. An empirical example illustrating the mechanics of the strategy is the anecdotal case study of OpenTable (Parker et al., 2016; Bhargava, 2014), which offered a software tool to attract restaurants and later leveraged this existing customer base to create a platform for restaurant reservations.

The Process of Entry

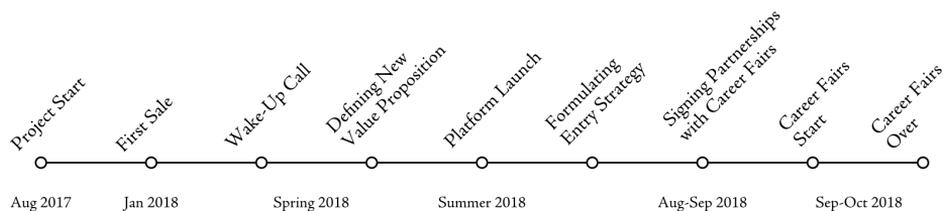


Figure 9.2: *Timeline of critical events during the course of the study*

⁷A term sheet is a bullet-point document outlining the material terms and conditions of a business agreement

The case study presented in section four narrates the execution of a 'single side first' strategy by the start-up company Poption. The study finds that Poption's successful entry in the two-sided market for campus recruiting was enabled by the firm's ability to balance the simultaneous activities of alignment and adaptability, a capability known in the literature as *organizational ambidexterity*. Moreover, the study illustrates how, by balancing activities and initiatives in the domains of business and product development, the firm was able to both adapt to and align with the opportunities and limitations of their environment. Figure 9.2 summarizes the nine critical events that shaped Poption's evolution in the period of the study from the fall of 2017 – the fall of 2018.

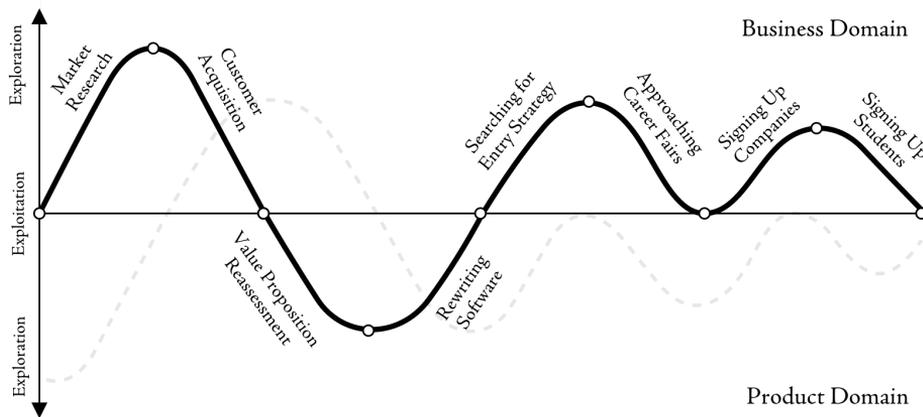


Figure 9.3: *Primary activities of exploration and exploitation in two domains: product and business development*

In Figure 9.3, the nine critical events that shaped Poption's evolution over the course of the study are depicted as inflection points in a cyclical process of exploration and exploitation in the company's two domains of operations at the time, product and business development. The activities depicted in the figure constitute those that primarily drove the evolution of the company in the period.

For instance, the firm first conducted (exploratory) market research in the business domain to better understand the demands of customers before engaging in a period of customer acquisition, which may be regarded as a more 'exploitative' endeavour

(e.g. March, 1991). In this period (from the fall of 2017 – spring of 2018), we see the firm moving more towards exploration in their period of market research until the first critical event/inflection point occurs, when the firm begins moving more towards exploitation during the customer acquisition process.

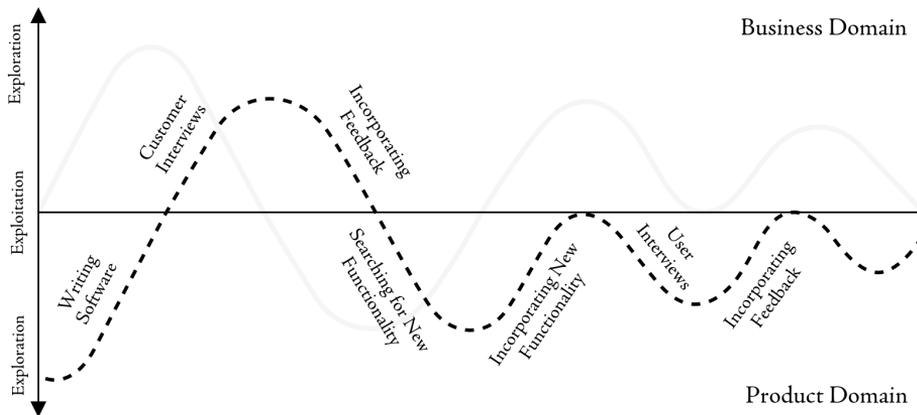


Figure 9.4: *Secondary activities of exploration and exploitation in two domains: product and business development*

In Figure 9.4, the same period from the fall of 2017 – spring of 2018 depicts the firm's simultaneous, secondary activities in the product domain, offset by half a period from its activities in the business domain. While engaging in the exploratory business activity of market research, the firm was simultaneously writing software which captured what they learned into a product which could be sold to customers. Next, still in Figure 9.4, we see the firm engaging in more exploration through customer interviews while simultaneously engaging in its primary activity of customer acquisition (Fig. 9.3). This period ends with the "wake-up call" that leads to a reassessment of the firm's value proposition (exploration) and the incorporating of feedback from customers in the rewriting of software (exploitation) which occurred in the summer of 2018. Viewed together, Figure 9.3 and 9.4 illustrate how a firm's simultaneous activities of exploration and exploitation may be mapped onto its domains of operations, which in the case of Poption at the time were two-fold:

- **Business**, which constituted the firm's primary activities for most of the period

of the study and which included market research, customer acquisition, strategy formulation, partnerships and the process of entry itself;

- **Product**, which although mostly secondary, was enabling to the firm's primary activities, and included software development, value proposition reassessments, user interviews and the incorporation of feedback in their product offering;

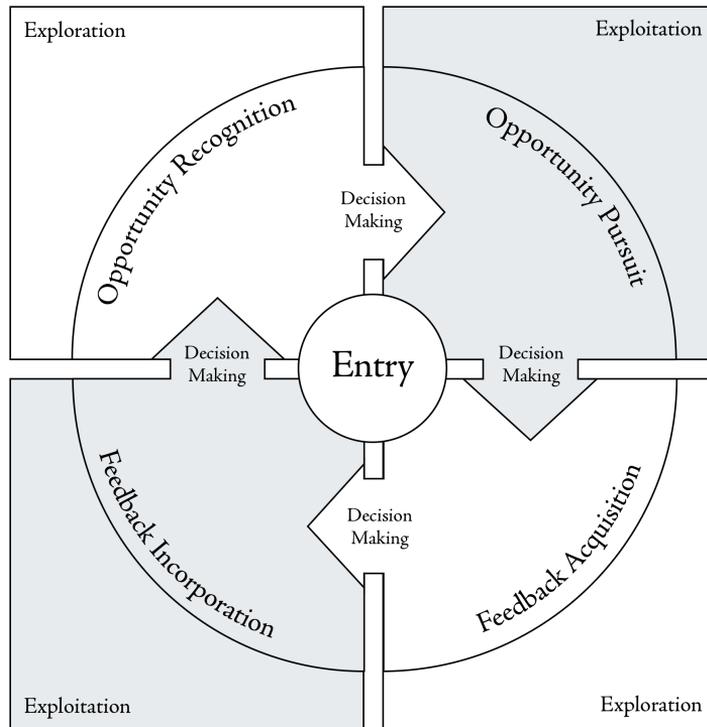


Figure 9.5: *Conceptual framework depicting the interaction between the three factors that enabled Poption's entry*

Enabling Factors

From the literature, it is known that exploration and exploitation require substantially different structures, processes, strategies, capabilities and cultures to pursue and may have different impacts on firm adaptation and performance (He & Wong, 2004). Inductively, based on the study presented in section four, we propose the following

three enabling factors as critical to Poption's successful entry, depicted visually in Figure 9.5.

1. Recognizing and Pursuing Opportunities

From the start of the project, through the firm's process of customer acquisition, wake-up call and relaunch, Poption excelled at simultaneously perceiving and pursuing opportunities, both in the product and business domain. In the product domain, they were early to recognize of the value-creating properties of the new Erasmus+ initiative which enabled their later value proposition to companies. Simultaneously, they were also able to move from recognizing (exploration) to pursuing (exploitation) the opportunity by building the necessary software. Similarly, in the business domain, from their experience of working with university recruiting, they were able to recognize the opportunity for mutual gains through a partnership between career fairs, companies and their start-up. Simultaneously, again, they were also able to move from recognizing this opportunity (exploration) to formulating a successful strategy for pursuing it (exploitation). In conclusion, it is proposed that:

Proposition A: The ability to recognize and pursue opportunities and effectively move cyclically from exploration to exploitation may be an enabling factor for successful entry in two-sided markets.

2. Acquiring and Incorporating Feedback

In addition to recognizing and pursuing opportunities, Poption excelled in both acquiring and incorporating feedback from their environment. In the product domain, despite seeming early success, they were early to conduct customer interviews in order to better understand how customers used their product and what might be improved in the future. From this process and their additional solicitation of feedback from the alumni organization and through interviewing with Y Combinator, they were able to acquire the necessary information needed to continuously evaluate and make changes in both their business- and product activities. In the period covered by the study, the firm solicited feedback from its environment through (at least)

five activities: 1. Interviews with potential customers, 2. Interviews with existing customers, 3. Workshops with alumni, 4. Interview with Y Combinator and 5. User interviews. From such explorations, they simultaneously adjusted both their product and business activities accordingly, in order to achieve a better alignment (exploitation) with their environment.

Proposition B: Emphasis on acquiring feedback from the environment, as well as the ability to simultaneously incorporate the essence of feedback in product- and business activities may be an enabling factor for successful entry in two-sided markets.

3. Swift and Decisive Decision Making

Finally, in order to be able to move between the four activities outlined above (opportunity recognition and pursuit, feedback acquisition and incorporation), Poption excelled at swift and decisive decision making. At each of the nine inflection points highlighted in Figure 9.2, the Poption team was able to reach consensus about changes to their business and product strategies and so swiftly move exploration to exploitation in both domains as needed. From the abandoning of their initial value proposition, to their decision to rewrite their back-end software, to adding new functionality based on user interviews, their flexibility was highly enabling to their successful entry.

Proposition C: The ability to swiftly and decisively reach consensus may enable necessary flexibility in moving from primarily emphasizing exploration or exploitation while simultaneously engaging in secondary, complementary activities

Conclusion

The unique challenge of successfully entering a two-sided market while simultaneously managing and supporting an existing value proposition may be understood as a prototypical challenge of organizational ambidexterity. Through an exploration of the first 16 months of operations in the start-up technology company Poption, this study narrates this challenge through an exploratory case study. From starting their

project in August of 2017, to the end of the study in June of 2019, it was found that Poption was able to leverage existing customer relationships to successfully launch a two-sided platform for on-campus recruiting. This was achieved as the result of a cyclical process consisting of exploratory and exploitative primary and secondary activities in the firm's two domains operations of business and product development.

Implications for Managers

Platform firms in two-sided markets are said to face a 'chicken-and-egg' problem upon entry. Employing a 'single side first' strategy such as that employed by Poption, may enable new entrant firms to overcome the problem by first offering a vertically integrated value proposition, which later may be leveraged to launch a platform business. In executing such a strategy, firms are required to simultaneously engage in both exploration and exploitation, the organizational capacity known as contextual ambidexterity. For Poption, this meant mastering the three key ambidexterous activities of:

1. *Opportunity recognition and pursuit* – Successful entry relies on the firm's ability to simultaneously recognize and pursue opportunities in both its product and business domains
2. *Feedback acquisition and incorporation* – Successful opportunity recognition relies on the firm's ability to acquire and incorporate feedback from its environment;
3. *Swift and Decisive Decision Making* – Successful entry relies on the firm's ability to swiftly and decisively reach consensus about when to move from exploration to exploitation;

Implications for Researchers

The inductive case study presented in this paper grounds the extant purely theoretically phenomenon of entry in two-sided markets using the anecdotal so-called 'single side first' strategy, through the narration of an empirical case study.

The case study narrates the firm-level dynamics of launching a platform service whose installed base (Evans & Schmalensee, 2007) is existing customers of a vertically integrated value proposition. These dynamics are incorporated in a conceptual framework (Fig. 9.5), which illustrates the firm-level factors that enabled successful entry.

Opportunities for further research on the topic of the 'single side first' entry strategy in two-sided markets are: 1. Deductively, illustrating the efficacy of a 'single side first' strategy versus other entry strategies, such as using first-party content (e.g. Hagiu & Spulber, 2013) or preannouncements (e.g. Bhargava, 2014). 2. Deductively, perhaps using surveys, investigating platform participants' awareness of the executing firm's activities during the entry process. This in order to determine whether or not participants in two-sided markets need (necessarily) be aware of their adoption of new services for platform entry to be viable; and 3. Inductively, narrating further what the business-/consumer-level expectations of a new entrant platform are at the point of entry. This in order to help ground theoretical predictions which typically assume that prior to entry, potential adopters' expectations about future participants are unfavorable (Hagiu, 2006).

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