Guiding the Evolution of B2B Platform Ecosystems: Governance Mechanisms and Acquisition Strategy

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Nicola Staub
from
Urnäsch (Appenzell Ausserrhoden)

Approved on the application of
Prof. Dr. Robert Winter
and
Prof. Dr. Kazem Haki

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List of Dissertation Papers

Paper A Staub, N., Haki, K., Aier, S., Winter, R., & Magan, A. (2021). *Evolution of B2B Platform Ecosystems: What Can Be Learned from Salesforce*? Proceedings of the 29th European Conference on Information Systems (ECIS 2021), A Virtual AIS Conference.

Paper B Staub, N., Haki, K., Aier, S., & Winter, R. (2022). Governance Mechanisms in Digital Platform Ecosystems: Addressing the Generativity-Control Tension. *Communications of the Association for Information Systems*, *52*(1), 906-939.

Paper C Staub, N. (2023). Implementation of Platform Governance Mechanisms: Insights from a B2B Platform Ecosystem. In S. Za, R. Winter, & A. Lazazzara (Eds.), *Sustainable Digital Transformation: Paving the Way Towards Smart Organizations and Societies* (pp. 237-252). Cham: Springer.

Paper D Staub, N., Haki, K., Aier, S., Winter, R., & Magan, A. (2021). Acquisition of Complementors as a Strategy for Evolving Digital Platform Ecosystems. *MIS Quarterly Executive*, *20*(4), 237-258.

Paper E Staub, N., Haki, K., & Aier, S. (2022). *Opportunity or Threat: A Complementors' Perspective on Platform Owner's Acquisitions*. Proceedings of the 30th European Conference on Information Systems (ECIS 2022), Timisoara, Romania.

Summary of Contents

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List of Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
B2B	Business-to-Business
B2C	Business-to-Consumer
C2C	Consumer-to-Consumer
CAIS	Communications of the Association for Information Systems
CRM	Customer Relationship Management
DSR	Design Science Research
e.g.	exempli gratia, for example
ECIS	European Conference on Information Systems
et al.	et alii, and others
etc.	et cetera, and similar other things
H	Hypothesis
HICSS	Hawaii International Conference on System Sciences
i.e.	id est, in other words
ICIS	International Conference on Information Systems
IoT	Internet of Things
IPR	Intellectual Property Rights
IS	Information Systems
ISV	Independent Software Vendor
IT	Information Technology
itAIS	Italian Conference of the Association for Information Systems
MISQE	Management Information Systems Quarterly Executive
OEM	Original Equipment Manufacturer
RQ	Research Question
SDK	Software Development Kit

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Abstract

Platform ecosystems are groups of interdependent firms and/or individuals that produce complementary products or services to create a coordinated shared value proposition. At the nexus of each platform ecosystem is a digital platform that provides a shared interface and facilitates exchange and collaboration between its actors. The evolution of such a platform ecosystem is shaped by complex interactions between the technology and functionalities of the digital platform and the roles and interests of the ecosystem's actors.

Despite the fact that platform ecosystems are becoming the new organizing logic of many industries, the majority of them fail to survive in the long-term due to fierce competition. Surprisingly, however, there is little research on the evolutionary dynamics of platform ecosystems, specifically in the business-to-business (B2B) context. Due to this, platform owners as orchestrators of their ecosystems require more guidance to ensure the adaptability of the platform ecosystem to emerging internal and external market conditions.

This dissertation aims to provide a more coherent understanding of the guidance of platform ecosystem evolution in the B2B context. Specifically, it aims to derive insights on two major types of guidance: (1) governance mechanisms to ensure alignment of all the ecosystem's actors' interests, and (2) acquisition strategy to enable rapid growth of the platform's technology and functionalities. To achieve this, the dissertation provides an in-depth case study of *Salesforce*, a leading global enterprise software company and a thriving B2B platform ecosystem.

The dissertation contributes to three research streams: (1) platform ecosystem evolution, (2) platform governance, and (3) platform owner's acquisitions. It shows how major governance mechanisms can be employed by platform owners to simultaneously incentivize and control the ecosystem's actors; it demonstrates how platform owners can employ acquisitions to strategically guide the evolution of their ecosystem; and it investigates how acquisitions affect the ecosystem's internal dynamics and actors. Based on these findings, this research suggests targeted guidance for platform owners in B2B platform ecosystems.

Keywords

Platform Ecosystems, Digital Platforms, Platform Ecosystem Evolution, Governance Mechanisms, Platform Acquisitions

Kurzfassung

Plattformökosysteme sind komplexe Ökologien von multilateral verflechteten Unternehmen und/oder Individuen, die über eine digitale Plattform komplementäre Produkte oder Dienstleistungen erstellen und durch Koordination auf ein gemeinsames Nutzenversprechen ausgerichtet sind. Ein Plattformökosystem entwickelt sich in einem laufenden Zusammenspiel zwischen den Technologien und Funktionalitäten der digitalen Plattform sowie den Rollen und Interessen der involvierten Akteure.

Obwohl zahlreiche Plattformenökosysteme ganze Industrien dominieren, kann die Mehrheit davon nicht nachhaltig dem Wettbewerbsdruck standhalten. Überraschenderweise gibt es in der aktuellen Forschung dennoch nur wenige Studien, welche auf die Entwicklungsdynamik von Plattformökosystemen fokussieren, insbesondere im B2B-Bereich. Dadurch haben Plattformanbieter, welche die Rolle eines Orchestrators im Ökosystem einnehmen, aktuell nur wenig Hilfestellung bei der Sicherstellung der Anpassungsfähigkeit des Plattformökosystems auf neue interne und externe Bedingungen.

Die vorliegende Dissertation verfolgt das Ziel, ein besseres Verständnis der Steuerung der Entwicklung von Plattformökosystemen im B2B-Bereich zu schaffen. Dabei wird auf zwei spezifische Steuerungsarten eingegangen: (1) Governance-Mechanismen zur Abgleichung der Interessen aller Akteure im Ökosystem und (2) Akquisitionsstrategie zur Verschnellerung des Plattformwachstums. Zur Erreichung des Forschungsziels wird eine Fallstudie des *Salesforce*-Plattformökosystems durchgeführt, einem führenden Unternehmen im Unternehmenssoftware-Bereich und florierenden B2B-Plattformökosystem.

Der wissenschaftliche Beitrag der Dissertation fokussiert auf drei Forschungsströme: (1) Entwicklung von Platformökosystemen, (2) Plattform-Governance und (3) Akquisitionen in Plattformmärkten. Insbesondere werden relevante Governance-Mechanismen aufgezeigt, anhand welcher die Akteure des Ökosystems gleichzeitig incentiviert und kontrolliert werden können. Zudem wird erläutert, wie Akquisitionen zur Entwicklung des Plattformökosystems in strategische Richtungen angewendet werden können und wie sich diese auf die interne Dynamik auswirken. Die Erkenntnisse der Dissertation bieten relevante Hilfestellungen für Praktiker in B2B-Plattformökosystemen.

Stichworte

Plattformökosysteme, Digitale Plattformen, Entwicklungsdynamik, Governance-Mechanismen, Akquisitionen

Part A – Synopsis

This cumulative dissertation comprises two parts: A synopsis (Part A), and five individual, thematically related research papers (Part B).

Chapter 1 explains *why* this research is needed, *what* it aims to achieve, and *how* it is conducted. Based on this, Chapter 2 presents the core themes of the dissertation to position the expected contributions in the academic field. Subsequently, an overview of each of the five research papers is provided in Chapter 3 along with each paper's contribution. Finally, the interdependencies between the research papers are discussed in Chapter 4 to conclude with the key contributions of the dissertation, its limitations, and implications for future research and current practice.

1 Introduction

Platform ecosystems are emerging as the new organizing logic of many industries, as exemplified in telecommunications (e.g., *Apple iOS*, *Google Android*), video gaming (e.g., *PlayStation, Xbox*), and enterprise software (e.g., *Salesforce, SAP*) (de Reuver, Sørensen, & Basole, 2018). As an organizational form, the platform ecosystem is a complex ecology of interdependent actors that produce complementary products and services and are aligned towards a shared value proposition (Autio & Thomas, 2021; Cennamo & Santaló, 2019; Jacobides, 2022). The nexus of each platform ecosystem is a digital software-based platform that consists of a modular technological architecture and facilitates interactions between platform ecosystem actors (Gawer, 2014). These actors include the platform owner (i.e., operator), complementors (e.g., developers), and customers. While each of these actors pursues their own – sometimes conflicting – interests and goals, they share a common interest in the survival and success of the platform for materializing and consuming their products or services (Selander, Henfridsson, & Svahn, 2013).

Given the fierce winner-take-all competition in platform-driven markets, platform ecosystems need to constantly adjust and improve their competitive position in an ever-changing environment (Staykova & Damsgaard, 2017). This requires continuous and dynamic adaptation to both ecosystem-internal changes (e.g., new complementor requirements) and ecosystem-external changes (e.g., new regulation or new competitor). To guide the emergent evolution of a platform ecosystem, the platform owner needs to maintain its role as the ecosystem orchestrator by continuously facilitating enhancements of the platform's technology and functionalities while simultaneously aligning all actors' individual interests toward their common objective.

To ensure this continuous alignment, platform owners rely on a purposefully defined governance structure that enables them to attract, incentivize, and control different groups of actors (Tiwana, 2014). As the success of the platform ecosystem is contingent on the contributions of a variety of ecosystem actors, effective platform governance aims to enable value cocreation among the various actors (generativity) while ensuring sufficient structure and stability of how their interactions take place (control), addressing both aspects of the generativity-control tension (Eaton, Elaluf-Calderwood, Sørensen, & Yoo, 2015; Ghazawneh & Henfridsson, 2013). Such governance practices are established through a portfolio of *governance mechanisms* (Schilling, 2005; Weill & Ross, 2004). Platform owners therefore need to continuously (re-)assess and – when necessary

– adapt appropriate governance mechanisms to guide the evolution of the platform ecosystem and enable it to respond to dynamic market conditions (Eaton et al., 2015).

To continuously improve the platform's technology and functionalities, platform owners have several options. One prevalent choice is the creation of proprietary (i.e., in-house) developments. However, a platform owner's ability to keep up with fast and diverging technological changes through internal innovation is limited, because proprietary developments are often time-consuming and only provide uncertain outcomes (Toppenberg, Henningsson, & Eaton, 2016). To complement their proprietary developments, platform owners therefore often opt for conducting *acquisitions* to include already-developed innovations and capabilities in the platform. Besides rapid growth, acquisitions specifically enable the platform owner to lock-in key third-party complementors' resources in the platform ecosystem (Miric, Pagani, & El Sawy, 2021). Consequently, platform owners need to constantly evaluate whether it makes sense to guide the platform ecosystem's evolution into certain fields through acquisitions.

1.1 Problem Setting

Platform Ecosystem Evolution. Despite the meteoric rise and tremendous success of many platform ecosystems, only a small fraction of them are able to survive and thrive in the long-term (Blaschke, Haki, Aier, & Winter, 2018; Hagiu, 2014; Yoffie, Gawer, & Cusumano, 2019). Many platform ecosystems fail during the nascent stage due to inadequate platform design when trying to attract a critical number of participants in the ecosystem's actor groups or aligning actors around a shared value proposition (Hagiu, 2006). Some research shows how these and other major challenges in the launch phase can be overcome (e.g., Hagiu, 2006; Shi, Li, & Chumnumpan, 2021). However, even platform ecosystems that have successfully ignited and moved beyond the nascent phase remain at risk of sudden failure. In particular, the sustainability of a platform ecosystem may be threatened, if they are unable to adapt to changing market conditions (Staykova & Damsgaard, 2017; Tiwana, 2014; Tiwana, Konsynski, & Bush, 2010). As a result, platform owners need to frequently make critical design decisions that guide the evolution of the platform ecosystem in an ever-changing environment.

Providing insights on guiding a platform ecosystem requires a close investigation of their evolutionary path. There is broad consensus that managing a platform ecosystem is a dynamic process that requires substantial resources and coordination (Gawer, 2014). However, there is only limited research on the dynamics and evolution of platform ecosystems (Autio & Thomas, 2021; de Reuver et al., 2018; Gawer, 2014; Rietveld &

Schilling, 2021; Staykova & Damsgaard, 2017). Generating more insights on this has the potential to help platform owners and complementors better understand the long-term implications of their design decisions and, ultimately, clarify potential design options. This is of particular relevance as many incumbents are currently transitioning from a traditional product-based strategy to a platform-based competitive strategy (Sandberg, Holmström, & Lyytinen, 2020).

Platform Governance Mechanisms. The lack of insights on how platform owners can guide platform ecosystem evolution is highlighted in two specific challenges faced by platform owners. The first challenge is to guide the evolution of the platform ecosystem by continuously aligning the interests of all ecosystem actors. Platform owners typically address this challenge with governance mechanisms (e.g., gatekeeping, pricing, informal control). In existing research, these mechanisms have often been considered as static, providing only limited support for platform owners in dynamically guiding platform ecosystem evolution. However, governance mechanisms need to be employed that simultaneously foster both aspects of the generativity-control tension (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013). This requires highly context-dependent adaptation of governance mechanisms, as illustrated by an example from the *Google Android* platform ecosystem. *Google* as the platform owner was confronted with hostile strategies when *Amazon* attempted to clone the *Android* open platform. In response, *Google* dynamically adjusted the open-source license (i.e., the gatekeeping mechanism) to safeguard selected areas of the platform core from further development by complementors (Karhu, Gustafsson, & Lyytinen, 2018). This highlights the *need to better understand how a platform owner can guide the platform ecosystem's evolution through continuous adaptation of governance mechanisms*.

Platform Owner's Acquisitions. The second challenge is to guide the evolution of the platform ecosystem by securing critical resources and enabling rapid growth in the platform's technology and functionalities. To cope with this challenge, platform owners frequently opt for acquisitions but face numerous difficulties in systemically conducting acquisitions (Miric et al., 2021; Toppenberg et al., 2016). One reason for this is that acquisitions in platform markets have distinct particularities which do not apply to acquisitions in conventional markets. For example, the success of a platform ecosystem is shaped considerably by the contributions of a variety of ecosystem actors; therefore, acquisitions may potentially change the contributions of individual actors as well as the relationships and power distance between multiple actors in the ecosystem. Although this can lead to major challenges, there is currently little understanding of such effects, especially in the case of platform owner's acquisitions of complementors. Existing research indicates in this case that some of the remaining, non-acquired complementors may perceive platform owner's acquisition as the platform owner entering into competition with its own complementors (Zhu, 2019). The limited empirical knowledge about such effects increases the difficulty of platform owners to derive a targeted acquisition strategy to guide the evolution of their platform ecosystems. Although acquisitions are sometimes conducted opportunistically, an acquisition strategy should allow platform ecosystem evolution to be guided strategically. Overall, there is a *need to better understand how a platform owner can guide the platform ecosystem's evolution through acquisitions*.

B2B Platform Ecosystems. While the above gaps apply to platform ecosystem research in general, they are of particular importance for platform ecosystems in a business-to-business (B2B) context, given that only a relatively small number of studies focus on this context (Tsai, Ahn, & Mortara, 2022). B2B platform ecosystems are characterized by the high complexity of customer requirements that cannot be fulfilled by the platform owner alone and require flexible integration of resources from the ecosystem's various actors (Blaschke et al., 2018; Schreieck, Wiesche, & Krcmar, 2022). The limited number of studies focusing on this area results in limited insights for B2B platform owners to guide the evolution of their platform ecosystems.

1.2 Research Objectives

This dissertation seeks to provide insights on governance mechanisms and acquisitions for guiding the evolution of B2B platform ecosystems. As a foundation for this, it is necessary to first study how a platform ecosystem evolves over time. In order to achieve the overarching objective of the dissertation, three specific research objectives are defined, which are explained in more detail in the following.

1.2.1 Platform Ecosystem Evolution

The few existing studies on platform ecosystem evolution mainly focus on specific technical (related to the digital platform's technology and functionalities) or social (related to the ecosystem actors' requirements and contributions) aspects. Interestingly, literature has not much investigated this from a sociotechnical standpoint. However, it is exactly this multifaceted process of complex interactions between social and technical aspects that jointly shape evolution. Many studies analyze platform evolution only from the perspective of the platform owner as the orchestrator (de Reuver et al., 2018;

Selander et al., 2013), although the evolution is shaped by the contributions of all ecosystem actors (i.e., platform owner, complementors, and customers).

The first research objective of this dissertation is to provide new insights on platform ecosystem evolution. Understanding this will make it possible to examine a platform owner's guidance of this process. Specifically, the dissertation aims to study the evolution of platform ecosystems as a process of events from a sociotechnical and multi-actor perspective. It is particularly aimed at presenting the major milestones and turning points which are relevant for all ecosystem actors during the evolution. Thus, the first research question is as follows:

RQ1: *How does a platform ecosystem evolve as a co-evolutionary process of technical (related to the digital platform's technology and functionalities) and social (related to the activities and contributions of the ecosystem's diverse actors) aspects*?

1.2.2 Platform Governance Mechanisms

Existing studies on the dynamics of platform governance mechanisms mainly discuss single mechanisms in isolation by focusing on a variety of platform contexts and by using diverse terminology (de Reuver et al., 2018; Rietveld & Schilling, 2021). Examples include gatekeeping (Wessel, Thies, & Benlian, 2017), pricing (Zimmermann, Angerer, Provin, & Nault, 2018), and informal control (Goldbach & Benlian, 2015b). Yet, the current body of literature is missing a consolidation of the fragmented, implicit knowledge on platform governance mechanisms to illustrate how these mechanisms can be employed by platform owners to simultaneously foster generativity and control.

Therefore, building on the in-depth understanding of platform ecosystem evolution, the second research objective is to provide a more coherent understanding of platform governance mechanisms as a means for platform owners to guide the evolution. This includes providing an overview of the governance mechanisms which are most relevant for the generativity-control tension and each of the major mechanisms' effects on the tension's two constituent aspects. Further, as this overview should enable a useful foundation for contextualizing such mechanisms, and given the focus on B2B platform ecosystems, this also refers to providing insights on how the major mechanisms can be implemented by B2B platform owners. Thus, the second research question is as follows:

RQ2: *What are the major governance mechanisms platform owners rely on to simultaneously facilitate generativity and control and what are platform owners' main activities to implement each of the mechanisms*?

1.2.3 Platform Owner's Acquisitions

The few studies on acquisitions in a platform ecosystem evolution context often focus on a particular dimension of evolution, for example the evolution of the platform core technology (Toppenberg et al., 2016). However, the evolution of a platform ecosystem may be shaped by multiple dimensions. With regard to the implications of acquisitions, past research has focused on analyzing the impact on specific constructs, such as innovativeness and quality of products (Ishihara & Rietveld, 2017). How evolution is affected by the implications of platform owner's acquisitions on the ecosystem's internal dynamics (concerning complementors and customers) has been largely neglected, specifically with regard to acquisitions of complementors. However, the latter provides promising opportunities to lock-in key resources in the ecosystem and quickly integrate them into the platform's existing product and service offerings.

Accordingly, and similarly building on the in-depth understanding of platform ecosystem evolution, the third research objective is to extend the current knowledge on platform owner's acquisitions to guide the evolution of a platform ecosystem. This refers to creating a more coherent understanding of how platform owners can acquire complementors in a strategic way to guide the platform ecosystem's evolution and includes both the strategic conduct of acquisitions and the management of the resulting implications on the ecosystem's internal dynamics. Consequently, the third research question asks:

RQ3: *How can a platform owner employ acquisition of complementors as a strategy and what are the effects on the ecosystem's internal dynamics with regard to complementors and customers*?

Given the scarce research on B2B platform ecosystems, this dissertation examines these three research questions in the B2B context. This can be considered a fruitful avenue because existing research indicates that incumbent firms in many B2B industries such as manufacturing (Pauli, Fielt, & Matzner, 2021), Oil and Gas (Matzner et al., 2021), or enterprise software (Schreieck et al., 2022) are currently transitioning into a platform ecosystem. In addition, existing research indicates that some of the characteristics of B2B platform ecosystems differ from other types of platform ecosystems such as more consumer-focused platform ecosystems like *Apple iOS* or *Google Android* (Blaschke et al., 2018; Ceccagnoli, Forman, Huang, & Wu, 2012; Foerderer, Kude, Schuetz, & Heinzl, 2019; Hein et al., 2019; Riemensperger & Falk, 2020; Schreieck, Wiesche, & Krcmar, 2017). For example, the provision of highly complex and industry-specific services to customers requires a more careful consideration of the ecosystem's complementary resources as contributed by heterogeneous actors. This suggests that B2B platform ecosystems have distinct evolutionary dynamics and therefore require context-dependent guidance.

This dissertation builds on a better understanding of B2B platform ecosystem evolution to provide insights on a platform owner's employment of governance mechanisms and acquisitions to systematically guide this evolution. Figure 1 visualizes the structure of this dissertation.

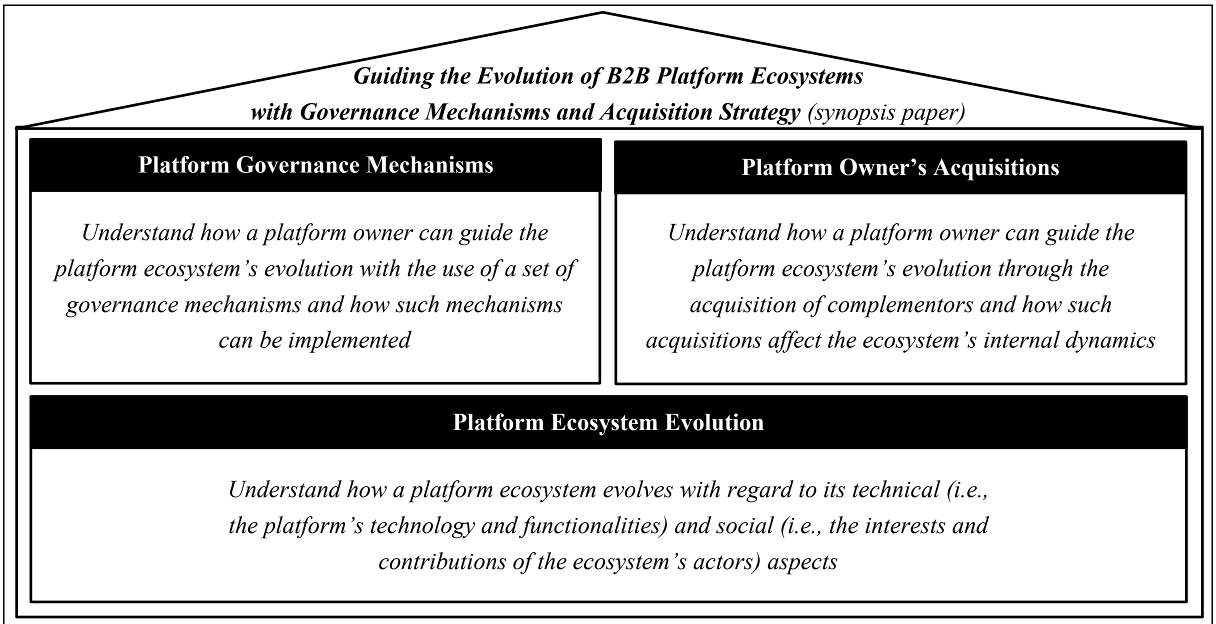

Figure 1: Dissertation Structure

1.3 Research Approach

As a cumulative work, this dissertation employs different research methods. Reaching a better understanding of how to guide platform ecosystem evolution can be considered a complex endeavor because the platform ecosystem is an emergent phenomenon and there is still relatively little theory on it, especially with regard to particularities of the B2B context. Different methods are applied to capture the complexity of platform ecosystems from various perspectives (e.g., Venkatesh, Brown, & Sullivan, 2016). The methodological emphasis of this dissertation is on in-depth case study research (Eisenhardt, 1989).

One suitable context for analyzing B2B platform ecosystems in this dissertation is the enterprise software industry, where many firms today are presenting themselves as orchestrators of a platform ecosystem rather than merely providers of products and services (e.g., *SAP*, *Adobe*, *Salesforce*). This dissertation focuses on *Salesforce*, a leading company in the global customer relationship management (CRM) market and a prime example of a thriving B2B platform ecosystem that has attracted more than one million registered developers and has more than 3,500 complementary applications listed on its marketplace. There are two main reasons indicating that the *Salesforce* platform ecosystem is a suitable context given the dissertation's research objectives. Firstly, over its 17-year history as a platform ecosystem, the platform owner (i.e., *Salesforce*) has continuously developed the platform's technology and functionalities and has engaged complementor firms in various ways; therefore, analyzing the evolution of the *Salesforce* case potentially offers rich insights on the evolutionary dynamics of and the applied governance mechanisms within a platform ecosystem. Secondly, given that *Salesforce* has conducted more than 60 acquisitions[1], analyzing this case offers vast potential to analyze platform owner's acquisitions.

To gain a concise understanding of B2B platform ecosystem evolution as a co-evolutionary process of technical and social aspects (*RQ1*), Paper A conducts a case study (Eisenhardt, 1989) of the *Salesforce* platform ecosystem. In-depth case study research specifically enables the gathering of detailed and extensive empirical accounts on each of the main evolution steps of the platform ecosystem, such as milestones and turning points (Yin, 1989). Process theory, which is frequently used to examine how organizational phenomena evolve over time, is employed to organize these major events in a coherent structure, namely antecedents, events, and outcomes (Markus & Robey, 1988; Mohr, 1982; Pettigrew, 1997; Van de Ven & Huber, 1990).

The insights gained through the case study on platform ecosystem evolution should reveal different options to guide the evolution. A first option is guidance through governance mechanisms (*RQ2*). To consolidate the fragmented knowledge on platform governance mechanisms and each of the mechanisms' effects on generativity and control in existing research, Paper B undertakes a structured literature review inspired by Webster and Watson (2002). Based on the concise overview of the mechanisms which are most

[1] For a list of key acquisitions made by Salesforce, see: https://www.salesforce.com/news/stories/salesforce-acquisitions/

relevant for generativity and control, Paper C performs an in-depth study of *Salesforce* in order to examine platform owner's activities to implement governance mechanisms.

A second option is guiding the evolution through acquisitions (*RQ3*). Paper D provides a case study of *Salesforce* on how acquisitions can be employed as a strategy and how platform owners can manage the implications of acquisitions on acquired complementors and customers. Paper E complements the latter by focusing on the implications on the non-acquired complementors. Following MacKenzie and colleagues (2011), the paper proposes and outlines a survey research design that will allow for subsequent data collection on complementors' reactions to platform owner's acquisitions. Table 1 provides an overview of the applied research methods and the reasoning for their selection.

Table 1: Applied Research Methods

RQ	**Paper**	**Research Method**	**Reasoning**
Platform Ecosystem Evolution			
1	A	Case study (Eisenhardt, 1989)	To understand how a platform ecosystem evolves in a co-evolutionary process of complex interactions between technical and social aspects
Platform Governance Mechanisms			
2	B	Literature review (Webster & Watson, 2002)	To understand what governance mechanisms platform owners rely on when managing their digital platforms to simultaneously foster generativity and control
2	C	Case study (Eisenhardt, 1989)	To understand what activities platform owners conduct to implement major governance mechanisms
Platform Owner's Acquisitions			
3	D	Case study (Eisenhardt, 1989)	To understand how platform owners can employ acquisition of complementors as a strategy as well as to understand the effects of such acquisitions on the acquired complementors and customers
3	E	Survey development (MacKenzie et al., 2011)	To understand the effects of platform owner's acquisition of complementors (i.e., market entry through acquisitions) on the non-acquired complementors

2 Research Background

Digital platforms and platform-based ecosystems have raised considerable attention in various fields. A relatively high number of different definitions are available for these concepts; therefore, it is important to clarify the focus of this dissertation. In the following, the major core concepts of the dissertation are introduced, namely platform ecosystems, platform ecosystem evolution, platform governance mechanisms, and platform owner's acquisitions.

2.1 Digital Platforms and Platform Ecosystems

Digital platforms are software-based systems that coordinate actors that innovate and/or compete and consist of a modular technological architecture composed of a core and a periphery (Gawer, 2014). The meteoric rise of digital platforms is to a considerable extent based on their ability to create network effects, reducing the search costs for the platform's actor groups (i.e., the costs of finding each other). Network effects occur in platform markets when "one actor group's benefit from joining the platform depends on the size of the other actor group that joins the platform" (Armstrong, 2006, p. 66). This leads to winner-take-all dynamics in platform markets, so that they are often dominated by a few large platforms that are able to claim a large share of the market (e.g., *Airbnb* in short-term housing rentals).

Cusumano et al. (2020) describe two main types of digital platforms. A transaction-focused platform (e.g., *Airbnb, eBay, Amazon*) serves as an intermediary for direct exchanges or transactions. An innovation-focused platform (e.g., *Apple iOS, Google Android, Salesforce*) serves as a technological foundation upon which external actors develop complementary add-ons and thereby extend the platform's scope of use and functionalities. Both these two fundamental platform types generate value by facilitating interactions between organizations and/or individuals.

Digital platforms often mark the central point of gravity in a platform-based ecosystem. In general, ecosystems are an organizational form in which (i) a shared value proposition is provided by (ii) a group of interdependent actors that produce complementary products and services under (iii) coordination, for example by a focal firm that acts as the ecosystem's orchestrator (Autio & Thomas, 2021; Jacobides, 2022; Jacobides, Cennamo, & Gawer, 2018; Lingens, Miehé, & Gassmann, 2021; Moore, 1993). An ecosystem often does – but not necessarily needs to – revolve around a digital platform. However, digital platforms are particularly well-suited for this purpose because they offer a shared interface that facilitates and simplifies interactions (e.g., exchange or collaboration) as well as enables modular integration of products and services provided by a variety of actors (Autio & Thomas, 2021; Tiwana et al., 2010).

In the distinct case of a platform ecosystem, a *platform own*er provides a digital platform that serves as a technological foundation upon which *complementors* can develop complementary add-ons (e.g., applications) to extend the initial functionality of the platform (Tiwana et al., 2010). *Customers* ultimately derive certain values from the offerings jointly provided by the platform owner and complementors. In these complex ecologies of organizations and/or individuals (Cennamo & Santaló, 2019), the platform owner plays the role of an orchestrator that ensures the fulfillment of a common value proposition and defines how the activities in the platform ecosystem are coordinated (e.g., interfaces, revenue sharing, decision rights).

This dissertation focuses on B2B platform ecosystems as a distinct type of platform ecosystems. While their consumer-focused counterparts have attracted considerable interest in existing research, B2B platform ecosystems have received little attention (Tsai et al., 2022). In B2B platform ecosystems, the platform owner and complementors jointly deliver highly complex products and services to customers. The latter can hardly be provided by one actor alone; therefore, the cocreation of value among various ecosystem actors is required to adapt to dynamic customer requirements. By focusing on various industries (e.g., manufacturing, Oil and Gas, or enterprise software), the few existing studies on B2B platform ecosystems indicate that the latter have their distinct particularities which do not apply to other platform ecosystems, such as the consumer-focused *Apple iOS* or *Google Android* (Blaschke et al., 2018; Matzner et al., 2021; Pauli et al., 2021).

Some of these characteristics are as follows (see Paper A for details): the provision of highly complex and industry-specific services to customers that requires diligent embedding of the ecosystem's complementary resources contributed by heterogeneous actors; the broad spectrum of complementary resources provided by the external actors (e.g., development, implementation, consultancy, or training); the high complexity of customer requirements that need to be solved through a flexible integration of resources provided by both the platform owner and complementors (Blaschke et al., 2018; Ceccagnoli et al., 2012; Foerderer et al., 2019; Hein et al., 2019; Riemensperger & Falk, 2020; Schreieck et al., 2017). Overall, this suggests that it is beneficial to examine the evolutionary dynamics of platform ecosystems in the B2B context.

2.2 Platform Ecosystem Evolution

Platform ecosystems evolve when either the platform's technology and functionalities (i.e., the technical aspect) or the ecosystem's actors' interests and contributions (i.e., the social aspect) change. This refers to new requirements of the platform or the ecosystem's actors as well as a wide array of possible changes of the environmental conditions (e.g., new regulation, new competitor). However, despite the dynamic nature of platform ecosystems (Gawer, 2014), only a limited number of studies focus on platform ecosystem dynamics and evolution because initially following a static approach has been somewhat dominant in the platform ecosystem research (de Reuver et al., 2018; Rietveld & Schilling, 2021; Staykova & Damsgaard, 2017).

Recent studies that have begun to consider platform ecosystems as evolving phenomena analyze their evolution from different perspectives (see Table 2). Many of these studies focus on the evolution of particular technical or social aspects of the platform ecosystem. Works that adopt the technical perspective focus on various topics (related to the digital platform's technology and functionalities). For instance, scholars examine the evolution of the platform core technology, such as through technology acquisitions made by the platform owner (Toppenberg et al., 2016). Another major focus is on the continuous extension of the platform's functional scope with new functionalities, which can be done either by the platform owner or complementors (Eisenmann, Parker, & Van Alstyne, 2011). Other examples are studies on the ongoing modification of application programming interfaces (APIs) to alter the access to the platform (Um & Yoo, 2016) or on the dynamic adjustment of technical boundary resources provided by the platform owner (Eaton et al., 2015).

The second perspective is concerned with social aspects of platform ecosystems (related to the roles of and the relationships between the platform owner, complementors, and customers). Examples include studies that have analyzed the mutual influences between distinct groups of ecosystem actors, such as the platform owner and complementors (Lindgren, Eriksson, & Lyytinen, 2015), complementors and customers (Song, Xue, Rai, & Zhang, 2018), or customers with one another (Spagnoletti, Resca, & Lee, 2015). An additional example is an analysis of the participation strategies of ecosystem actors depending on different types of platform orchestration (O'Mahony & Karp, 2022).

A relatively small number of studies have started to consider both technical and social aspects. Several of these studies focus on the general evolution process in order to derive stages of evolution or to analyze major transformation processes. For example, Tan et al. (2015) highlight the role of information systems (IS) capabilities in platform ecosystem evolution and derive major capabilities that are of importance in three distinct evolution stages (i.e., nascent, formative, and mature stages). Other studies focus on one specific stage; for example, Shi et al. (2021) identify capabilities for guiding platform ecosystem evolution in the nascent stage. Besides this, existing research analyzes transformation processes, such as the transition from a *product platform* into a *platform ecosystem* (Sandberg et al., 2020; Schreieck et al., 2022).

Table 2: Focus of Current Platform Ecosystem Evolution Research

Perspective	Focus	References
Technical	Dynamics related to the platform's technology and functionalities: - Continuous addition of new platform features - Continuous extension of the platform core technology - Ongoing modification of the platform's interfaces - Continuous modification of the platform's technical boundary resources	Eisenmann et al. (2011); Toppenberg et al. (2016); Um & Yoo (2016); Eaton et al. (2015)
Social	Dynamics related to the ecosystem actors (i.e., platform owner, complementors, and customers): - Changing roles of and relationships between ecosystem actors - Changing platform participation strategies of ecosystem actors	Lindgren et al. (2015); Song et al. (2018); Spagnoletti et al. (2015); O'Mahony and Karp (2022)
Sociotechnical	Co-evolutionary dynamics of both technical and social aspects: - Stages of evolution (e.g., nascent, formative, and mature stages) - Transformation processes (e.g., transition into a platform ecosystem)	Tan et al. (2015); Shi et al. (2021); Sandberg et al. (2020); Schreieck et al. (2022)

This dissertation aims to complement the existing research adopting the sociotechnical perspective by following a co-evolutionary and multi-faceted approach to study the major milestones and turning points during the evolution of a platform ecosystem. Given that such a co-evolutionary process can be more thoroughly comprehended when the evolution is studied from the perspective of all actors in the ecosystem, the dissertation adopts a multi-actor approach (i.e., from the perspective of the platform owner, complementors, and customers). In doing so, the dissertation focuses on the understudied B2B context, which may offer new insights on the evolutionary dynamics of platform ecosystems due to the distinct particularities of B2B platform ecosystems.

2.3 Platform Governance Mechanisms

Governance has been defined from numerous perspectives, for example sociological governance, corporate governance, or IT governance (see Paper B for definitions). What these three perspectives have in common is the orchestrated use of mechanisms to encourage consistent behavior, notwithstanding their specific context (De Haes & Van Grembergen, 2009; Weill & Ross, 2004). A mechanism can therefore be understood as a means to implement governance, such that governance is exercised through a portfolio of interrelated and purposefully designed governance mechanisms.

Platform governance, however, has its distinct particularities owing to the fact that platform ecosystems deviate from traditional organizational forms. The success of a platform ecosystem is contingent on loosely coupled and independent actors that are opportunistic and pursue their own goals and interests (Tiwana, 2014). As these actors are usually active in several competing platform ecosystems, traditional governance with command-and-control structures is hardly applicable to the platform ecosystem context (Tiwana, 2014; Tiwana et al., 2010). Therefore, platform owners rather need to act as orchestrators by continuously aligning their interests with those of the heterogeneous stakeholder groups of their platform ecosystem.

During the evolution of a platform ecosystem, one key challenge of platform owners is to continuously and simultaneously enable value cocreation among the platform participants (generativity) whilst maintaining sufficient stability over how these value cocreation activities take place (control). This is also referred to as the tension of generativity vs. control (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013). As such, platform ecosystem governance requires the purposeful design and implementation of governance mechanisms to achieve an appropriate balance of generativity and control.

Various platform governance mechanisms to ensure this have been discussed in existing research (see Paper B for an overview). For example, Ghazawneh and Henfridsson (2013) provide a boundary resources model that refers to a platform owner's provision of resources to attract complementors and enable them to innovate on the platform (e.g., programming resources or knowledge resources). Other scholars focus on rules established by the platform owner such as gatekeeping (i.e., which actors can access the platform) (Zhang, Li, & Tong, 2022) or revenue sharing (i.e., which actors get which share of the overall revenue of the platform) (Zimmermann et al., 2018). It has also been discussed how platform owners can foster relational control in order to create a vibrant community among the various actors in the platform ecosystem (Goldbach & Benlian, 2015b).

While many of these studies adopt a rather static approach to analyze these mechanisms, some of them have already begun to consider the dynamic nature of governance mechanisms. For example, several works analyze how different constellations of the gatekeeping mechanism or boundary resources can incentivize complementors in different ways during platform ecosystem evolution (Foerderer et al., 2019; Thies, Wessel, & Benlian, 2018).

In order to contribute to the dynamic perspective on platform governance, this dissertation aims to consolidate the current knowledge on platform governance in order to provide an overview of the mechanisms which are most relevant to address the generativity-control tension as well as each of the mechanisms' effects in fostering the tensions' two constituent aspects. Besides this, given that scholars recently asked for a more detailed view on the implementation of governance mechanisms (Jacobides et al., 2018; McIntyre & Srinivasan, 2017), the dissertation also aims to derive insights on how such mechanisms can be implemented by platform owners in the B2B platform ecosystem context.

2.4 Platform Owner's Acquisitions

Despite platform owners' propensity to acquire complementors, research on acquisitions in the platform context has been scarce (Miric et al., 2021). In general, acquisitions can help organizations quickly grow their market share and create synergies of size, geography, assets, people, or competencies (Epstein, 2005). The focus here, however, is on digital platform markets which are different from conventional markets (see Paper D for details). Specifically, digital markets are characterized by the reprogrammable nature of digital products, which, in combination with modular technological architectures, enables digital technologies to evolve because they can be continually reconfigured with new components (Yoo, Henfridsson, & Lyytinen, 2010).

Moreover, digital platform markets have important additional properties. In particular, they are characterized by winner-take-all competition, resulting in fierce competition among platform owners to be the first in securing (i.e., acquiring) essential resources. Hence, acquisitions enable a platform owner to quickly lock-in key third-party complementors' resources in the platform ecosystem and integrate their solutions into the platform's core offerings. Examples of platform owners competing to acquire complementors include *Microsoft* and *Salesforce* competing to acquire *Slack* and *LinkedIn*, and *Adobe* and *Salesforce* competing to acquire *ExactTarget* and *Marketo.*

Furthermore, the evolution of a platform ecosystem is contingent on a plethora of loosely coupled and independent actors that opportunistically pursue their own goals and interests. These ecosystem actors are essential for the overall value provided by a digital platform, so the platform owner must continuously align all the actors' interests to ensure they are motivated to participate in the ecosystem. As a consequence, acquisitions also entail risks, because they may unintentionally change the dynamics within and between ecosystem actors and influence some of their incentives for participating in the ecosystem.

The latter is specifically the case when platform owners choose to acquire some of their own complementors (see Paper E for details). If several complementors are active in a certain market niche (i.e., compete with one another) and the platform owner acquires one of them and deeply integrates that complementor's resources into the platform's core offerings, such an acquisition would erode some of the complementors' incentives to innovate. These complementors may subsequently reduce their development efforts or even leave the platform ecosystem. For example, *Meerkat*, a mobile app that enabled *Twitter* users to broadcast live video streaming to their followers, vanished after *Twitter* acquired *Meerkat's* competitor *Periscope* (Zhu, 2019).

Thus, the complementors affected by acquisition of one of their competitors might perceive such acquisitions as the platform owner entering into competition with its own complementors. This has been conceptualized as the platform owner's market entry in a growing stream of literature in platform research (Gawer & Henderson, 2007; Zhu, 2019). Platform owner's market entry generally refers to the platform owner entering certain market niches of its own market by imitating complementors with similar offerings to appropriate a share of their revenue. These studies document mixed results on the effects of platform owner's entry on the complementors (see Paper E for an overview). As it is currently unclear to what extent these findings can be transferred to market entry through acquisitions, platform owners should carefully consider conducting such acquisitions.

A number of studies on platform owner's acquisitions have already started to examine the role of acquisitions to guide platform ecosystem evolution. For example, one recent study analyzes the optimal timing of platform owner's acquisitions in a transaction-focused platform context (Miric et al., 2021). The authors find that transaction platform owners initially often acquire similar, smaller transaction platforms from the same market niche (e.g., a housing portal acquiring other, smaller housing portals). Subsequently, they begin to expand the scope of their acquisitions and acquire platforms from other market niches. It is currently unclear to what extent these findings can be transferred to the context of a platform ecosystem centered around an innovation platform. With focus on the latter, Toppenberg et al. (2016) illustrate how a platform owner can conduct acquisitions to continuously evolve the platform's core technology as one exemplary strategic direction of evolution. Further, regarding the implications of acquisitions, scholars provide initial insights on the effects on certain key constructs, namely the innovativeness or quality of products offered on the platform (Ishihara & Rietveld, 2017).

This dissertation aims to complement these studies by analyzing how platform owners can employ acquisition as a strategy to guide the platform ecosystem's evolution. This refers to enabling evolution into different directions as well as managing the implications of acquisitions on the ecosystem's actors. In doing so, the dissertation focuses on acquisitions of complementors, as a distinct type of platform owner's acquisitions. Due to the indication in existing research that this type of acquisition can cause particular challenges for platform owners in terms of the ecosystem's dynamics, this acquisition type requires special attention from platform owners.

3 Findings

This chapter outlines the dissertation's findings. It first explains how each of the three research questions is answered by the papers' contributions and then provides a short summary of each paper.

3.1 Overview

Table 3 shows an overview of how each of the five individual papers addresses the three research questions.

Table 3: Contributions of Papers to Research Questions

Paper		RQ1	RQ2	RQ3
A	Evolution of B2B Platform Ecosystems: What Can Be Learned from Salesforce?	●	○	◑
B	Governance Mechanisms in Digital Platform Ecosystems: Addressing the Generativity-Control Tension	○	●	○
C	Implementation of Platform Governance Mechanisms: Insights from a B2B Platform Ecosystem	○	◑	○
D	Acquisition of Complementors as a Strategy for Evolving Digital Platform Ecosystems	◑	○	●
E	Opportunity or Threat: A Complementors' Perspective on Platform Owner's Acquisitions	○	○	◑

Legend:

○ No relation to RQ ◑ Partial answer to RQ ● Main contribution to RQ

RQ1 How does a platform ecosystem evolve as a co-evolutionary process of technical (related to the digital platform's technology and functionalities) and social (related to the activities and contributions of the ecosystem's diverse actors) aspects?

RQ2 What are the major governance mechanisms platform owners rely on to simultaneously facilitate generativity and control and what are platform owners' main activities to implement each of the mechanisms?

RQ3 How can a platform owner employ acquisition of complementors as a strategy and what are the effects on the ecosystem's internal dynamics with regard to complementors and customers?

RQ1 is concerned with B2B platform ecosystem evolution as a co-evolutionary process of technical and social aspects. By conducting an in-depth single case study, Paper A demonstrates the evolution of the *Salesforce* platform ecosystem as a prime example of a thriving B2B platform ecosystem in the enterprise software industry. The paper illustrates how the platform owner engaged complementor firms in a variety of different ways. Besides this, Paper D also contributes to RQ1 with insights on platform ecosystem evolution through platform owner's acquisitions (e.g., acquisitions in different directions of evolution, drivers of acquisitions, implications of acquisitions on evolution).

The main answer to RQ2 is provided in Paper B. The latter consolidates the fragmented knowledge on the major governance mechanisms' effects toward generativity and control, one of the key challenges that needs to be continually addressed by platform owners during platform ecosystem evolution. By doing so, the major governance mechanisms discussed in existing research are presented in a coherent organizing structure. While Paper B considers different types of platform ecosystems, Paper C contextualizes these insights by illustrating how such mechanisms are implemented in the B2B context (*Salesforce* case).

The main answer to RQ3 can be found in Paper D. Based on insights derived from analyzing the *Salesforce* case, it shows how platform owners can guide the platform ecosystem's evolution with acquisitions of complementors in different strategic directions and how they can create major advancements in the evolution by creating synergies between acquisitions and proprietary developments. It also provides insights on how to address the resulting challenges with regard to the implications of acquisitions on the acquired complementors and customers. As a complement to the latter, Paper E focuses on the implications of acquisitions on the non-acquired complementors. Specifically, the paper links two literature streams on platform owner's acquisitions and market entry to derive three constructs which require the special attention of platform owners conducting acquisitions. Besides this, Paper A also provides a partial answer to RQ3 by illustrating the importance of acquisitions in the evolution of platform ecosystems.

3.2 Papers of the Dissertation

In the following, a brief description of each paper is provided. This includes the bibliographic information as well as a short explanation of each paper's research objective, research method, findings, and contribution to the dissertation.

3.2.1 Paper A

Citation

Staub, N., Haki, K., Aier, S., Winter, R., & Magan, A. (2021). *Evolution of B2B Platform Ecosystems: What Can Be Learned from Salesforce*? Proceedings of the 29th European Conference on Information Systems (ECIS 2021), A Virtual AIS Conference.

Research Objective

There is little evidence in existing research on how platform ecosystems develop and thrive over time indicated by a limited number of studies focusing on platform ecosystem dynamics and evolution (de Reuver et al., 2018; Rietveld & Schilling, 2021). The majority of existing studies on platform ecosystem evolution focus on distinct technical (e.g., different types of application programming interfaces to attract complementors) or social (e.g., relations between actors) aspects. In addition, scholars often focus on consumer-focused platform ecosystems as well as on the platform owner due to its role as the platform ecosystem's orchestrator.

Paper A aims to complement these studies with insights on how the B2B platform ecosystem evolves as a co-evolutionary process of technical (related to the digital platform's technology and functionalities) and social (related to the activities and contributions of the ecosystem's actors). The paper follows a multi-actor approach and considers the evolutionary dynamics of the platform ecosystem from the perspective of all involved actors (i.e., the platform owner, complementors, and customers).

Research Method

Platform ecosystem evolution is typically investigated with an in-depth study of a platform ecosystem (Rietveld & Schilling, 2021; Staykova & Damsgaard, 2017), which is why Paper A follows a single case study approach (Yin, 1989). *Salesforce* was chosen as the case due to its long history as a platform ecosystem as well as the large number of existing complementors and customers. To collect data, 15 semi-structured interviews were conducted with representatives of the platform owner, complementors, and customers. Process theory (Markus & Robey, 1988; Mohr, 1982; Pettigrew, 1997) was employed to analyze the longitudinal process of platform ecosystem evolution at *Salesforce*. After coding for the major events, their antecedents and outcomes, and the relationships of the engaged actors, codes were categorized into higher level meta-codes as part of an exploratory process in step-by-step coding of data (Eisenhardt, 1989).

Findings

After conducting the coding procedure in an iterative fashion, three dimensions of platform ecosystem evolution were identified, namely the *extension of the platform core technology*, the *extension of the platform's functional scope*, and the *industry-specific specialization of the platform*. While the first two dimensions were evident from the beginning, the latter emerged over the last five years. Further, three cross-dimension levers were revealed, namely *proprietary developments*, *acquisitions*, and *partnerships and alliances*, which were employed by the platform owner to drive the platform ecosystem's evolution.

Contribution to the Dissertation

Paper A provides insights on the main evolution steps of a leading and thriving B2B platform ecosystem in the enterprise software industry. This serves as an important foundation for analyzing different types of guidance available to platform owners (e.g., different levers to guide the evolution). The paper specifically illustrates how a platform owner can engage complementors in various ways and highlights the importance of acquisitions in platform ecosystem evolution.

3.2.2 Paper B

Citation

Staub, N., Haki, K., Aier, S., & Winter, R. (2022). Governance Mechanisms in Digital Platform Ecosystems: Addressing the Generativity-Control Tension. *Communications of the Association for Information Systems*, *52*(1), 906-939.

Research Objective

A key challenge of platform owners is to simultaneously facilitate platform participants to cocreate value whilst also retaining some control over how these value cocreation processes take place, such that simultaneously fostering generativity and control (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013). To address this tension in a structured way, platform owners rely on a purposefully designed governance structure (Tiwana, 2014), which is implemented through a set of mechanisms (Schilling, 2002). A variety of governance mechanisms have been discussed in the existing research (e.g., gatekeeping, pricing, boundary resources). The majority of studies focus on individual mechanisms and a plethora of different contexts, resulting in a fragmented body of knowledge.

Paper B aims to consolidate the existing research on platform governance mechanisms. Specifically, it aims to provide a coherent overview of the governance mechanisms which are most relevant to the generativity-control tension along with each of the major mechanisms' effects in fostering each of the tension's two constituent aspects.

Research Method

Considering the research objective, a structured literature review (Webster & Watson, 2002) was considered appropriate. The AIS basket of senior scholars' journals for all years until mid-2021 and the proceedings of the International Conference on Information Systems (ICIS) from the years 2015 until 2020 were included. The *Web of Science* and *AIS Electronic Library* (*AISeL*) databases were searched for relevant papers employing a search string that contained variations for the terms "platform" and "ecosystem" in both the title and abstract. After applying the exclusion criteria, the final literature set consisted of 122 papers. An analysis framework was developed and applied to identify the major governance mechanisms in the existing research as well as their application in dealing with the generativity-control tension. The analysis framework to code the governance mechanisms and their effects was inspired by Tiwana's (2014) framework. However, it also included additional perspectives such as the boundary resources model of Ghazawneh and Henfridsson (2013).

Findings

Paper B consolidates fragmented academic discourses on platform governance mechanisms that have been accumulated in different literature streams. The paper provides an overview of the governance mechanisms most relevant to generativity and control, and presents these mechanisms in a comprehensive framework that consists of three pillars, namely *platform boundary resources*, *platform rules*, and *ecosystem identity*. While existing research discusses many governance mechanisms towards either generativity or control, this paper shows how major governance mechanisms can be applied by platform owners to account for both aspects of the generativity-control tension. Further, the paper's findings highlight the importance of contextual factors when designing and implementing governance mechanisms as well as their mutual interrelatedness when applied in a portfolio.

Contribution to the Dissertation

The derived governance mechanisms and their effects on generativity and control show how platform owners can dynamically guide the platform ecosystem's evolution and enable it to respond to changing market conditions. Besides this, Paper B provides several avenues for future research on platform governance, concerning both the individual effects of a particular governance mechanism as well as the collective effects of several mechanisms when applied in a portfolio. Moreover, the resulting understanding of what the major mechanisms are serves as a basis for the detailed investigation of the required activities to implement the mechanisms in Paper C.

3.2.3 Paper C

Citation

Staub, N. (2023). Implementation of Platform Governance Mechanisms: Insights from a B2B Platform Ecosystem. In S. Za, R. Winter, & A. Lazazzara (Eds.), *Sustainable Digital Transformation: Paving the Way Towards Smart Organizations and Societies* (pp. 237-252). Cham: Springer

Research Objective

To repeatedly align all the ecosystem actors' interests, platform owners rely on a carefully defined governance structure (Tiwana, 2014), which is implemented through a portfolio of mechanisms (Schilling, 2002). Scholars have recently called for a more detailed view on the implementation of platform governance mechanisms to gain a deeper understanding of the specific activities available to platform owners to implement each mechanism (Jacobides et al., 2018; McIntyre & Srinivasan, 2017).

Paper C answers this call by providing insights about platform owners' main activities to implement governance mechanisms. The paper focuses on the underresearched B2B context, as one exemplary context of platform ecosystems.

Research Method

An in-depth study is used to address the given research objective. Specifically, data was collected by means of semi-structured interviews with experts in the *Salesforce* ecosystem. Similar to Paper A, a total of 15 interviews with representatives of the platform owner, complementors, and customers were conducted and data was analyzed by employing process theory. The codes were again categorized into higher level meta-codes in step-by-step coding of data (Eisenhardt, 1989).

Findings

Paper C illustrates that *Salesforce* as the platform owner relies on several major proprietary developments or acquisitions to implement the platform governance mechanisms. For example, to provide more targeted application programming interfaces, *Salesforce* acquired a leading integration technology (i.e., *MuleSoft*) with a marketplace for APIs and several interface builders. The paper provides detailed empirical accounts on *Salesforce's* activities to implement each of the major governance mechanisms.

Contribution to the Dissertation

Paper C builds on Paper B by providing insights on how platform governance mechanisms to guide platform ecosystem evolution can be implemented. The coherent overview of *Salesforce's* main implementation activities supports B2B platform owners in implementing these mechanisms in their specific context. Further, the paper contributes to the scarce literature stream on B2B platform ecosystems. In particular, it provides indication that the implementation of these governance mechanisms can be different in B2B platform ecosystems as compared to consumer-focused platform ecosystems, which should be examined in more detail by future research.

3.2.4 Paper D

Citation

Staub, N., Haki, K., Aier, S., Winter, R., & Magan, A. (2021). Acquisition of Complementors as a Strategy for Evolving Digital Platform Ecosystems. *MIS Quarterly Executive*, *20*(4), 237-258.

Research Objective

Platform ecosystems evolve in an emergent way with regard to the platform owner's constant improvement of the digital platform's technology and functionalities, and in respect to complementors' diverse contributions as well as customers' ever-changing requirements. A platform owner's ability to keep up with fast and diverging technological changes through internal innovation is limited because proprietary developments are often time-consuming and uncertain. Therefore, platform owners often opt for acquiring complementors to include their already-developed innovation and capabilities to the platform as an addition to proprietary developments. However, platform owners encounter various challenges in employing acquisitions in a strategic way and in leveraging acquisitions to enable major advancements in the platform ecosystem's evolution.

Paper C aims to provide guidance for digital platform owners on how to employ acquisitions as a strategy and how to manage the resulting implications of acquisitions on acquired complementors and customers.

Research Method

Similar to Paper A and Paper C, an in-depth study of *Salesforce* was conducted. *Salesforce's* evolution has been considerably influenced by more than 60 acquisitions made by the platform owner. Compared to Paper A and Paper C, four additional interviews were added to the dataset, resulting in a total of 19 interviews. Process theory (Markus & Robey, 1988; Mohr, 1982; Pettigrew, 1997) was employed to analyze the longitudinal process of platform ecosystem evolution through acquisitions at *Salesforce*. After coding for major events (i.e., proprietary developments and acquisitions), their antecedents and outcomes, and the relationship to the engaged actors, codes were categorized into higher level meta-codes as part of an exploratory process in step-by-step coding of data (Eisenhardt, 1989).

Findings

The paper conceptualizes *Salesforce's* acquisitions and shows that *Salesforce* employed acquisition as a strategy (to drive the ecosystem's evolution in distinct directions) and as a mechanism (to create new or boost existing proprietary developments). Further, the acquisition-related challenges with regard to customers and acquired complementors are highlighted. Finally, the paper provides four specific recommendations to platform owners on how to acquire complementors and how to manage the resulting implications on the ecosystem's actors.

Firstly, platform owners are recommended to deliberately delineate a strategic portfolio of acquisitions in various, complementary directions with regard to the stakes and interests of all the ecosystem actors. *Salesforce* did so in three distinct directions, namely the *extension of the platform core technology*, the *extension of the platform's functional scope*, and the *industry-specific specialization of the platform*.

Secondly, platform owners are recommended to employ acquisitions as a lever to initiate totally new or reinforce existing proprietary developments. *Salesforce* incorporated its acquisitions into its proprietary developments and eventually turned them into the platform owner's own technological and functional competencies.

Thirdly, platform owners are recommended to continuously keep the coherency and consistency of platform offerings to customers regardless of the acquisitions' considerable diversity. This specifically applies to those platform types that aim to create a one-stop-shop of platform offerings, similar to *Salesforce* with its comprehensive *Customer 360* overview providing customers with a single access point to all products and services.

Finally, platform owners are recommended to opt for integration of acquired complementors into their existing technologies and business model in a flexible and case-by-case manner. *Salesforce* approached the integration of acquired complementors based on their distinct characteristics with respect to both technical (e.g., infrastructure) or business (e.g., branding or licensing) aspects.

Contribution to the Dissertation

Paper D contributes to the dissertation's objectives by illustrating how platform owners can employ acquisitions as a strategy to enable rapid growth of their platform's technology and functionalities. It also provides important insights on acquisitions' implications on the ecosystem's internal dynamics with regard to acquired complementors and customers. These findings support platform owners in guiding the evolution of their platform ecosystems through acquisitions.

3.2.5 Paper E

Citation

Staub, N., Haki, K., & Aier, S. (2022). *Opportunity or Threat: A Complementors' Perspective on Platform Owner's Acquisitions*. Proceedings of the 30th European Conference on Information Systems (ECIS 2022), Timisoara, Romania.

Research Objective

Next to their undeniable potential, platform owner's acquisitions also entail risks as they may unintentionally intervene in the ecosystem's internal dynamics. While a group of non-acquired complementors may benefit from an acquisition through additional resources to perform their development work, others may perceive an acquisition as the platform owner entering into competition with them to appropriate a share of their revenue (Foerderer, Kude, Mithas, & Heinzl, 2018; Li & Agarwal, 2017). The latter specifically applies to the group of complementors who are affected by acquisition of one of their competing complementors in the same niche.

While there is surprisingly little research on the effects of acquisitions in platform markets, a research stream on platform owner's entry to its own complementary markets discusses comparable market interventions. The effects on complementors documented in these studies are mixed; some identify positive effects through, for instance, attention spillover effects from increasing customer demand (Foerderer et al., 2018) and others reveal negative effects, for example due to the platform owner increasing the entry frequency (Cennamo, Gu, & Zhu, 2018a). The existing studies focus on a variety of different, mainly consumer-oriented, platform contexts.

The objective of Paper E is to develop a research design that allows to examine the effects of platform owner's acquisition of complementors (i.e., market entry through acquisitions) on the non-acquired complementors in the B2B platform ecosystem context. Specifically, the research design should enable to answer the question of whether complementors affected by the acquisition of one of their competitors (*competing group*) react differently than the other complementors (*non-competing group*).

Research Method

A survey research design was considered appropriate to capture a large number of non-acquired complementors' reactions after platform owner's acquisitions. By building on existing research and following MacKenzie et al.'s (2011) guidelines, Paper E aims to provide major constructs which might be affected by platform owner's market entry through acquisitions. In addition, a pre-test should be conducted with researchers who are familiar with the research field as well as with a few complementors from the *Salesforce* platform ecosystem (i.e., members of the target group).

Findings

With reference to the literature on platform owner's market entry and from the complementors' perspective, Paper E derived three major constructs that may potentially be impacted by platform owner's acquisitions: (1) market share (Ceccagnoli et al., 2012; Cennamo & Santaló, 2019), (2) variety (Boudreau, 2012; Wareham, Fox, & Giner, 2014), and (3) quality (Cennamo & Santaló, 2019; Wareham et al., 2014) of complements. These constructs may require the specific attention of platform owners when conducting their acquisitions. As part of an ongoing research project, these constructs are to be tested by future research.

Contribution to the Dissertation

Paper E successfully connects the discourse on two important topics that have been previously only analyzed in isolation, namely the acquisitions and the market entry of platform owners. The paper also outlines a research design that can be followed in future research. Further, the derived constructs provide preliminary insights on acquisitions' implications on the non-acquired complementors. This may help platform owners to balance their own interests and those of the complementors as well as to moderate potential negative effects. Eventually, the insights on the implications of acquisitions can help platform owners inform targeted acquisition strategies.

4 Discussion and Conclusion

Digital technologies have facilitated the reorganization of industries around platforms and transformed many firms into either platform owners or providers of complements in a platform ecosystem. One considerable gap in literature is the limited knowledge on platform owner's governance mechanisms and acquisitions to guide the evolution of the platform ecosystem, specifically in the B2B context. To address this gap, three specific research questions were identified and a case study-focused research design with five constituent papers was developed.

4.1 Contributions

This dissertation provides novel insights on how platform owners can employ governance mechanisms and acquisitions to guide the evolution of their ecosystems. The dissertation also sheds light on the platform ecosystem evolution as a process. Figure 2 shows the main contributions of each of the five papers as well as the dependencies among these contributions.

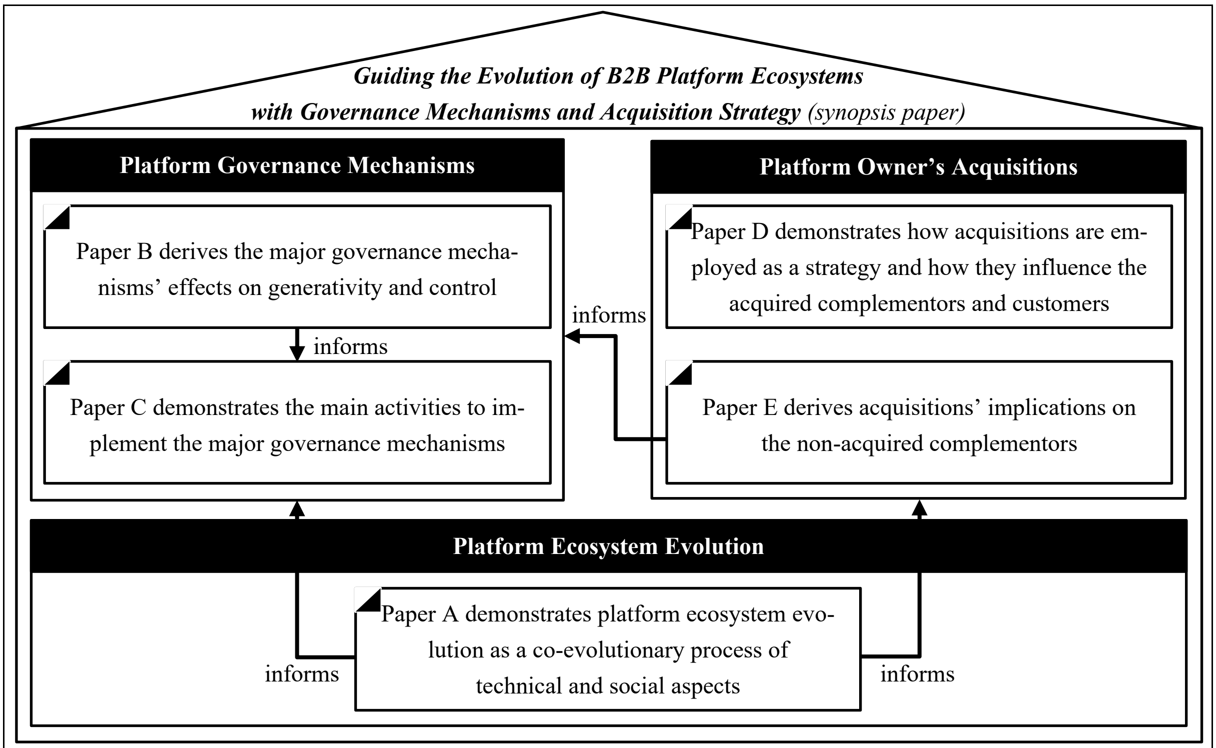

Figure 2: Contributions of the Dissertation Papers

Platform Ecosystem Evolution. The first objective was to shed light on platform ecosystem evolution as a co-evolutionary process of technical and social aspects and from a multi-actor perspective (*RQ1*). Paper A contributes to research on platform ecosystem evolution by demonstrating the evolution of *Salesforce*, a leading company in the global CRM market and a thriving B2B platform ecosystem in the enterprise software industry. Specifically, it provides detailed insights on the major milestones and turning points in the evolution. This indicates how a platform owner can embrace its role as an orchestrator by incentivizing and controlling complementors in various ways (*arrow from Paper A to Platform Governance Mechanisms box*). The analysis of platform ecosystem evolution at *Salesforce* also brings to the forefront the dominant role that acquisitions can play in this evolution (*arrow from Paper A to Platform Owner's Acquisitions box*).

Platform Governance Mechanisms. The second objective was to understand how platform owners can guide the evolution of their platform ecosystems through continuous adaptation of governance mechanisms to simultaneously foster generativity and control (*RQ2*). By conducting a structured literature review, Paper B provides a comprehensive overview of how governance mechanisms are employed to address the generativity-control tension. While existing research mainly discusses such mechanisms either with regard to generativity or control, the paper gives rise to the double-sidedness of governance mechanisms, indicating that most of them concern both aspects of the tension depending on the specific context. Informed by these insights (*arrow from Paper B to Paper C*) and with an in-depth study of *Salesforce*, Paper C derives major activities by platform owners to implement governance mechanisms in the B2B context, illustrating that this usually requires a broad range of resources along with considerable efforts of platform owners (e.g., a large proprietary development). Overall, these findings contribute to the literature on platform ecosystem governance, specifically concerning its role in continuously fostering generativity and/or control during the evolution of a platform ecosystem.

Platform Owner's Acquisitions. The third objective was to understand how a platform owner can guide the platform ecosystem's evolution through acquisition of complementors (*RQ3*). As an in-depth study of *Salesforce*, Paper D illustrates how acquisitions can be employed as a strategy in different directions and how they can enable major advancements in the evolution of the platform ecosystem through synergies with proprietary developments. Further, the paper also provides insights on the implications of acquisitions on the ecosystem's internal dynamics with regard to customers and acquired complementors. The latter is complemented by Paper E, which outlines a research design to analyze platform owner's acquisitions on the non-acquired complementors. Specifically, it derives three major constructs (i.e., market share, variety, and quality of the complements provided by non-acquired complementors) that may potentially be influenced by platform owner's acquisitions of complementors. In doing so, the paper connects two literature streams, namely on platform owner's acquisitions and platform owner's market entry. It further argues that a group of the non-acquired complementors might perceive platform owner's acquisitions as the platform owner entering into competition with its own complementors (Zhu, 2019). Therefore, platform owners are required to change existing and/or create new incentives for the (potentially negatively) affected complementors by adjusting the current focus of governance mechanisms (*arrow from Paper E to Platform Governance Mechanisms box*). Overall, these findings contribute to the scarce literature on (i) acquisitions in platform markets, and concerning the implications on the non-acquired complementors on (ii) platform owner's market entry from an acquisition perspective.

B2B Platform Ecosystems. In answering each of the three research questions, the focus was on platform ecosystems in the B2B context. Therefore, with its findings on governance mechanisms and acquisitions to guide the evolution of platform ecosystems, the dissertation contributes to the emerging literature on B2B platform ecosystems. In the following, it will be discussed to what extent the findings are transferrable to other contexts or are distinct to this context.

4.2 Generalizability and Limitations

A considerable portion of the dissertation's insights were derived from analyzing the *Salesforce* case as the example of a thriving B2B platform ecosystem. Given its long history and remarkable success as a platform ecosystem, it can be argued that the *Salesforce* case is promising for analyzing the evolution of platform ecosystems. Nevertheless, it should be discussed to what extent certain findings need to be reconsidered and contextualized when applied to other contexts.

Salesforce represents one B2B platform ecosystem in the enterprise software industry. Beyond enterprise software, the B2B context includes other industries that are being dominated by platform ecosystems, such as manufacturing (Pauli et al., 2021) or Oil and Gas (Matzner et al., 2021). There is evidence that several of the findings can be transferred from B2B platform ecosystems in the enterprise software industry to B2B platform ecosystems in other industries, but not to consumer-focused platform ecosystems (e.g., *Apple iOS*, *Google Android*):

(i) The platform owner engages a wide range of different complementor types in the development of the platform's technology and functionalities (e.g., native software developers, open-source software developers, partners that integrate existing offerings, implementation consultants). This can also be observed in the manufacturing context, where complementors additionally might be hardware providers or machine manufacturers (Pauli et al., 2021). This is different from consumer-focused examples of platform ecosystem such as *Apple iOS* where app developers are usually the prevailing complementor type.

(ii) Many successful B2B platform owners provide a large portion of the products and services offered on the platform themselves, which leads to complementors focusing mainly on side offerings. This is in contrast to *Apple iOS*, where the platform owner offers only a few of the several thousand applications listed on its marketplace.

(iii) There is also a relatively higher need for integration of the platform's diverse offerings in the B2B context compared to consumer-focused platform ecosystems. For example, as illustrated by Paper D, maintaining the coherency and consistency of platform offerings is a key challenge in the *Salesforce* ecosystem, where the platform owner aims to provide its clients with a one-stop shop for enterprise software. This comes along with a high need for technical integration of platform offerings with customers' diverse applications. This challenge might not be so prominent for platform owners in other settings. In *Apple iOS* or *Google Android*, customers may not necessarily require consolidation and consistency of the platform's offerings because – unlike enterprise software – they can be used more independently.

Overall, these are just three important characteristics to illustrate that B2B platform ecosystems have distinct particularities, which in turn lead to distinct evolutionary dynamics, governance requirements, and motivations for acquisitions. For example, the need for seamless integration led *Salesforce* to conduct a major acquisition of a leading integration platform (i.e., *MuleSoft*). *SAP* also invested considerable resources into the development of its *SAP Integration Suite*, which ensures integration with other cloud or on-premises systems. Another example is that B2B platform owners need to take the specific complementor groups into account when designing appropriate governance mechanisms. To do so, *Salesforce* dynamically applies different licensing models to different types of complementors (i.e., independent software vendors (ISVs) are required to share 15% and original equipment manufacturers (OEMs) 25% of their revenue generated in the *Salesforce* ecosystem).

The dissertation faces some limitations due to the nature of the applied methodology, specifically with regard to the type of data collection. The dissertations' insights have been informed by one major case (*Salesforce*). Other platform ecosystems might evolve through different evolution dimensions or levers employed by the platform owner such as partnerships, which were not the focus of this dissertation. Analyzing other platform ecosystems might help derive additional insights, for example on the activities to implement governance mechanisms or the motivations of platform owners to conduct acquisitions. Besides this, it needs to be acknowledged that data on the *Salesforce* platform ecosystem was collected only from a retrospective. While this might be of minor importance for the platform owner, it could result in limited knowledge on former complementors. Lastly, concerning the literature review conducted in Paper B, the focus was mainly on IS outlets. However, platform ecosystems are a multidisciplinary topic and have also been studied in the management and organization science literature. Therefore, including these outlets to the scope of an exhaustive literature review would potentially result in additional insights on platform governance mechanisms.

4.3 Implications for Research

Platform Governance Mechanisms. This dissertation offers several implications for future research. In terms of platform governance, the findings illustrate the double-sidedness of governance mechanisms and that most of them concern both generativity and control depending on the given context (e.g., platform type, maturity stage, ecosystem dynamics). The findings further highlight the mutual relatedness of multiple mechanisms when applied in a portfolio. Therefore, as suggested in Paper B, future research could build on this by providing insights on the context-dependency of an individual mechanism or by focusing on the interrelatedness and collective effects of multiple mechanisms when applied in a portfolio. Specifically, regarding the individual effects, future research may (i) study the individual effects of a governance mechanism (either towards generativity or control depending on various platform contexts) by conducting in-depth case studies or (ii) study the dynamics in the individual effects of a governance mechanism (switching between generativity and control depending on time episodes of the same platform context) by employing a longitudinal approach. Regarding the collective effects, future research could build on this by (i) studying the collective effects of a portfolio of governance mechanisms by comparing it across various platform contexts or (ii) studying the mechanics of governance mechanisms in a portfolio by conducting case surveys and simulations.

Platform Owner's Acquisitions. The dissertation also has implications for research on acquisitions made by platform owners, specifically regarding acquisitions of complementors. Given the few studies in existing research, one promising avenue for scholars is to extend the dissertation's findings on the implications of acquisitions for the ecosystem's internal dynamics. In particular, future research may complement the dissertation's preliminary results on platform owner's market entries from an acquisition perspective. Three constructs were derived which might be subject to impacts of such acquisitions. This is an important endeavor as the potential negative effects of acquisitions might sometimes go under the radar during rapid growth phases of platforms. To analyze this, future research could conduct complementor surveys with a large number of complementors or adopt a qualitative approach to collect details on the reactions of a selection of complementors impacted by platform owner's acquisitions.

Furthermore, the findings contribute to a more granular understanding of the distinct particularities of acquisitions in platform markets which do not apply to acquisitions in conventional markets. Future research could build on these insights by further refining these characteristics through insights from other B2B platform ecosystem contexts. This may facilitate the derivation of classes of acquisitions based on major acquisition drivers and outcomes. The latter, together with further insights on the effects of acquisitions, could help develop a theory for the strategic conduct and integration of acquisitions in platform markets.

B2B Platform Ecosystems. In addition to extending the dissertation's main findings in the area of evolution guidance, a fruitful avenue for future research is to build on the dissertations' contributions on B2B platform ecosystems by examining whether the findings would hold true in other B2B platform ecosystem evolution contexts. It would be interesting to see to what extent the dimensions of platform ecosystem evolution are similar in other B2B contexts or whether there are additional or different dimensions (e.g., in the manufacturing industry due to the inclusion of physical devices). Similarly, there might be other activities to implement governance mechanisms as well as other motivations to conduct acquisitions and other outcomes thereof. In doing so, given the dissertation's rich insights, the applied longitudinal, multi-actor approach, focusing on both technical and social aspects, has proven to be promising for the in-depth case study of the evolution of platform ecosystems.

4.4 Implications for Practice

The insights on B2B platform ecosystem evolution can provide guidance for the design and management of B2B platform ecosystems in a continuously changing environment. The derived dimensions of evolution in Paper A provide a strategic roadmap to platform designers and managers, that is based on learnings accumulated from a leading company like *Salesforce* and specifies the main directions of evolution and advancement for platform ecosystems.

Further, the insights on platform governance mechanisms help platform owners to continuously address the tension of generativity (to facilitate innovation) vs. control (to enable structural stability). Platform owners benefit from a comprehensive overview of the major governance mechanisms along with each of the mechanisms' effects in regard to generativity and control. This may serve as guidance for digital platform designers that are considering building a digital platform (and define an appropriate governance structure) as well as for digital platform managers that aim to identify possible adaptations of their current portfolio of governance mechanisms. Further, the dissertation shows the double-sidedness of governance mechanisms in terms of their ability to foster either generativity or control depending on the given context, encouraging platform owners to carefully take the particular contextual conditions into account. In addition, the dissertation indicates that governance mechanisms are highly interrelated and mutually dependent, requiring practitioners' attention when applied in a portfolio. Moreover, the dissertation provides detailed empirical accounts on the major activities of *Salesforce* to implement each of the major governance mechanisms in the B2B context, which should provide further guidance to practitioners implementing the mechanisms.

The dissertation's findings also highlight the role of acquisitions in guiding platform ecosystem evolution. The dissertation provides guidance to platform owners on how to acquire complementors as well as on how to manage the resulting implications on the ecosystem's internal dynamics. Regarding the former, detailed empirical data on *Salesforce's* motivation to conduct acquisitions may support platform owners in evaluating potential acquisition targets. In addition, the dissertation shows how platform owners can employ acquisitions as a strategy to guide the platform ecosystem in different strategic directions and how they can create synergies with existing proprietary developments to enable major advancements in the evolution of the platform ecosystem.

With respect to the latter, the implications on the internal dynamics of the ecosystem, the dissertation shows key challenges platform owners might encounter. With regard to customers, platform owners in the B2B context are recommended to maintain the coherency and consistency of the platform's offerings. Further, a flexible approach to integration can help dealing with acquired complementors. Moreover, the dissertation specifically highlights the importance of considering the (potentially negative) effects of acquisitions on the non-acquired complementors. The dissertation provides three constructs that might call for platform owners' particular attention when conducting acquisitions of complementors.

While these implications were mainly targeted for platform owners, the dissertation's insights might also help complementors. Specifically, they might support complementors in their strategic positioning and competitive moves in platform ecosystems, for example through a more detailed understanding of the potential motivations of platform owners to employ or alter certain governance mechanisms or to conduct acquisitions.

Part B – Papers of the Dissertation

Part B presents the five research papers of the dissertation. The papers were reformatted for a consistent presentation, figures and tables were numbered in a unified sequence, and references were merged into a single list. The text of the papers, however, was not changed.

Paper A – Evolution of B2B Platform Ecosystems: What Can Be Learned from Salesforce?

Table 4: Bibliographic Metadata Paper A

Title	Evolution of B2B Platform Ecosystems: What Can Be Learned from Salesforce?
Authors	Staub, Nicola[1]; Haki, Kazem[1]; Aier, Stephan[1]; Winter, Robert[1]; Magan, Adolfo[2] [1]University of St.Gallen, Institute of Information Management, St.Gallen, Switzerland [2]salesforce.com, Munich, Germany
Selected approach for order of authors	Sequence determines credit
Publication outlet	Proceedings of the 29th European Conference on Information Systems (ECIS 2021), A Virtual AIS Conference
Publication type	Conference paper
Publication year	2021
Rating (Jourqual 3)	B
Publication status	Published
Acknowledgements	This work has been supported by the Swiss National Science Foundation.

Abstract

Platform ecosystems are complex ecologies of firms with individual competencies and collective objectives. The sustainable evolution of platform ecosystems is thereby contingent on taking advantage of the individual competencies of the ecosystem's actors toward obtaining collective objectives. To learn more about platform ecosystem evolution and dynamics, we study Salesforce, a leading and thriving B2B platform ecosystem. We find that the ecosystem's evolution was closely defined not only by the platform owner's orchestrating initiatives, but also by its complementors' and customers' competencies and particularities. Specifically, we derive three distinct dimensions of evolution, namely the extension of the platform core technology, the extension of the platform's functional scope, and the industry-specific specialization of the platform. We further identify three cross-dimension levers, namely proprietary developments, acquisitions, as well as partnerships and alliances, which were employed by the platform owner to drive its platform ecosystem's evolution.

Keywords

Platform Ecosystem, Digital Platform, Evolution, Enterprise Software

A.1 Introduction

Platform ecosystems are becoming the new organizing logic of many industries as exemplified in telecommunications (e.g., iOS, Android), video games (e.g., PlayStation, Xbox), and enterprise software (e.g., Salesforce, SAP) (de Reuver et al., 2018; Yoo et al., 2010). Each platform ecosystem is marked by a digital platform as a technological foundation that offers a core functionality shared by the modules that interoperate with the respective platform (Baldwin & Woodard, 2009; Tiwana et al., 2010). Beyond the technical aspect, platform ecosystems are socio-technical phenomena as each digital platform functions as the nexus of its ecosystem of peripheral firms or individuals that produce extensions complementary to the given platform (Jacobides et al., 2018). Therefore, as a new way of organizing interdependent innovation activities (Cennamo & Santaló, 2019; Yoo, Boland, Lyytinen, & Majchrzak, 2012), a platform ecosystem is orchestrated by a *platform owner* to leverage the competencies of a plethora of *complementors* to co-create and offer specialized products and services to *customers* (Blaschke, Riss, & Aier, 2019; Ghazawneh & Henfridsson, 2013; Haki, Blaschke, Aier, & Winter, 2019). As such, the evolution of a platform ecosystem is characterized as a co-evolutionary process with complex interactions between the technical (related to the digital platform's technology and functionalities) and the social (related to the activities and contributions of the ecosystem actors) aspects (e.g., Selander et al., 2013).

Platform ecosystems need to constantly evolve to maintain and/or improve their competitive position in an ever-changing environment. From a platform owner's perspective, this not only requires continuously developing the platform's technology and functionalities, but also constantly aligning the diverse interests and competencies of the ecosystems' heterogeneous actors to ensure the ecosystem's sustainable evolution (Tiwana et al., 2010). There is a widespread consensus in existing research that successfully managing a platform ecosystem is an inherently dynamic process that requires substantial resources and coordination (Gawer, 2014). Nonetheless, there is little evidence on how platform ecosystems develop and thrive over time indicated by a limited number of studies focusing on platform ecosystem dynamics and evolution (de Reuver et al., 2018; Rietveld & Schilling, 2021). Further, essential contributions of all the ecosystems' heterogeneous actors significantly delineate the platform ecosystem's evolution (Selander et al., 2013; Yoo et al., 2010). Nevertheless, extant research predominantly investigates digital platforms and platform ecosystems from the platform owner's perspective due to its orchestrator role in the ecosystem (de Reuver et al., 2018; Selander et al., 2013). Therefore, studying the long-term evolution of platform ecosystems from the perspective of all ecosystem actors (i.e., platform owner, complementors, and customers) is of considerable value for both research and practice to better understand the long-term implications of technology-related and ecosystem's actors-related design decisions.

To bridge this void, this study aims to illustrate how a platform ecosystem evolves in a co-evolutionary process through which the technology and functionalities of the digital platform (the technical aspect) and the diverse activities and contributions of the network of ecosystem actors (the social aspect) mutually influence one another. While a considerable portion of existing platform research is centered around consumer-focused or trading platform ecosystems (e.g., Apple's iOS, Google's Android, Amazon.com), our focus is on B2B platform ecosystems. Several of the particularities of B2B ecosystems make it particularly suitable for studying platform ecosystem evolution from a co-evolutionary perspective. For example, the high dependency of a platform owner on complementors and customers (e.g., Ceccagnoli et al., 2012; Foerderer et al., 2019). Therefore, we specify the following research question: *How does a B2B platform ecosystem evolve in a co-evolutionary process with respect to its technical (related to the digital platform's technology and functionalities) and social (related to the activities and contributions of the network of ecosystem actors) aspects*?

To answer the research question, we conduct an exploratory study on the case of Salesforce, a leader in the global CRM market and an evolving B2B platform ecosystem that has considerably thrived over the last years. Our study provides process theory-based insights into Salesforce's main evolution steps and specifies these steps in three overarching dimensions of evolution, namely the *extension of the platform core technology*, *extension of the platform's functional scope*, and *industry-specific specialization of the platform*. We further reveal that Salesforce as the platform owner employed some cross-dimension levers (i.e., *proprietary developments*, *acquisitions*, and *partnerships and alliances*) to drive the evolution of the ecosystem.

A.2 Research Background

In this section, we introduce our conceptualization of platform ecosystems, the main discourses on platform ecosystem evolution, and the particularities of B2B platform ecosystems.

A.2.1 Platform Ecosystems

As the nexus of platform ecosystems, digital platforms are software-based technological foundations upon which peripheral business actors produce their own products and services (Gawer, 2009; Tiwana et al., 2010). Although digital platforms as IT artefacts have an essentially technical basis, they do not exist in isolation (Bonina, Koskinen, Eaton, & Gawer, 2021; de Reuver et al., 2018). As socio-technical systems, the technology and functionalities of the digital platform are surrounded by complex ecologies of firms with individual and collective, intertwined interests (Bonina et al., 2021; Cennamo & Santaló, 2019; Jacobides et al., 2018). In such complex ecologies of firms, while the platform *owner* offers the platform core, *complementors* extend the core through their complementary add-ons (Jacobides et al., 2018). Since connecting to the platform enables complementors to gain access to the platform's customers (Cennamo & Santaló, 2019), they have a common interest in the prosperity of the central platform for materializing their own products or services (Selander et al., 2013). Ultimately, *customers* derive certain values from the offerings jointly provided by the platform owner and complementors. The platform owner in its role as an orchestrator of the entire ecosystem simultaneously needs to improve the technological core while constantly aligning the interests and competencies of all actors involved in the ecosystem (Tiwana et al., 2010). The resulting co-evolution of technical and social aspects creates self-reinforcing feedback loops that may affect the ecosystem in turning participants both into collaborators and competitors (Moore, 1993; Selander et al., 2013; Walley, 2007; Wareham et al., 2014).

A.2.2 Platform Ecosystem Evolution

Following a static approach has been somewhat dominant in the existing digital platforms and platform ecosystems research (de Reuver et al., 2018) resulting in only a limited number of studies on platform ecosystem evolution (Gawer, 2014; Rietveld & Schilling, 2021; Staykova & Damsgaard, 2017). Nevertheless, providing thorough insights into the sustainability and success of platform ecosystems requires a close investigation of the journey and the evolution path along which platform ecosystems develop and thrive over time. Thus, recent work has already begun to acknowledge that platform ecosystems are dynamic and consider them as evolving phenomena. In doing so, existing research particularly focuses on specific technical or social aspects in theorizing platform ecosystem evolution. From a technical perspective, existing research, for instance, discusses the continuous addition of new features to the platform (e.g., Eisenmann et al., 2011) or the ongoing modification of application programming interfaces (APIs) to alter platform access (e.g., Um & Yoo, 2016). From a social standpoint, the focus of research is specifically on the platform owner due to its role in orchestrating the ecosystem. Further, current studies also examine the evolving relationships and mutual influences between distinct groups of ecosystem actors, such as the platform owner and complementors (e.g., Lindgren et al., 2015), complementors and customers (e.g., Song et al., 2018), or customers with one another (e.g., Spagnoletti et al., 2015).

Acknowledging the importance and necessity of the provided insights by existing research into specific aspects of platform ecosystem evolution, we complement the existing research by following a co-evolutionary and multi-faceted approach to the study of platform ecosystem evolution. On the one hand, we posit platform ecosystem evolution as a co-evolutionary process between the technical (the technology and functionalities of the digital platform) and the social (the activities and contributions of the engaged ecosystem actors) aspects. On the other hand, such a co-evolutionary process can be more thoroughly comprehended when platform ecosystem evolution is studied from the perspective of all ecosystem's actors, i.e., platform owner, complementors, and customers. We do so in the understudied context of B2B platform ecosystems (e.g., Hein et al., 2019) due to their particularities in revealing the dynamics of relation between all the ecosystem's actors.

A.2.3 B2B Platform Ecosystems

Similar to consumer-focused platform ecosystems, B2B platform ecosystems employ adaptations of the innovative mechanisms for organizing complementor and customer transactions (e.g., app stores, rating systems). However, with respect to our objective to study evolution from a multi-actor perspective, B2B platform ecosystems are specifically relevant due to their particularities that put complementors and customers more to the fore front of the ecosystem. Some of these particularities are as follows: the provision of highly complex and industry specific services to customers that requires much more diligent integration of the ecosystem's complementary resources contributed by heterogeneous actors; the broader spectrum of complementary resources provided by the external actors (e.g., development, implementation, consultancy, or training); the negligible power distance between the ecosystem actors as the platform owner (e.g., Salesforce), complementor firms (e.g., Accenture), and customers (e.g., ABB) are often all big players in their respective industry; the higher complexity of customer requirements that need to be solved through a flexible integration of resources provided by both the platform owner and complementors (Blaschke et al., 2018; Ceccagnoli et al., 2012; Foerderer et al., 2019; Hein et al., 2019; Riemensperger & Falk, 2020; Schreieck et al., 2017).

A.3 Methodology

The investigation of platform ecosystem evolution requires an in-depth study of a platform ecosystem (Rietveld & Schilling, 2021; Staykova & Damsgaard, 2017) considering the digital platform itself as well as all engaged actors in the ecosystem (de Reuver et al., 2018; Tilson, Lyytinen, & Sørensen, 2010). Therefore, we opt for a single-case study approach for two reasons. First, the comprehensive study of a platform ecosystem entails the need for inclusion of all ecosystem's actor groups. Therefore, we investigate one platform ecosystem with all of its actor groups to account for an in-depth investigation of the given ecosystem. Second, due to our longitudinal perspective, a single-case study approach is suitable to study the same case at different points in time. We also adopt an exploratory perspective in our research owing to the study's objective in unfolding the underpinning co-evolutionary process in the longitudinal development of a platform ecosystem.

A.3.1 Case Selection and Description

We opt for Salesforce, a prime example of a thriving B2B platform ecosystem in the enterprise software industry. Our inquiry includes Salesforce's evolution over the course of the last 15 years, starting in 2005 when Salesforce launched its marketplace for enterprise software and began facilitating an ecosystem of external actors. Due to its long history as a platform ecosystem as well as the large number of complementors and customers in the ecosystem, the study of Salesforce specifically enables us to investigate the long-term evolution of B2B platform ecosystems from the perspectives of the different actors involved.

Salesforce's main products are advertised as a *Customer 360* with different modules related to sales, customer service, marketing, and e-commerce. All customer data can be aggregated across the different modules to create innovative cross-channel customer experiences through the combination of functionalities from different modules. When launching a commercial marketplace (*AppExchange)* in 2005, which enables complementors to sell complementary applications to Salesforce customers, Salesforce also created a developer environment (*Force.com*) upon which third-party software developers can build their applications. Until today, Salesforce has attracted more than one million registered developers on *Force.com* and more than 3’500 applications are currently offered on the *AppExchange*. Further, Salesforce initiated several collaborations with partners external to its ecosystem to integrate their offerings into the Salesforce platform ecosystem (e.g., with Microsoft to integrate its calendar). Moreover, Salesforce also relies on registered implementation consultancy providers, who support customers with respect to complex implementation projects.

With these offerings provided by the platform owner and complementors, Salesforce has attracted more than 150’000 customers, ranging from small businesses to multinational large enterprises. Customers can buy licenses for different modules on a pay-per-use basis and have the possibility to extend these modules with the applications provided by complementors. In addition, Salesforce offers several tools (e.g., a proprietary programming language) to customers to customize their modules.

In the interplay of different actors, Salesforce as platform owner plays the role of orchestrator of the platform ecosystem. However, as Salesforce strongly relies on the offerings provided by complementors and the specific requirements of a plethora of customers, the evolution of the ecosystem as a whole is defined by all actors together.

A.3.2 Data Collection

We collected data from July until October 2020 by means of semi-structured interviews to get first-hand insights from informants in the Salesforce ecosystem. We conducted 15 interviews with an average duration of 63 minutes per interview.

Due to the exploratory nature of our research, we derived interview questions based on the roles, interests, concerns, and competencies of the ecosystem’s actors to explore their contribution as well as their perspectives to the evolution of the whole ecosystem. More specifically, we intended to collect data on the following points: How does each of the actors (i.e., platform owner, complementors, and customers) understand the ecosystem (e.g., the core and side offerings); What is each actor’s role in the ecosystem and in relation to the other actors; What were the major developments in the ecosystem that considerably impacted the roles of actors and the values that they derive from the ecosystem; What were the major changes that considerably impacted the evolution of the ecosystem as a whole. In addition, in each interview we collected data about the temporal sequence of the major changes in the ecosystem to later elaborate on their relations in provoking one another.

In the following, we describe the steps that we conducted (1) before, (2) during, (3) and after the interviews to ensure a consistent data collection in line with our research objective: (1) To get a comprehensive view of the different perspectives in the ecosystem, we opted for collecting data from all three actor groups involved in the ecosystem: the platform owner (Salesforce), complementors (e.g., software developers, implementation consultancy service providers), and customers. Since Salesforce is the orchestrator of the ecosystem, we decided to conduct a large portion of the interviews with Salesforce employees in different roles. For identifying potential interviewees, requirements were business and/or technology roles in relation to Salesforce as well as in-depth familiarity with Salesforce and its ecosystem. Table 5 provides an overview of our interviewees and their organizations. To ensure consistency of the data collection procedure, we also developed a comprehensive interview guideline comprising interview questions and an introduction to the project team and objectives. Further, in accordance to our ecosystem view in data collection, we adapted the interview guideline and its constituent questions with the role of each interviewee's organization in the Salesforce ecosystem (owner, complementor, or customer). In the case of interviews with Salesforce employees, we also adapted the interview guideline depending on their functional area inside Salesforce. Prior to each single interview, we shared the interview guideline several days in advance with interviewees along with an interviewee factsheet (to collect interviewee's demographic data such as position, department, location, and years of experience). Besides the primary data collected through interviews, we also gathered secondary data including publicly available documents (e.g., business reports, news articles). The secondary data was only employed to enhance our understanding of the case, specifically on the details of the major changes in the studied platform ecosystem. (2) The majority of interviews were conducted by two researchers. We recorded all the interviews with the consent of the interviewees and later transcribed them verbatim, except for one interview for which we created notes during the interview session. (3) Next to the transcribed interviews that we used as the basis for data analysis, the researchers involved in each interview reflected on and documented the major insights that they gained from each particular interview immediately after the corresponding interview. In addition, after every few interviews, the research team had a discussion on new directions that emerged during the so far conducted interviews that we previously did not consider. The latter discussion sessions stimulated the parallel conduction of data collection and analysis steps and the results of these discussions were documented in the form of notes and visualizations.

Table 5: Organizations and Profiles of the Interviewees	
Eco-system Actors	**Organization (or pseudonym); Interviewee (Position / Unit / Experience[2])**
Platform owner (Salesforce)	*Platform owner* (Salesforce) - Program Architect Director / Customer Success Group / 20, 5 (*PO-1*) - Senior Director, Product Management / Community Cloud / 16, 5 (*PO-2*) - Vice President, Product Management / Developer Platform / 19, 10 (*PO-3*) - Senior Director, Solution Engineering / Solution Consulting / 30, 12 (*PO-4*) - Business Architect Director / Customer Service Group / 32, 5 (*PO-5*) - Senior Executive, Global Professional Services / Customer Success Group / 29, 12 (*PO-6*) - Program Architect Director / Customer Service Group / 20, 6 (*PO-7*) - Senior Executive, AppExchange & ISV Enablement / AppExchange / 19, 16 (*PO-8*)
Complementors	*Complementor* #1 (Developer): A USA-based provider of an end to end DevOps solution with more than 100 employees and offices in North America and Europe. - Chief Technology Officer / Product Development / 19, 7 (*CO-1*)
	Complementor #2 (Developer): A USA-based provider of industry-specific cloud and mobile software with more than 500 employees and offices in North America, Europe, Asia, and Latin America. - Chief Digital Transformation Officer / Customer Success & Strategy / 25, 2 (*CO-2*)
	Complementor #3 (Developer): A USA-based provider of integration software for applications, data, and devices with more than 2'000 employees and offices in North America, Europe, and Latin America. - Senior Customer Success Architect / Customer Success / 23, 10 (*CO-3*)
	Complementor #4 (Implementation consultant): A Spain-based provider of Salesforce consultancy services with more than 120 employees, offices in two countries. - Chief Executive Officer / 21, 12 (*CO-4*)

[2] Years of professional experience, years of experience in current firm.

Customers	*Customer #1:* A Germany-based producer of building materials and construction systems with more than 35'000 employees and offices in more than 85 countries. - Senior Manager, Sales Excellence / Group Marketing / 6, 6 (*CU-1*)
	Customer #2: An Ireland-based industrial gases and engineering firm with almost 80'000 employees in more than 100 countries. - Director, Applications / IT / 20, 15 (*CU-2*)
	Customer #3: A Kenya-based non-for-profit organization that has developed several funding programs to support education and to fight famine. - Founder & Sponsor Development / 30, 8 (*CU-3*)

A.3.3 Data Analysis

Next to our parallel conduction of data collection and analysis steps, we employed process theory to analyze the longitudinal process of platform ecosystem evolution at Salesforce. Similar to our research objective, process theory is frequently employed to examine how organizational phenomena evolve over time (Markus & Robey, 1988; Mohr, 1982; Pettigrew, 1997; Van de Ven & Huber, 1990). Process studies analyze three main components, namely antecedents, events, and outcomes. *Antecedents,* which trigger an *event*, consist of external (e.g., the technological and business environments) and internal (e.g., mechanisms imposed by the platform owner) contextual factors. In turn, *outcomes* are the results of each *event*. As such, a *process* represents a sequence of collective events unfolding over time to give meaning to a phenomenon's status-quo (Pettigrew, 1997). In the context of our study, each event corresponds to a major change in Salesforce's platform ecosystem that can be considered as a turning point in the way the platform ecosystem evolves and emerges over time. After coding for the main events and their corresponding antecedents and outcomes, we coded the relation between events with respect to, for instance, the engaged platform ecosystem actors in the respective event. This approach enabled us to classify these major events according to their impact on the platform and the ecosystem. For example, initially we identified several different outcomes of events from a technical perspective (e.g., improved technology, higher integration capabilities, new programming language), but also from the perspectives of the involved complementors (e.g., lower transaction fees, better enablement services, new business plan assessment) and customers (e.g., improved documentation, voting for new features, improved customer community). We then categorized the codes into higher level meta-codes as part of an exploratory process in step-by-step coding of the data (Eisenhardt, 1989). While we applied process theory to analyze the data in a structured way, the goal was not to merely derive episodes of change or to explain the antecedents and outcomes of each event, but to identify patterns that describe how the ecosystem has evolved over time. After conducting this procedure in an iterative fashion, our coding endeavor resulted in exploring three distinct *dimensions* of platform ecosystem evolution that specify in which directions, why, and how the Salesforce platform ecosystem evolved over time. Besides the distinctive platform ecosystem evolution dimensions, our coding endeavor revealed that Salesforce employed three cross-dimension *levers* in each and every of the platform ecosystem evolution dimensions that illustrate how Salesforce as platform owner makes progress in the respective evolution dimension.

A.4 Dimensions and Levers of Platform Ecosystem Evolution at Salesforce

In this section, we present the results of our analysis on the evolution of the Salesforce platform ecosystem. While in Salesforce's early stages, its primary value proposition was a sales-related software module (today known as *Sales Cloud)*, until today Salesforce has evolved into an integrated CRM offering with a diverse set of available modules and features.

By studying this evolution process, we identify three overarching *dimensions* of platform ecosystem evolution through which Salesforce has evolved over time:

1. Extension of the platform core technology: Refers to the addition of new or the considerable improvement of existing platform core technology elements, such as the development environment, integration capabilities, or software development processes.
2. Extension of the platform's functional scope: Refers to the addition of new or the considerable improvement of existing platform modules or features that serve a *generic* purpose and are relevant for all customers.
3. Industry-specific specialization of the platform: Refers to the addition of new or the considerable improvement of existing platform modules or features that serve an *industry-specific* purpose and are relevant for customers from a particular industry.

Salesforce's platform ecosystem has been developed in the first two evolution dimensions in parallel and as of its outset. Nevertheless, evolution in the third dimension has manifested itself over the last five years. The evolution of the Salesforce ecosystem along each of these three dimensions can be observed through the most significant events that specify evolution steps. While the three dimensions spell out the distinct evolution directions in the Salesforce platform ecosystem, we identified that Salesforce employed three cross-dimension *levers* in all the evolution dimensions for their realization:

a. Proprietary developments: Refer to the addition of a new or the considerable improvement of an existing platform technology, module, or feature through a proprietary development by the platform owner itself.

b. Acquisitions: Refer to the addition of a new or the considerable improvement of an existing platform technology, module, or feature through the platform owner's acquisition of complementors.

c. Partnerships and alliances: Refer to the addition of a new or the considerable improvement of an existing platform technology, module, or feature through the platform owner's initiation of a strategic alliance or partnership with complementors or competitors.

In the following we describe each of the three main evolutionary dimensions with reference to the three levers in each dimension as well as the engaged actors (see Table 6).

A.4.1 Extension of the Platform Core Technology

To enable complementors to produce their own applications, Salesforce first launched a development environment called *Force.com*. The *Force.com* typically receives three releases each year and the applications can be built using an object-oriented programming language called *Apex*.

To give more flexibility and further options to complementors in their application development endeavors, Salesforce acquired a development environment called *Heroku* that enabled complementors to use various open source programming languages to build their applications. *Heroku*, Salesforce's first major acquisition, also enabled customers to more flexibly customize their applications. As such, both the inhouse (*Force.com*) and the acquired (*Heroku*) development environments were two important steps in the evolution of Salesforce's core technology, as they created and significantly extended the possibilities for both complementors and customers to develop applications, as was described by a Salesforce customer:

"You can also write applications outside the Force.com platform. You can use Heroku and you can run whatever, Heroku is just an environment to run Python or [...]

> *other development platforms. And they will run on Salesforce modules. […] You can write applications that are connected to Salesforce. Everything is possible.”* (Director Applications, Customer, CU-2)

Due to the modular architecture of platforms and the necessity of seamless integration among platforms’ modules and with external IT systems, the development and improvement of an integration technology was the other fundamental initiative for the Salesforce core technology. In providing the latter technology, Salesforce acquired *MuleSoft*, a leading integration platform with their own marketplace for APIs called *Anypoint Exchange*. Due to its ability to connect any two IT systems both inside and outside of the Salesforce ecosystem, *MuleSoft* significantly extended Salesforce’s integration capabilities. This particularly supported external contributors in connecting their applications to the Salesforce core platform. Since acquisition is one of the crucial levers for Salesforce platform ecosystem evolution, the newly embedded integration technology thanks to *MuleSoft* also streamlined the integration of existing and prospective acquisitions with Salesforce’s existing offerings. With respect to customers, *MuleSoft* was particularly useful for large organizations with a complex IT infrastructure (e.g., on-premise software that needs to be connected to Salesforce modules). A Senior Director at Salesforce explains the strategic relevance of integration capabilities as follows:

> *“We’re moving into an area where very few organizations, no organizations actually, have a homogeneous technology environment. They have solutions from multiple vendors and data has to be shared amongst those different environments. So, having an integration layer ourselves was fundamental both for sharing data amongst our own platforms […] and other vendor environments as well.”* (Senior Director, Solution Engineering, Platform owner, PO-4)

After acquiring *MuleSoft*, Salesforce further developed the *MuleSoft* integration capabilities and turned them to a proprietary development called *Integration Cloud*, an integral part of Salesforce’s CRM core modules. *Integration Cloud* provides an overview of all integration possibilities, such as API basics, reusable integration templates, and security requirements. While *Integration Cloud* uses several features that were previously known from *MuleSoft*, Salesforce still uses the brand *MuleSoft* due to its popularity among the Salesforce customers.

Digital infrastructure is another essential element of the platform core upon which the whole platform operates. Initially Salesforce’s major CRM modules operated on the core Salesforce infrastructure. Nevertheless, the exponential extension of the platform core over time led Salesforce to initiate strategic alliances with global infrastructure providers such as Amazon (Amazon Web Services), Microsoft (Azure), and Alibaba (in China). This led Salesforce to take advantage of cutting-edge infrastructure technology from other providers and more focus on its own competencies. Further, Salesforce started several technology partnerships with smaller businesses in the Salesforce ecosystem that improve software development processes in development environments. These firms are usually registered as independent software vendors (ISVs) in the Salesforce ecosystem and benefit from extensive support services from different Salesforce enablement teams. One example of such a partner is *Copado*, a provider of a DevOps solution for Salesforce.

A.4.2 Extension of the Platform's Functional Scope

When Salesforce was founded, the main offering was a sales module, today known as *Sales Cloud*. The latter helped companies manage their sales activities with features for contact management, opportunity management, and forecasting. However, Salesforce continuously and considerably extended the platform's functional scope over the course of last years.

The first major step was the launch of a commercial marketplace for enterprise software applications called *AppExchange*. As a proprietary development, *AppExchange* enabled complementors to sell their own applications to Salesforce customers. *AppExchange* was introduced in 2005, notably before Apple's App Store (2008) or Google Play for Android (2012). Until today, *AppExchange* has become the largest enterprise cloud marketplace, with the number of ISVs evolving over the years from 250 (2006), 450 (2007), and 2'000 (2013) to more than 3'500 as of today. *AppExchange* is greatly used by customers, as illustrated by the probability of around 90% that a published application gets purchased at least once. To manage how third-party actors interact on the *AppExchange*, Salesforce as the platform owner puts certain rules and standards in place, for instance, for pricing or to ensure quality standards. While in the *AppExchange*'s early stages Salesforce did not generate any financial return, transaction fees on revenue generated by external parties through the marketplace are introduced over the past years. To ensure quality standards, ISVs must go through a well-structured onboarding process, for both technical and business enablement, to be able to sell their developed applications through the *AppExchange*. The technical part includes a compliance check, signing a distribution agreement, and a security review. Salesforce also offers business enablement services, for example to discuss a complementor's business plan or upcoming changes in the Salesforce product roadmap.

To further extend the platform's functional scope, Salesforce continuously added new CRM core modules, namely a customer service module (*Service Cloud*), a digital marketing module (*Marketing Cloud*), an e-commerce module (*Commerce Cloud*), and an analytics module (*Analytics Cloud*). While the *Service Cloud* was purely a proprietary development by Salesforce itself from the outset, the other three clouds resulted from or further developed by Salesforce's several acquisitions. To build the *Commerce Cloud*, Salesforce acquired *Demandware*, a provider of a cloud-based e-commerce solution, and completely integrated it as is to build its new CRM core module. In other words, *Commerce Cloud* was only a rebranding of *Demandware*. In the other two clouds (i.e., *Marketing Cloud* and *Analytics Cloud*), the respective modules were already developed and launched by Salesforce itself but later significantly boosted through acquisitions. Salesforce launched its *Marketing Cloud* one year before they acquired *ExactTarget*, a provider of online marketing solutions. Nonetheless, as *ExactTarget* was able to serve both B2B and B2C clients, Salesforce was then able to transform its *Marketing Cloud* into a full-service digital marketing offering. Similarly, *Analytics Cloud* was launched a few years before the acquisition of *Tableau*, a leading provider of analytics software, but was later significantly boosted through *Tableau*'s existing offerings. Similar to the case of *MuleSoft*, Salesforce today still uses the *Tableau* brand due to its global popularity.

Besides the afore-mentioned CRM core modules, Salesforce did several acquisitions in AI area that made the foundation to build *Einstein*. The latter is an AI technology that is deeply integrated into Salesforce's CRM core and can be accessed by customers in different modules and features. While *Tableau* helps to connect large data volumes from different Salesforce systems, *Einstein* is optimized towards empowering people to make predictions and drive immediate actions.

Customer interface is one of the basic features of any digital system, which concerns the other Salesforce initiative to extend the platform's functional scope and features. As a proprietary development, Salesforce introduced *Lightning*, a completely new CRM experience to replace the previous version *Classic* that was used since 1999. While *Classic* and *Lightning* can both be used for sales, service, and marketing, the modernized framework of *Lightning* comes with a higher customer friendliness, improved layouts, and a more efficient navigation to facilitate customer's productivity.

Salesforce's next efforts to extend the platform's functional scope were to increase the number of customer interactions through two proprietary development initiatives. *Trailblazer*, an online voting system allowed customers to contribute new feature ideas for future releases. As some promising ideas remained unexplored for several years with no specific action, Salesforce decided to use free market research to identify the most important customer needs and to adjust their product roadmap accordingly. In addition, as the platform offerings continuously grew over the past years, it became much more difficult for customers and complementors in the Salesforce ecosystem to keep track of all the diverse offerings. This resulted in the second proprietary development called *Trailhead*, an online learning system with online courses and certificates:

> *"We recognized that we weren't reaching enough people to allow them to learn about Salesforce and our products. Trailhead came as a result of our desire to grow our footprint and knowledge in the wider business and technology communities. So, now you will see a lot of people that made their first experience at Salesforce [...] via Trailhead".* (Senior Director, Solution Engineering, Platform owner, PO-4)

Next to the features directly concerning customers, the other extension of the platform's functional scope concerned complementors. As a proprietary development, Salesforce developed a program called *Developer Experience (DX)*, which supported developers with improved technical and business enablement services:

> *"That was a big turn for our community [...]. For a very long time, we had focused on the end user configuring, but we had not done a lot of investment in developer tooling, sort of professional developer tooling to help them build around Salesforce implementations. [...] What we did, we went through a big program, worked a lot with our partners around the types of developer tooling that they would need to really kind of take a professional developer lens on how to improve support for our platform. [...] For years and years, we've been getting asked to build more declarative tools and services."* (Vice President, Product Management, Platform owner, PO-3)

Finally, to extend its platform with the features of enterprise software providers outside of its ecosystem, Salesforce started several strategic alliances to leverage integration of cross-platform offerings. For instance, Salesforce integrated Microsoft's calendar into its own platform to increase customers' productivity.

A.4.3 Industry-specific Specialization of the Platform

The initiation of Salesforce specializing in industries was indeed triggered by some complementors once they successfully delivered industry-specific applications to customers. The need for industry-specific solutions was emerged because the value of Salesforce's offerings is perceived differently in different industries. For example, in a pharmaceutical company or a bank, compliance and quality may be more important than speed, while in a high-tech company, speed is the top priority. Salesforce has subsequently reinforced this trend by partnering with some of these complementors. Examples include partnership with firms such as *Veeva*, a CRM for the pharmaceutical industry, or *nCino*, a CRM for the financial industry. Similar to technology partnerships, industry partners also benefit from additional enablement services from Salesforce. For instance, in the case of *Veeva*, the company benefits from several agreements with Salesforce to facilitate integration between their offerings and various Salesforce core modules.

The next major step was a proprietary development by Salesforce itself to include an industry-specific module to the CRM core called *Industry Cloud*, with focus on manufacturing, education, and non-for-profit industries. The Chief Executive Officer of a leading complementor described Salesforce's approach as follows:

> *"They're starting to build on top of their own product, a customization that covers a higher percentage of what the customers need, which actually means potentially less work for us to do on the one hand. […] On the other it means more customers jumping on the solution and every customer will always need our services, but it makes Salesforce a more compelling proposition. Now, most are focused on a few verticals. We work with every vertical, but there's a few verticals here we have a very powerful story."* (Chief Executive Officer & Founder, Complementor, CO-4)

Industry Cloud was later significantly boosted by the acquisition of *Vlocity*, a leading provider of Salesforce solutions for different industries. *Vlocity* was already an industry partner of Salesforce and its solutions were natively built on the Salesforce platform. A Senior Vice President at Salesforce explained some of the reasons why Salesforce decided to acquire *Vlocity*:

> *"Salesforce has for the last […] five years now, been really investing heavily into industries. That's from our go-to-market strategy of how we organize our sales teams and our marketing, but also in building products. There are so many business processes that a manufacturer expects and a financial services company expects. Salesforce has built a portfolio of industry solutions over the last five plus years, but*

if you go back in time when we partnered with Vlocity, basically we didn't have any, [...] so we needed a multiple pass to get into the industry markets that we were not in yet." (Senior Executive, AppExchange & ISV Enablement, Platform owner, PO-8)

Table 6: Dimensions and Levers of Evolution in the Salesforce Platform Ecosystem

Evolution Dimensions	**Evolution Levers**	**Manifestations**	**Engaged Platform Components or Ecosystem Actors**
Extension of the platform core technology	Proprietary developments	Launching a development environment upon which complementors build their applications	Force.com
		Developing an integration module (*a CRM core module*) based on the integration technology of an acquired complementor (*MuleSoft*)	Integration Cloud
	Acquisitions	Including a more flexible development environment enabling complementors to access open source development languages	Heroku
		Including an integration technology and features such as a marketplace for APIs and interface builder	MuleSoft
	Partnerships and alliances	Extending and empowering the digital infrastructure	e.g., Amazon, Alibaba
		Improving software development processes in development environments	e.g., Copado
Extension of the platform's functional scope	Proprietary developments	Launching a marketplace for sharing and selling applications developed by complementors	App Exchange
		Developing a customer service module (*a CRM core module*)	Service Cloud
		Developing an online marketing module (*a CRM core module*)	Marketing Cloud
		Developing an e-commerce module (*a CRM core module)* based on the e-commerce technology of an acquired complementor (*Demandware*)	Commerce Cloud

		Developing an analytics module (*a CRM core module*)	Analytics Cloud
		Launch of an online learning system enabling customers and complementors to learn about Salesforce and achieve certifications	Trailhead
		Launch of a voting system enabling customers to suggest and vote for new product features	Trailblazer
		Launch of a new customer interface enabling customers to achieve a higher productivity through efficient navigation and better layouts	Lightning Experience
		Developing an AI technology based on the AI technologies of several acquired small complementors	Einstein
		Launching a developer experience program to improve technical and business enablement services for complementors	Developer Experience (DX)
	Acquisitions	Including an e-commerce technology to build *Commerce Cloud (a CRM core module)*	Demandware
		Adding additional analytics features to extend *Analytics Cloud (a CRM core module*)	Tableau
		Adding additional online marketing features to extend *Marketing Cloud* (*a CRM core module*)	ExactTarget
	Partnerships and alliances	Including features of leading enterprise software providers	e.g., Microsoft
Industry-specific specialization of the platform	Proprietary developments	Developing an industry-specific module (*a CRM core module*)	Industry Cloud
	Acquisitions	Adding additional industry-specific features to extend *Industry Cloud* (*a CRM core module*)	Vlocity
	Partnerships and alliances	Initiating specialization in some specific areas through providing industry-specific features	e.g., Veeva, nCino

Due to *Vlocity*'s relevance to Salesforce's intentions to specialize its offerings in industries, the integration of *Vlocity* with Salesforce's existing offerings became a top priority. To this end, the development team of *Vlocity* started superseding Salesforce's industry teams and strongly benefitted from Salesforce internal resources:

> *"Now their product team is part of our product and engineering teams. They're in-house, everyone's internal, everyone's in house. So that one was very differentiated as once that officially closed, my team stopped engaging with them because they didn't need any more technical enablement from me as a partner. […] They get all their technical enablement benefits of being an employee of Salesforce and they can go tap into all the different experts internally […]. But yeah, when we make that acquisition, they become internal product teams."* (Senior Executive, AppExchange & ISV Enablement, Platform owner, PO-8)

A.5 Discussion and Conclusion

Platform ecosystems have gained significant interest in research and practice due to their transformative power across industries. One considerable gap in existing research is the lack of research on platform ecosystem evolution (de Reuver et al., 2018; Rietveld & Schilling, 2021), particularly from a perspective that considers both technical (related to the digital platform's technology and functionalities) and social (related to the activities and contributions of the network of ecosystem actors) aspects. In this study we posit that a better understanding of a platform ecosystem's long-term evolution from the perspectives of all actors (i.e., platform owner, complementors, and customers) would support research and practice in delineating appropriate design decisions for the management of platform ecosystems. By conducting an in-depth study on Salesforce, we derived three distinct dimensions of evolution, namely *extension of the platform core technology*, *extension of the platform's functional scope*, and *industry-specific specialization of the platform,* that explain in which directions Salesforce has evolved to eventually become a leading platform ecosystem in the enterprise software industry. Further, we identified three cross-dimension levers, namely *proprietary developments*, *acquisitions*, and *partnerships and alliances,* that Salesforce as the platform owner employed to operate and advance in each of the three dimensions of evolution. While each of the dimensions represent distinct directions of evolution, the three cross-dimension levers manifested themselves along all of the three dimensions of evolution. In the following, we discuss the results of our study and elaborate on their limitations and boundary conditions.

First, we demonstrate the particular dynamics of a B2B platform ecosystem, thereby illustrating that its evolution is closely delineated by all actors involved in the ecosystem (i.e., platform owner, complementors, and customers). Unlike the predominantly studied consumer-focused or trading platforms in existing research such as Apple's iOS, Google's Android, or Amazon.com (e.g., Cennamo, Ozalp, & Kretschmer, 2018b; Karhu et al., 2018; Oh, Koh, & Raghunathan, 2015), in the B2B context complementors are not just an army of application developers that use the platform; they rather considerably delineate the platform's technical core, scope, and functionalities, and thereby impact the dynamics of the entire ecosystem. The latter is evident in empirical data from Salesforce, such that the evolution of the ecosystem was closely laid out by essential contributions from various groups of complementors. The impact of customers is also much higher in the B2B context as they are often large firms in their industry and strongly engaged in defining the digital platform's scope and value proposition. This is specifically manifested in the industry-specific requirements of customers that delineated a new direction of evolution to the Salesforce ecosystem. In other words, while technological improvements of the platform have considerable impacts on all ecosystem actors, the digital platform's evolution is also closely defined by all actors. Ultimately, in a co-evolutionary process, the platform owner not only develops the technology and the functionalities of the digital platform (the technical aspect), but also includes the competences and interests of all ecosystem's actors (the social aspect) into the platform.

The latter brings us to the second point. That is, we provide more insights into the owner's role as the cornerstone and orchestrator of the ecosystem to align the interests and to take advantage of the competencies of all stakeholders involved in the ecosystem (e.g., Iansiti & Levien, 2004; Selander et al., 2013). In this regard, we specifically identify three important aspects: (a) The platform owner continuously developed the platform core technology. Interestingly, even in this aspect, complementors are actively engaged by the owner. For example, in several cases Salesforce incentivized complementor partnerships to extend the platform technology (e.g., software development processes) and shaped alliances with partners external to the ecosystem (e.g., infrastructure partnerships). (b) The platform owner in several cases strongly embedded the value proposition of complementors into the platform's core and functionalities (e.g., Baldwin & Woodard, 2009; Tiwana et al., 2010). Our case material shows that the platform owner goes even further and sometimes created a new core module of the digital platform that was initially developed by complementors without the platform owner's engagement at the first place. In addition, on the non-technical aspect, Salesforce has strongly embedded a strategic developer enablement program in its complementor onboarding process (e.g., through assessing complementors' business plan with regard to the Salesforce product roadmap) in order for complementors to focus on additional features to extend the core modules that are strategically relevant for the platform owner. (c) While the first two aspects mainly referred to the platform technology and its core functionalities for *generic* customer problems, Salesforce further developed specialized use cases of the digital platform in close collaboration with complementors to meet *specific* problems of particular customer groups.

Third, in all the afore-mentioned actions executed by the platform owner, which to some extent resemble our derived evolutionary *dimensions*, we observe the dynamics and dyadic interplays of the employed *levers* by Salesforce as the platform owner. Specifically, acquisitions turned out as being intertwined with other levers in three ways (see also Table 6): (a) Two of the major acquisitions made by Salesforce were subsequently turned into the Salesforce's CRM core modules (*MuleSoft* into *Integration Cloud* and *Demandware* into *Commerce Cloud*). (b) Several of the CRM core modules, which were initially developed by Salesforce itself, were subsequently and significantly powered by acquisitions (*Marketing Cloud* by *ExactTarget*, *Analytics Cloud* by *Tableau,* and *Industry Cloud* by *Vlocity*). (c) Besides the CRM core modules, our empirical data shows that acquisitions were also employed to build additional functionalities that are not directly related to the CRM core modules but significantly extend the digital platform's capabilities (e.g., several acquisitions to build *Einstein* as an AI feature).

Our study also provides several recommendations for practitioners. First, the main results of our study provide guidance for the design and management of B2B platform ecosystems in a constantly changing environment. Specifically, the derived evolutionary dimensions in this study cater a strategic roadmap to designers and managers, based on learnings accumulated from a leader like Salesforce, to specify the main directions of evolution and advancement in platform ecosystems. Further, the derived levers and the observed inter-lever dynamics particularly highlight how platform managers can engage complementors into their proprietary developments or turn complementors' competencies into one of the platform's integral parts. Second, our insights bring to the fore the role of acquisitions in leveraging and sustainably managing the evolution of B2B platform ecosystems. Our study specifically provides empirical data on a platform owner's motivation to conduct acquisitions as well as on the impact of acquisitions on the other actors involved in the ecosystem.

Finally, we acknowledge that the resulted insights have some boundary conditions and limitations. In this study, data was only collected from a retrospective view. While this may be of minor impact as far as the platform owner is concerned, it may be more problematic regarding the lack of data on former complementors. In addition, we posit that the context of a B2B platform ecosystem is well-suited to study platform ecosystem evolution due to the crucial role of all ecosystem actors. Nevertheless, the resulted insights and guidance may be of bounded application to other types of platform ecosystems.

Paper B – Governance Mechanisms in Digital Platform Ecosystems: Addressing the Generativity-Control Tension

Table 7: Bibliographic Metadata Paper B

Title	Governance Mechanisms in Digital Platform Ecosystems: Addressing the Generativity-Control Tension
Authors	Staub, Nicola[1]; Haki, Kazem[2]; Aier, Stephan[1]; Winter, Robert[1] [1]University of St.Gallen, Institute of Information Management, St.Gallen, Switzerland [2]Geneva School of Business Administration (HES-SO, HEG Genève), Geneva, Switzerland
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Abstract

Digital platform owners repeatedly face paradoxical design decisions with regard to their platforms' generativity and control, requiring them to facilitate co-innovation whilst simultaneously retaining control over third-party complementors. To address this challenge, platform owners deploy a variety of governance mechanisms. However, researchers and practitioners currently lack a coherent understanding of what major governance mechanisms platform owners rely on to simultaneously foster generativity and control. Conducting a structured literature review, we connect the fragmented academic discourse on governance mechanisms with each aspect of the generativity-control tension. Next to providing avenues for prospective digital platform research, we elaborate on the double-sidedness of governance mechanisms in fostering both generativity and control.

Keywords

Digital Platforms, Platform Ecosystems, Platform Governance, Governance Mechanisms

B.1 Introduction

Digital platforms are currently transforming almost every industry, as exemplified in finance (e.g., Kickstarter), mobility (e.g., Uber), or telecommunications (e.g., iOS, Android) (de Reuver et al., 2018). As software-based systems, digital platforms facilitate interactions and collaboration between two or more mutually interdependent groups of participants thanks to their ability to leverage production, transaction, and innovation (Evans & Schmalensee, 2007; Thomas, Autio, & Gann, 2014; Tiwana, 2014). Digital platforms are the central point of gravity for their corresponding platform ecosystems, comprised of a plethora of actors that contribute to the platform's survival and growth by providing complementary extensions (e.g., applications) to the platform (Bonina et al., 2021; Jacobides et al., 2018; Selander et al., 2013). Actors of the platform ecosystem include the platform owner (i.e., operator), complementors (e.g., third-party developers), and users. Since these loosely-coupled actors have individual and collective intertwined interests (Cennamo & Santaló, 2019), platform owners as orchestrators of their ecosystems need to continuously align the diverse, and sometimes conflicting, interests of all actors to ensure their digital platforms' survival and prosperity (Tiwana, 2014).

One key challenge of platform owners is to simultaneously enable the co-creation of value among platform participants (*generativity*) whilst maintaining sufficient stability over how these value co-creation processes take place (*control*). This has been conceptualized as the generativity-control tension in existing research (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013). The effective management of this tension is crucial as was illustrated by the case of Google in its Android developer ecosystem. While the Android platform generally relied on an open architecture to attract complementary app developers, it was vulnerable to being exploited by hostile strategies as ultimately was the case when Amazon cloned almost the entire platform (Karhu et al., 2018). However, by critically addressing this tension, Google was able to take effective countermeasures such as adjusting the open-source license to close off selected areas of the platform's core from further development by complementors (Karhu et al., 2018). This is one of many examples that shows how the generativity-control tension can threaten the survival of a digital platform. Hence, managing the platform-inherent generativity-control tension is a dynamic process and requires substantial resources to align the interests of the ecosystem's various actors (Gawer, 2014).

To address the generativity-control tension in a systematic way, platform owners need to purposefully design governance structures allowing them to attract, coordinate, and control different groups of platform participants (Tiwana, 2014). This practice intends to harmonize platform owners' strategies with the interests, activities, and goals of their complementors (Tiwana et al., 2010), which must be a key priority due to the complementors' essential role in delineating the overall value that users derive from the platform. As complementors are generally not dependent on a single platform, platform owners need to exercise 'soft control' for shaping and influencing their ecosystems, rather than trying to direct them with command-and-control interventions (Tiwana, 2014; Williamson & De Meyer, 2012). Such governance practices are established through a portfolio of interrelated governance mechanisms (Schilling, 2005; Weill & Ross, 2004). Thus, one of the objectives of platform owners is to design effective governance mechanisms that account for and balance the interests of the platform ecosystem's various stakeholders, i.e., to address the generativity-control tension.

Governance mechanisms for digital platforms have been discussed in different research streams and with diverse terminology that inhibited scholars from identifying each other's work (de Reuver et al., 2018; Rietveld & Schilling, 2021), resulting in a growing body of fragmented, implicit knowledge that has been generated over the last years. Therefore, the existing body of knowledge needs a consolidation to systematically relate governance mechanisms to different aspects of the generativity-control tension. Since governance structures are typically implemented in a portfolio of interrelated mechanisms, it is of value for both research and practice to thoroughly comprehend each of the governance mechanisms' potential effects on effectively attaining and continuously maintaining the balance between generativity and control.

We conduct a structured literature review to identify which platform governance mechanisms have been focused on in the current literature and how they relate to each aspect, or the balance, of the generativity-control tension. Specifically, our research objective is to identify *what governance mechanisms platform owners rely on when (re)designing and managing their ecosystems to foster control and generativity*. By reviewing the digital platform literature, we aim to give an overview of each of the key mechanisms' contributions to dealing with the generativity-control tension.

The remainder of this paper is structured as follows. We first introduce the concept of digital platforms and platform ecosystems, the notion of tensions, as well as governance and its application to the platform context. Subsequently, we describe how each of the key governance mechanisms as identified in our literature review was discussed regarding control and/or generativity. Lastly, we conclude with a discussion of our findings, limitations, and suggested avenues for future research.

B.2 Conceptual Foundation

In this section, we provide an overview of digital platforms and platform ecosystems, introduce the notion of tensions, and explain governance and its implementation through mechanisms.

B.2.1 Digital Platforms and Platform Ecosystems

As socio-technical systems, digital platforms coordinate the co-creation of value among actors that innovate and/or compete, leverage economies of scope in supply and/or demand, and consist of a modular technological architecture composed of a core and a periphery (de Reuver et al., 2018; Gawer, 2014). Digital platforms function as the nexus of platform ecosystems, in which the platform *owner* offers the platform, *complementors* extend the platform's technology and functionalities through their complementary add-ons, and *users* derive certain values from the offerings jointly provided by the platform owner and complementors (Bonina et al., 2021; Cennamo & Santaló, 2019; Jacobides et al., 2018).

The platform's participants are both collaborators and competitors (Moore, 1993; Selander et al., 2013; Walley, 2007). On the one hand, complementors have a collective interest in the survival and prosperity of the central platform (Selander et al., 2013). On the other hand, they are in constant competition to materialize their own offerings and sell them to the platform's users. To ensure complementors' motivation to constantly identify innovative ways to extend the platform, a platform owner needs to identify and effectively address such conflicts of interest among the different stakeholders involved.

B.2.2 Tensions

Tension refers to conflicting aspects, competing demands, or opposing perspectives (Lewis, 2000; Smith & Lewis, 2011). Within tensions, Smith and Lewis (2011) distinguish between dilemmas (i.e., trade-offs) and paradoxes (i.e., dualities). Dilemmas are defined as situations in which actors need to choose one aspect over another (Lewis, 2000; Putnam, Fairhurst, & Banghart, 2016). The dilemma is thus resolved by choosing between different aspects, weighing the advantages and disadvantages of each option, and ultimately preferring certain advantages of one aspect at the expense of those of the other aspect. Paradoxes, however, are defined as "contradictory yet interrelated aspects that exist simultaneously and persist over time; such aspects seem logical when considered in isolation, but irrational, inconsistent, and absurd when juxtaposed" (Smith & Lewis, 2011, p. 387). Therefore, paradoxical tensions require acknowledging the co-existence of the tension's diverging aspects as well as ongoing efforts of managing them to account for their duality.

Digital platforms are rife with tensions as their owners often seek to balance the divergent goals of different groups of participants (Mini & Widjaja, 2019). Our focus lies on the tension of generativity vs. control that platform owners experience when seeking to leverage the expertise of external actors whilst simultaneously encouraging or enforcing these external actors to act in desired ways (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013). Generativity refers to a platform's ability to constantly generate new input, structure, or behavior (Tilson et al., 2010; Zittrain, 2006). Control is exercised by the platform owner over complementors with the goal to achieve a desirable behavior (Tiwana, 2014).

Existing research discusses the generativity-control tension using heterogeneous terminology. Examples include autonomy vs. control, which is referred to as the need for a delicate balance of control by the platform owner and autonomy among independent complementors (e.g., Karhu et al., 2018; Tiwana et al., 2010); openness vs. control, where the first term denotes a governance-related concept to determine complementor's perceived platform openness (e.g., Benlian et al., 2015); or generativity vs. stability, in which the owner aims to achieve a balance between stable and flexible aspects (e.g., Jain & Ramesh, 2015). What all these tensions have in common is their objective to align the platform participants' interests, by simultaneously facilitating value co-creation and structuring how the participants' interactions take place, i.e., resembling the generativity-control tension.

Simultaneously maintaining platform control and transferring design authority to external complementors (Ghazawneh & Henfridsson, 2013) certainly has the potential to bring up conflicts of interest. We argue that the tension of generativity vs. control in platform ecosystems can be classified as a *paradox* due to the following reasons. First, the paradox requires actors to approach competing demands simultaneously. Actors embrace paradoxical tensions with a strategy of "working through", despite the juxtaposing opposites, rather than resisting or avoiding the tension (Lewis, 2000). In platform ecosystems, such strategies are essential for platform owners as they need to simultaneously give rights to complementors to promote innovation, whilst retaining a sufficient degree of control to ensure consistent quality. In other words, both aspects of the tension (i.e., generativity *and* control) need to co-exist. Second, the paradox accounts for organizational entities, such as platform ecosystems, as dynamic and complex systems (Gawer, 2014) that require attaining and retaining a delicate balance between different aspects of their inherent tensions. The latter is due to the criticality of the tension's constituent aspects for the prosperity of the system as a whole. In this study, however, despite this classification as a paradox, we continue to use the term tension for the sake of simplification.

Given the paradoxical nature of the generativity-control tension, attaining an optimal balance between the tension's two aspects requires a purposefully designed governance structure.

B.2.3 Governance

Governance can be defined from different perspectives. First, from a sociological perspective, each society develops its own ways of making decisions and resolving conflicts. In this regard, governance is about "the processes of interaction and decision-making among the actors involved in a collective problem that lead to the creation, reinforcement, or reproduction of social norms and institutions" (Hufty, 2011, p. 405). Second, from a corporate governance perspective, governance refers to "providing the structure for determining organizational objectives and monitoring performance to ensure that objectives are attained" (Weill & Ross, 2004, pp. 4-5). In this context, governance aims to protect stakeholder interests and prevent them from financial losses. Third, in the IT governance context, governance is defined as "specifying the decision rights and accountability framework to encourage desirable behavior in using IT" (Weill & Ross, 2004, p. 2) and ensuring that individual IT decisions are aligned with strategic objectives (Weill & Ross, 2005). What these three perspectives have in common is the orchestrated use of *mechanisms* to encourage consistent behavior, notwithstanding their specific context (De Haes & Van Grembergen, 2009; Weill & Ross, 2004). Therefore, we understand a mechanism as a means to implement governance, such that governance is exercised through a portfolio of interrelated and purposefully designed governance mechanisms.

What makes governance and governance mechanisms special in the context of platform ecosystems is the fact that platform ecosystems deviate from traditional firm settings. Platform ecosystems are shaped by loosely coupled and independent actors, who are opportunistic and pursue their own goals and interests (Tiwana, 2014). In this context, platform owners merely function as *orchestrators* to align the interests of heterogeneous stakeholder groups, to ensure that all stakeholders' interests are in place. As a consequence, traditional governance structures are hardly applicable to the platform ecosystem context, where performance-based incentives rather than punitive penalties are needed (Tiwana, 2014; Tiwana et al., 2010). A key challenge thereby lies in harmonizing platform owners' strategies with the goals and interests of the complementors (Tiwana et al., 2010), as reflected in the paradoxical tension of generativity vs. control, where each aspect refers to the interests of major stakeholders in platform ecosystems and both need to be in place simultaneously (Ghazawneh & Henfridsson, 2013). Thus, platform ecosystem governance entails the employment of governance mechanisms to purposefully operationalize paradoxical design decisions.

Various platform governance mechanisms have been discussed in existing research. The need for a new governance perspective in the context of platform ecosystems was first raised by Tiwana et al. (2010). Tiwana (2014) later applies the concept of governance to platform ecosystems and distinguishes between three dimensions of platform governance, namely the allocation of decision rights to grant autonomy to complementors, the configuration of a control portfolio to ensure integration, and pricing to create incentives. Ghazawneh and Henfridsson (2013) expand this view with their boundary resources model which refers to a platform owner's provision of resources to attract complementors and enable them to innovate on the platform. Moreover, various scholars focused on a particular platform governance mechanism such as pricing (Zimmermann et al., 2018) or gatekeeping (Zhang et al., 2022). Overall, platform governance refers to a portfolio of mechanisms through which a platform owner aligns its own interests with those of the complementors and users (Schilling, 2005), enabling heterogeneous groups of actors to interact harmoniously (Tiwana, 2014).

B.3 Methodology

In this study, we opt for a structured literature review to consolidate discourses in existing digital platform research with the aim of deriving insights on governance mechanisms for managing the generativity-control tension. We applied the method in three steps: First, we describe how we selected the set of papers that best fits our research objective. Second, we introduce our analysis framework. Third, we describe the analysis procedure, i.e., how we applied the analysis framework to code the selected papers as well as the steps that we applied to derive the final results of the literature review.

B.3.1 Literature Selection

In order to identify relevant literature that contributes to the goal of our study, we followed the steps outlined by vom Brocke et al. (2015). We chose the AIS basket of senior scholars' journals (EJIS, ISJ, ISR, JIT, JMIS, JSIS, JAIS, MISQ) for all years until mid-2021. In order to also capture the very recent discussions in the field, we included ICIS proceedings, as the flagship conference of the IS discipline, from the years 2015 until 2020. Subsequently, we searched for relevant papers in both Web of Science and the AIS Electronic Library (AISeL) employing a search string[3] that contains variations for the terms "platform" and "ecosystem" in both title and abstract. Moreover, since cloud platforms are common and the study of cloud and cloud computing has been dominant in IS literature, we also included the term "cloud" in our search string. While the objective of our research is to gain insights into governance mechanisms to deal with the generativity-control tension, we did not restrict the search in the literature to terms such as mechanism, governance, or tension.

We obtained 164 papers on Web of Science and 191 papers on the AIS Electronic Library. After removing research-in-progress papers (80), we carefully reviewed abstracts and screened full texts and excluded papers where digital platform is not the focus of the study (142) as well as literature review (5) and conceptual/editorial papers (6). Ultimately, our final literature set consisted of 122 papers, thereof 68 from AIS basket of senior scholars' journals and 54 ICIS papers (Table 13 in the appendix).

While the focus of our analysis is merely on information systems (IS) outlets, we also aimed to explore to what extent studies published in management and organization science outlets may complement our main findings. Since our aim is to obtain an external perspective by looking at relevant neighboring disciplines, we did not intend to analyze these studies in the same level of detail as the IS studies. To identify relevant studies, we searched in Web of Science for studies published in the Financial Times 50 (FT50) journals employing our original search string[1]. This resulted in 350 studies. To reduce the size of the literature set (i.e., define a relevant subset), we decided to analyze only studies that explicitly use the term "governance" in the title, abstract, or keywords. From

[3] platform*, ecosystem*, "eco-system*", "eco system*", or cloud* for both title and abstract.

the resulting 30 studies, we removed duplicates (12) that were already included in our original literature set, studies that do not focus on digital platforms (6), and conceptual/editorial papers (3). This resulted in 9 relevant studies. Owing to our focus on IS outlets, we do not include insights derived from these studies in the results section, but include those insights in the discussion section to illustrate to what extent they may complement our findings derived from IS-related studies.

B.3.2 Analysis Framework

Following the recommendations of Webster and Watson (2002), we developed an analysis framework to guide our coding procedure. Our analysis framework (Table 11 in the appendix) is comprised of three major constituents, namely tensions, governance mechanisms, and research specificities.

First, we included the generativity-control tension and its different variations discussed in the literature. We further extended this part of the analysis framework with other somewhat relevant tensions to not miss any important discussion. While we believe our list is comprehensive with regard to generativity vs. control and its different variations, platform owners certainly face other tension types, which we did not include in our analysis framework (e.g., regarding their architectural design).

We built our coding of governance mechanisms on Tiwana's (2014) framework. We further broadened this view and include other perspectives, such as the boundary resources model of Ghazawneh and Henfridsson (2013). In addition, we extended our analysis framework by, for instance, distinguishing between pricing and revenue sharing (Oh et al., 2015). These concepts are sometimes considered to be similar. For example, the pricing dimension of Tiwana's (2014) framework also discusses how profits are distributed among platform owners and complementors. We, however, opted for a more comprehensive analysis framework and included pricing and revenue sharing as distinct concepts. Finally, we extended the main categories of the analysis framework with subitems, where we see the potential for additional, more detailed insights.

With respect to research specificities, we coded for units of analysis, research methods, employed theoretical lenses, and contribution types.

B.3.3 Analysis Procedure

Owing to the development of a comprehensive analysis framework at the outset, our analysis procedure follows a bottom-up approach. We started coding the papers according to our coding scheme. We first coded for tensions and governance mechanisms (i.e., their sub-items). We then revealed tensions and mechanisms that share semantics in spite of different designations. We grouped them according to their commonalities in an iterative fashion (axial coding). Subsequently, for each mechanism we coded whether it was discussed with regard to generativity and/or control.

During this process, we found that the vast majority of studies focus on the generativity-control tension, even though other terminology might have been used. Therefore, we combined generativity vs. control with the three other dominant variations, namely autonomy vs. control, openness vs. control, and generativity vs. stability. Specifically, autonomy vs. control refers to how platform owners control the decision-making autonomy of complementors (Ye & Kankanhalli, 2018), which is ultimately the same key question in the generativity-control tension, as the interests of different stakeholders need to be aligned. The same applies to openness vs. control, where platform owners need to determine the optimal level of openness to attract complementors and give them autonomy to successfully develop complementary add-ons for the platform, whilst also ensuring rules and standards (Benlian et al., 2015). Eventually, with this approach we captured the main tension, which is omnipresent in the majority of platform studies.

Concerning governance mechanisms, our goal was to identify the most relevant and frequently discussed mechanisms in digital platforms. To derive these mechanisms, we excluded mechanisms that were only briefly discussed, such as metrics (see definition in Table 11 in the appendix). Due to similarities in the discussions, we also combined decision rights and ownership (e.g., Fuerstenau et al., 2019; Karhu et al., 2018). We further merged intellectual property rights and licensing (two sub-items of boundary resources in our coding scheme) and discuss them together as intellectual property sharing, following Niculescu et al. (2018). Most sub-items were not discussed in much detail, therefore we did not include them in our results section. However, we specifically discuss interfaces, programming resources, and intellectual property sharing, as these three sub-items were discussed in several studies.

B.4 Results

In this section, we present the results of our literature review. We focus on the governance mechanisms that were identified as most relevant and describe their application in the literature toward generativity and control. Beyond our focused analysis of governance mechanisms, the appendix (Table 12) extends our overview to digital platform research in general.

We assumed that the effective management of the generativity-control tension requires a governance structure that is implemented through a portfolio of governance mechanisms, and that each mechanism either addresses one aspect of the tension or balances the two aspects. In this light, to contribute to the existing research on platform governance, we aggregate insights on its major mechanisms across the literature set. More specifically, we (1) screened all papers for governance mechanisms and (2) collected data on how each mechanism addresses control and/or generativity.

To systematically aggregate the fragmented, implicit knowledge in existing research, we present governance mechanisms in three fundamental pillars of platform governance. Each of the pillars is fundamental in the sense that every single one is required from the platform owner's perspective to guide the platform ecosystem's design and evolution. Following Ghazawneh and Henfridsson (2013), the first pillar refers to *platform boundary resources* that are provided by platform owners to complementors to leverage their development of complementary add-ons. The majority of corresponding studies focus on the platform's interfaces and programming resources. Some scholars apply a broader understanding of the concept, such as knowledge resources including, for instance, information portals, documentation, helpdesks, or alignment workshops (Foerderer et al., 2019; Petrik & Herzwurm, 2020). The second pillar refers to *platform rules* that are established by the platform owner to define the scope of activities for each of the platform ecosystem's actors. The mechanisms dominantly discussed in our literature set are gatekeeping (who can have which access), decision rights (who can do which tasks), intellectual property sharing (who owns the generated innovations), pricing (what is the pricing model), and revenue sharing (who can get which share of revenue). The third pillar refers to the shared *ecosystem identity* among the actors as a sense of belonging to the platform ecosystem. Drawn from organizational identity (Corley & Gioia, 2004), this has been frequently discussed in the existing platform research as relational control that aims to facilitate mutually shared expectations and norms among the ecosystem's actors about what constitutes a legitimate behavior in the platform ecosystem (Lindgren et al., 2015). While these three pillars provide a coherent organizing structure for the mechanisms, owing to our focus on the mechanisms' individual effects, in the following we individually present the effects of each mechanism toward generativity and control. Table 8 gives an overview of the major governance mechanisms and their focus on the generativity and control aspects as discussed in the existing literature.

Table 8: Governance Mechanisms for Generativity and Control

Pillar	Mechanism	Generativity	Control
Platform boundary resources	Interfaces	- Standardize access and connection - Facilitate data exchange	- Retain fine-grained control over complementor activities - Prevent platform exploitation
	Programming resources	- Lower the threshold for complementor participation - Support complementors with the provision of tools and knowledge - Help complementors overcome knowledge boundaries	- Facilitate tight control over development quality through software tools and regulations - Increase complementor focus on selected app functionalities
Platform rules	Gatekeeping	- Facilitate connection of complementors to the platform - Increase the diversity in offered apps and functionalities	- Restrict access to ensure quality and attractiveness for complementors and users (e.g., levels of access rights) - Prevent uncontrolled variance in the platform's innovation output
	Decision rights	- Ensure decision-making autonomy of complementors to increase their innovation output	- Define the complementors' amount of freedom (e.g., regarding their goals and task types)
	Intellectual property sharing	- Attract more complementors by expanding their intellectual property rights (particularly important in the early stages of platform evolution)	- Encourage complementors to not build a superior solution - Increase control through agreements with different complementor groups - Structure formal relations to complementors

	Pricing	- Subsidize one side to reach the critical mass of complementors and users - Enhance platform adoption by complementors and users (particularly in platform markets with fierce competition)	- N/A
	Revenue sharing	- Maintain complementor motivation while extracting an appropriate share of profits	- N/A
Ecosystem identity	Relational control	- Increase complementor motivation and commitment through community building - Facilitate clans to enhance complementor performance and minimize errors	- Align platform and complementor strategy - Benefit from rather inexpensive, community-driven self-control

B.4.1 Interfaces

Interfaces seamlessly connect and integrate complementors' add-ons to the platform core. Application programming interfaces (APIs) are specifically designed to "accept a broad class of apps in ways that allow app developers to use the platform's capabilities without having to concern themselves with how those capabilities are implemented in the platform" (Tiwana, 2014, p. 289).

Generativity: As a mechanism for generativity, interfaces grant complementors with a standardized form of platform access to sell their complementary add-ons (Bender & Gronau, 2017; Ghazawneh & Henfridsson, 2013). In this role, APIs constitute an important part of digital platforms that connects the platform core with external complementors. Also, APIs facilitate data exchange by enabling external developers to access and retrieve data and use it to build their applications (Fuerstenau et al., 2019). As they allow a platform to connect to external data sources and smart devices, they are a key enabler for the effective diffusion of information (Spagnoletti et al., 2015). Further, it has been one of scholars' main interests to investigate which APIs developers prefer over others and why some APIs spark major changes in ecosystems, while others are mostly ignored. For instance, Um and Yoo (2016) specifically discuss what determines the fate of different APIs, concluding that external APIs exhibit a higher influence than components offered by the focal platform system. In addition, Wulf and Blohm (2020) consolidate different perspectives on API design and provide insights into the effects of API design on complementary innovation performance.

Control: However, at the same time interfaces have a control function, in the form of design rules that are controlled by the platform owner and need to be followed by complementors (Um & Yoo, 2016). By adjusting boundary resources such as APIs, platform owners can keep control over the boundaries within which complementors can innovate (Bender & Gronau, 2017; Ghazawneh & Henfridsson, 2013). It also enables platform owners to retain fine-grained control over the possibilities of the complementors and influence community behavior by seeding them with new features (Bender & Gronau, 2017; Spagnoletti et al., 2015; Tiwana, 2015a).

B.4.2 Programming Resources

Programming resources (e.g., software tools, software development kits/SDKs, libraries, and documentation) are provided by the platform owner to complementors to help them develop add-ons.

Generativity: Furnishing third parties with development knowledge and tools to foster the generation of innovations is a common strategy for platform owners (Foerderer et al., 2019; Parker, Van Alstyne, & Jiang, 2017). Knowledge resources often aim to provide a holistic picture of the offered platform functionalities to support complementors in identifying possible ideas to create their complementary extensions. For example, Hukal et al. (2020) illustrate how platform owners can signal strategic interests to activate complementors to generate new platform content. Further, scholars particularly highlight the relevance of programming tools as an important means to lower the threshold to develop on the platform (Karhu et al., 2018). Various scholars discuss how a platform owner can incentivize complementors with various types of programming resources, such as Karhu et al. (2018) with regard to Google Android. Further, based on archival data from Apple iOS and Google Android, Ye and Kankanhalli (2018) show that SDKs may also be applied to positively influence complementors in innovating services (e.g., generate ideas or create add-ons on the platform).

Control: On the other hand, it is argued that programming resources can be an important mechanism for platform owners to increase control over their ecosystem (Karhu et al., 2018). For instance, SDKs facilitate tight control over software development, thereby increasing the quality of complementary products/services (Kuebel & Zarnekow, 2015). For example, platform owners can launch their own proprietary development languages in order to increase complementors' platform-specific investments which may in turn reduce their willingness to multihome in several competing platform ecosystems (Foerderer et al., 2019). Moreover, programming resources can foster the development of specific complement types by incentivizing complementors to focus on specific app functionalities (Karhu et al., 2018).

B.4.3 Gatekeeping

Gatekeeping (i.e., input control or bouncer rights) refers to "the degree to which the platform owner uses predefined objective acceptance criteria for judging what apps and app developers are allowed into a platform ecosystem" (Tiwana, 2014, p. 123).

Generativity: Regarding generativity, gatekeeping usually means easing access for complementors, which results in a more open platform and potentially increases diversity in offered complements (Goldbach & Benlian, 2015a). For example, Wessel et al. (2017) explore how a reduction in input control (and thus increasing platform openness) affects key performance indicators for different platform participants. In their study, they investigate a policy change on Kickstarter, a leading crowdfunding platform, where certain restrictions were reduced and platform access was facilitated. Their results suggest that increasing platform openness for complementors rapidly increased the number of crowdfunding projects on Kickstarter but project creators needed to cope with higher uncertainties due to increased competition.

Control: Therefore, it is not surprising that gatekeeping is also discussed from a control perspective, aiming to retain control over who can access the platform (Tiwana, 2015a). A lack of input control may lead to an uncontrolled variance in the platform's resulting innovation output (Thies, Wessel, & Benlian, 2018). This suggests that one reason for platform owners to monitor and control the access to their platforms is to ensure a sufficient level of complement quality for users. Specifically, the gatekeeping mechanism can influence complementor behavior through, for instance, quality requirements, stricter guidelines, or different access rights for different groups of complementors (Huber, Kude, & Dibbern, 2017; Karhu et al., 2018).

B.4.4 Decision Rights

Decision rights can be defined as the division of authority and responsibilities between the platform owner and complementors. In general, it must become clear who decides about the strategic objectives of the platform or individual apps and how these objectives should be implemented (Tiwana, 2014).

Generativity: According to Ye and Kankanhalli (2018), platform owners should leave complementors sufficient decision rights to ensure their own decision-making autonomy, which ultimately influences the resulting innovation output (in terms of quality and quantity). Further, existing research highlights that platform owners should practice rules with both flexibility and benevolence at the same time in order to maximize complementor dedication (Hurni, Huber, Dibbern, & Krancher, 2021). As the platform evolves, platform owners may continuously reconfigure decision rights to incentivize complementors in different ways (Sandberg et al., 2020).

Control: From a control perspective, decision rights help platform owners define the amount of freedom complementors are given to generate content for the platform (e.g., Ye & Kankanhalli, 2018). For example, Karhu et al. (2018) articulate how platforms can successfully adjust the decision rights of complementors by structuring their resources provision. The locus of authority remains anywhere on the continuum from completely with the platform owner (concentrated) to completely with complementors (delegated) (Tiwana, 2015b). This suggests that platform owners should continuously monitor the complementors' satisfaction with their assigned authority and make adjustments as needed. Further, as different actors approach the digital platform with different expectations (Khalil, Winkler, & Xiao, 2017), platform owners should consider granting different amounts of decision rights to each actor group to ensure control over their actions (e.g., complementors that develop natively on the platform vs. complementors that sell their existing solutions on several competing platforms).

B.4.5 Intellectual Property Sharing

Intellectual property sharing can happen in two different ways (Niculescu et al., 2018): via direct inter-firm agreements (licensing) or by making a technology accessible to the general public (open source project).

Generativity: As a mechanism for generativity, platform owners can exchange intellectual property to increase complementors' security to be able to materialize and sell their own offerings (Niculescu et al., 2018). Ceccagnoli et al. (2012) examine whether joining a platform ecosystem improves a complementor's business performance. They find that joining a major platform owner's ecosystem is associated with an increase in sales and a greater likelihood of issuing an initial public offering (Ceccagnoli et al., 2012) and that these impacts are greater when the complementor has stronger intellectual property rights (IPR). Specifically, inter-firm agreements with licensing are often applied in the early stages of digital platforms where this mechanism can help reach the critical mass of complementors by enabling licensed firms to make a sufficient return on their development investments (Giessmann & Legner, 2016).

Control: Regarding the use of this mechanism for control, Giessmann and Legner (2016) refer to IPR as a design principle to establish well-defined rules and standards to structure and control the relationship with complementors and provide a solid basis for collaboration and avoiding conflicts. In addition, IPR can set a strategic incentive for complementors to not independently build a superior solution that is not linked with the platform (Niculescu et al., 2018). Further, with reference to Apple's iOS, Ghazawneh and Henfridsson (2013) illustrate how Apple revised its developer license agreement to effectively address other actors' potential attempts for bypassing Apple's SDK and APIs. Similarly, Karhu et al. (2018) highlight that, by effectively employing IPR, platform owners ensure that their shared resources cannot easily be copied, reverse engineered, or breached. Lastly, a platform owner can retain control by making distinct agreements with different groups of complementors (e.g., to share more resources with selected groups).

B.4.6 Pricing

Pricing policies are used by the platform owner to create incentives for complementors to make personal investments to ensure the prosperity of their own offerings and in turn the whole ecosystem. This includes, for instance, the app pricing model, pricing symmetry, and the selection of a subsidy-side (Tiwana, 2014).

Generativity: Pricing is primarily discussed from a generativity perspective. For instance, platform owners can choose to subsidize one, highly valued side of platform participants by granting them free or inexpensive platform access over a certain time period (Thies et al., 2018). This is of particular relevance in the case of consumer platforms, as they often need to reach a critical mass of users to remain competitive. For example, in markets with fierce competition among C2C sharing platforms, a platform owner can set financial incentives (e.g., rewards) for users to significantly boost consumption, which in turn attracts more complementors (Guo, Li, & Zeng, 2019). Further, platform owners of C2C sharing platforms in monopolistic settings should employ accurate pricing strategies that incentivize both of the platform's sides (i.e., demand and supply) to foster interactions on the platform (Zimmermann et al., 2018).

B.4.7 Revenue Sharing

Revenue sharing represents the degree to which the platform extracts revenue that is co-created with the complementors (Oh et al., 2015).

Generativity: Revenue sharing is primarily discussed with a focus on generativity. A platform owner extracts a part of the co-created value, such as a percentage of sales or service use (Karhu et al., 2018). A main research interest lies in the distribution of revenue shares that ensures complementors are encouraged to develop their high-quality complementary products/services on the platform (Oh et al., 2015). For instance, Oh et al. (2015) analyze different revenue sharing models, which can be employed by platform owners to increase the innovation output of the complementors. In the case of mobile ecosystems, they find that in a stable equilibrium, the platform owner receives 75% of the total value created by the platform and the complementors collectively receive the remaining 25% (Oh et al., 2015). Platform owners may also adjust the revenue shared with complementors during the evolution of the platform ecosystem or depending on the complementor type (e.g., complementors that are only active in the respective platform ecosystem vs. complementors that are active in several competing platform ecosystems).

B.4.8 Relational Control

Relational control, as informal control, refers to "the degree to which the platform owner relies on norms and values that it shares with app developers to influence their behavior" (Tiwana, 2014, p. 125). Relational control can be divided into self-control (e.g., set your own goals, monitor and sanction or reward yourself) and clan control (Ouchi, 1979).

Generativity: As a generative mechanism, relational control mainly refers to the benefit of a strong clan of complementors. A clan is a homogenous group of interdependent members who share common values and beliefs that influence their behavior (Goldbach & Benlian, 2015a). Through shared norms and values (formed by knowledge exchange and learning from each other), a strong community among complementors is likely to enhance their performance through fewer mistakes and less rework, thereby improving the average app quality (Goldbach & Benlian, 2015a; Huang, Tafti, & Mithas, 2018). A shared vision and similar ambitions, for instance concerning design and security standards, strengthen a common understanding and bring complementors closer together (Goldbach & Benlian, 2015a). This community feeling can in turn attract new complementors.

Control: On the other hand, clan control allows platform owners to reduce the differences between complementors' activities and their own strategies (Goldbach & Benlian, 2015b). For example, because of shared values, beliefs, or common goals, complementors ideally feel obligated to follow certain procedures or provide high-quality complements. Clan control has proven to be particularly useful in situations in which, for example, the result or the amount to which a prescribed procedure is followed is difficult to measure. Another reason why platform owners often rely on relational control is the fact that it becomes extremely difficult to retain formal control over every interaction taking place in a fast-growing, highly scalable platform ecosystem (Goldbach & Benlian, 2015b).

B.5 Discussion and Conclusion

Digital platforms and their significant economic impact across various industries have led to an increasing interest in this topic from researchers and practitioners alike. One considerable research gap is to understand how platform governance mechanisms are employed by platform owners to simultaneously foster generativity and control. To bridge this void, in this study we aggregated the fragmented knowledge on governance mechanisms into three pillars of platform governance and discussed how each governance mechanism can be employed to account for each aspect or balance the two aspects of the generativity-control tension.

Before we discuss the implications of our study, we acknowledge that our literature review focuses on the IS discipline. In effect, digital platforms are a multidisciplinary topic and have also been studied in the management and organization science literature. Therefore, including these outlets in the scope of an exhaustive literature review would potentially result in additional insights. To guide prospective research in this endeavor, in the following sections we discuss how studies from management and organization science outlets may complement our findings.

B.5.1 Implications for Research on Platform Governance Mechanisms

Our literature review offers implications for research on platform governance mechanisms. Our results illustrate that, while some governance mechanisms are specific to generativity or control, most of them are double-sided and address both aspects (see Table 8). This is important because several of the mechanisms have been mainly discussed toward one aspect of the generativity-control tension in existing research, such as programming resources for generativity (e.g., Foerderer et al., 2019) or gatekeeping for control (e.g., Tiwana, 2015a). The same applies to our suggested three pillars of governance (i.e., platform boundary resources, platform rules, ecosystem identity). While researchers mainly considered platform owners to provide resources for generativity (e.g., Foerderer et al., 2019) or define rules for control (e.g., Tiwana, 2014), our results illustrate that in each pillar mechanisms are employed to address both generativity and control.

Accordingly, the generativity-control focus of each governance mechanism is a context-dependent factor depending on, for instance, the platform type. For example, the revenue sharing model in the case of Apple's consumer-focused platform ecosystem, in which complementors need to pay 30% of their revenue to the platform owner (Oh et al., 2015), is relatively well-perceived by its complementors. However, it may be questioned whether this holds for other platform types. For instance, in the Salesforce enterprise software ecosystem, where the platform owner and complementors provide complex products/services to users, Salesforce (i.e., the platform owner) adjusts the required revenue share between 15% and 25%, depending on the type of complementor (Staub, Haki, Aier, Winter, & Magan, 2021c). This stands in contrast to the example from Apple, as Salesforce's revenue sharing mechanism is dynamically adapted to different types of complementors to be in line with their particular (and sometimes non-interchangeable) contributions to the ecosystem and with their distinct generativity motives in the ecosystem.

Besides the platform type, the maturity stage of the platform is another important contextual factor. For example, platform owners often rely on a gatekeeping strategy that involves being more open in the early stages to attract a high number of complementors and users (focus on generativity), while introducing more restrictions after a certain period of time (focus on control) (Eisenmann, Parker, & Alstyne, 2006).

Beyond the general platform evolution, however, sudden changes in the ecosystem's dynamics (e.g., inappropriate conduct of the ecosystem's actors, new regulation, increased competition) may require platform owners to immediately adjust the focus of their governance mechanisms in general or for certain actor groups in particular. The latter can be illustrated by the recent case of free speech social media app *Parler* which was temporarily removed by Apple from the app store within only two days after its users increasingly published posts that spread misinformation and incited violence[4]. In other words, Apple increased the control focus of the gatekeeping mechanism for this complementor. These examples illustrate that platform owners need to constantly assess opportunities and risks in their environment to effectively alter the generativity-control focus of their governance mechanisms.

While the focus of our analysis is on studies published in IS outlets, we observed that our consolidated insights in terms of the mechanisms' double-sided effects toward generativity and control are also reported by separate studies published in management and organization science outlets. For example, with regard to the gatekeeping mechanism, Zhang et al. (2022) examine how gatekeeping is adapted by platform owners to control the interactions between complementors. Other scholars highlight the potential of the gatekeeping mechanism to foster generativity. For example, O'Mahony and Karp (2022) highlight that gatekeeping is one aspect of governance that platform owners may use to facilitate platform adoption of complementors (i.e., foster generativity). The authors also find that that platform owners can sequentially increase the openness of their digital

[4] For more information about the *Parler* case, please visit the following *New York Times* article: https://www.nytimes.com/2021/01/09/technology/apple-google-parler.html

platforms and that the effect on generativity is moderated by different levels of decision rights. These explanations demonstrate that these studies are useful to enrich our findings from IS literature, but they do not considerably change our main results in terms of the mechanisms' double-sidedness. However, it may be worthwhile for future IS research to consider the studied cases in management and organization science outlets in order to analyze more diverse platform settings. For example, Ansari et al. (2016) investigate a television ecosystem, which had been disrupted by a start-up developing a digital platform that connects multiple actors in the ecosystem (e.g., TV providers, advertisers, content distributors). This setting is different compared to a setting in which the platform owner plays a central role and can exercise power over complementors and users to a considerably higher degree (e.g., Apple on its *iOS* platform or SAP on its *Business Technology Platform*). This is confirmed by several scholars that highlight the need to study more decentralized (Chen, Pereira, & Patel, 2020) or collective (O'Mahony & Karp, 2022) governance practices.

Overall, given the strong context-dependency of the mechanisms' effects, there is no uniform recipe for the selection of appropriate governance mechanisms. On a high level of abstraction, most mechanisms can be employed to address either of the two aspects of the generativity-control tension. In practice, however, the resulting effect of a particular mechanism is subject to the given context. The fact that the platform context changes over time illustrates the persistent nature of the tension that requires continuous attention and management. This makes it challenging for platform owners to design effective mechanisms that are targeted for their specific context. Therefore, while this study provides a comprehensive overview of the major governance mechanisms along with their potential effects on generativity and control, we currently still lack more context-dependent knowledge to better estimate whether the focus of the effects will be on generativity or control in a predefined context.

The focus of our analysis is on the effects of individual governance mechanisms. We posit that the *collective* effects of a portfolio of mechanisms can only be partially understood by comprehending the *individual* governance mechanisms' effects. Similar to the individual mechanisms, the collective generativity and/or control focus and their balance in a portfolio of several mechanisms is also expected to be context-dependent as, for instance, platform owners might shift the focus of the portfolio depending on the maturity stage of the platform (Lavie, Stettner, & Tushman, 2010).

However, the complexity increases considerably when estimating the collective effects of a portfolio of mechanisms because individual mechanisms are highly interrelated and mutually dependent on one another. For example, a simultaneous change in revenue sharing (higher share goes to complementors) and programming resources (additional documentation to support complementors) is expected to increase generativity. However, we currently lack knowledge about the mutual influences of the two mechanisms, for instance, whether the effects of revenue sharing positively interact with the effects of programming resources. This challenge is even more decisive in the case of multiple mechanisms, particularly when platform owners employ various mechanisms with some of them focusing on generativity and others on control.

B.5.2 Future Research on Platform Governance Mechanisms

To gain more systematic insights into the optimal generativity-control focus of an *individual governance mechanism* in its specific context, we encourage prospective research to conduct in-depth studies of the governance practices of different platform types. While existing research has extensively discussed several consumer-focused platform ecosystems such as Apple iOS, Google Android, or Firefox, studying other platform cases that received relatively less attention (e.g., enterprise software ecosystems) may potentially provide additional insights on how each mechanism can be implemented in a specific platform context. A useful example is Foerderer et al.'s (2019) case study of the resources provided by enterprise software platform owners to their complementors under various circumstances.

Further, prospective research is encouraged to conduct longitudinal studies to examine the dynamics of a governance mechanism over time. For example, Wessel et al. (2017) analyze the impact of a policy change that resulted in the platform owner relaxing the access to the platform (more focus on generativity in the gatekeeping mechanism) on a crowdfunding platform, illustrating that an increasing platform openness for third-party offerings can destabilize a platform ecosystem. This study provides important insights into how the same governance mechanism (gatekeeping) can have a different generativity-control focus in the same platform ecosystem. In this vein, future research could study policy changes in various platform governance mechanisms, which would extend our current knowledge about the application and effects of mechanisms with respect to their specific contexts.

To derive novel insights into the collective generativity and control effects of *multiple governance mechanisms*, we recommend prospective research leverage our results on individual mechanisms by systematically comparing identical combinations of governance mechanisms across different contexts. Future research is also encouraged to enhance our understanding of the mechanics of governance mechanisms, particularly their complementary or contradictory relations in reinforcing or cancelling-out one another in addressing the generativity-control tension. To gain insights into the complex interactions between the platform governance mechanisms, we particularly recommend future research to employ the case survey method (Larsson, 1993; Yin & Heald, 1975). Building on a considerable number of existing case studies (almost 35% of the platform studies in our data set (see Table 12 in the appendix)), case surveys would enable researchers to systematically compare the simultaneous application of multiple governance mechanisms across different contexts. Through the translation of contextual factors (e.g., type and maturity stage of a platform) and a set of variables (e.g., applied governance mechanisms and their effects) into quantitative variables, this approach may further provide insights into the contextual situations that determine the application and effects of different combinations of governance mechanisms. For example, Henfridsson and Bygstad (2013) analyzed how generative mechanisms, as an effect of different configurations of interconnected contextual conditions, jointly cause digital infrastructure evolution.

In studying the complex interactions between the platform governance mechanisms, we also encourage future research to employ a simulation-based research approach (Beese, Haki, Aier, & Winter, 2019; Haki, Beese, Aier, & Winter, 2020; Schmid, Haki, Tanriverdi, & Aier, 2021). Simulation makes it feasible to experimentally manipulate all the governance mechanisms in any possible combinations to observe if and how they interact with each other; an important inquiry that is virtually unfeasible in conventional empirical settings (Haki et al., 2020; Nan & Tanriverdi, 2017).

Table 9 summarizes our main suggestions for prospective research on platform governance mechanisms.

Table 9: Suggestions for Future Research on Platform Governance Mechanisms

Research focus		Suggested avenues	Suggested foci
Platform governance mechanisms	Individual effect of a governance mechanism	- Context-dependency (e.g., platform type, maturity stage, ecosystem dynamics) of an individual governance mechanism	- Study the individual effects of a governance mechanism (either toward generativity or control depending on various platform contexts) by conducting in-depth case studies - Study the dynamics in the individual effects of a governance mechanism (switching between generativity and control depending on time episodes of the same platform context) by employing a longitudinal approach
	Collective effect of a portfolio of governance mechanisms	- Interrelatedness and collective effects of multiple governance mechanisms applied in a portfolio	- Study the collective effects of a portfolio of governance mechanisms by comparing it across various platform contexts - Study the mechanics of governance mechanisms in a portfolio by conducting case survey and simulation

B.5.3 Future Research on Digital Platforms

While the focus of our investigation is on platform governance mechanisms, we also provide insights for the digital platform research in general (see Table 12 in the appendix). In our literature set, researchers strongly focused on prominent examples of thriving cases of digital platforms. This is demonstrated by the five most discussed cases in our literature set (i.e., Google's Android, Apple's iOS, Kickstarter, Taobao, and Firefox). However, studying cases of failed platforms may potentially extend the existing knowledge and provide important insights on the major obstacles during the early maturity phase of digital platforms (e.g., Cusumano, Gawer, & Yoffie, 2019). This is an important inquiry since many platform businesses have emerged, and are about to emerge, in different industries due to the phenomenal rise of the platform economy (Kenney & Zysman, 2016; Parker, Van Alstyne, & Choudary, 2016), a considerable number of which cannot survive and thrive in their market (Gawer & Cusumano, 2008; Hagiu & Altman, 2017; Zhu & Furr, 2016).

Similarly, compared to consumer-focused platform ecosystems that have drawn considerable attention in existing research, analyzing the underrepresented B2B platform ecosystems in various industries (e.g., enterprise software, manufacturing, oil and gas) has the potential to yield complementary insights (Blaschke et al., 2018; Matzner et al., 2021; Pauli et al., 2021; Schreieck, Wiesche, & Krcmar, 2021). The latter is due to the distinct characteristics of B2B platform ecosystems that often make the platform owner more dependent on complementors and users, for example during the provision of highly complex solutions that requires diligent integration of diverging resources provided by various actors (e.g., Ceccagnoli et al., 2012; Foerderer et al., 2019). This may require platform owners to consider more decentralized approaches for the design and management of their digital platforms (Chen et al., 2020).

Our review further reveals that the majority of the studied cases are platform-native cases such as Apple's iOS and Google's Android. This leads to a limited comparability between studies, as other platform types do not share the same characteristics. For example, only a small set of research explores how incumbents enter into the platform economy and strategically reorientate from a product-based to a platform-based competition strategy (Sandberg et al., 2020). However, incumbents in various industries such as financial services, healthcare, or enterprise software are increasingly adopting platform business models (de Reuver et al., 2018). Examples are SAP and Salesforce that nowadays consider themselves platform ecosystems rather than merely enterprise software providers (Staub et al., 2021c). Studying such underexplored cases of *platformization* can result in interesting theoretical and practical insights. Existing research has already started discussing the build-or-join decision, i.e., whether incumbents should build their own or join an existing platform ecosystem (e.g., Cusumano et al., 2019). Prospective research could complement these studies by identifying additional strategies of incumbents in entering the platform business and ensuring their sustainable evolution in platform-driven markets (e.g., Hermes, Guhl, Schreieck, Weking, & Krcmar, 2021).

With regard to the methodological approach, dominantly employing a descriptive approach to explain and theorize on platform cases restricts the extracted knowledge to what has been (successfully) tried. Nevertheless, considering the necessity of both descriptive and prescriptive knowledge (Gregor & Hevner, 2013), we lack knowledge on what could or should be tried. Therefore, we encourage design-oriented studies capture, synthesize, and share design knowledge for digital platforms. In particular, future research may propose taxonomies of digital platforms from various perspectives to differentiate distinct platform contexts, thereby enabling the identification of patterns and the systematic comparison of different platforms across major aspects (e.g., Hein, Scheiber, Böhm, & Weking, 2018; Staub, Haki, Aier, & Winter, 2021a).

Platform researchers also applied a variety of theoretical lenses to guide the derivation of their theories on digital platforms. Although a large number of different theories were applied, there are still relatively few dominant theories in platform research, as illustrated by the fact that only three theories have been used more than three times (i.e., game theory, complex adaptive systems theory, and modular systems theory). We further encourage employing theories that help theorizing on paradoxical platform design decisions. For instance, ambidexterity theory helps articulate different circumstances under which the duality and the two aspects of a paradox can be dynamically and simultaneously achieved (Lavie et al., 2010). Specifically, extant ambidexterity research has conceptualized four modes, namely contextual, structural, temporal, and domanial ambidexterity (Lavie et al., 2010) that may support future research in providing insights on addressing the paradoxical tensions inherent in the design and evolution of digital platforms.

Regarding the unit of analysis, our review reveals that the majority of existing studies take a platform owner, complementor, or user perspective. Nevertheless, a thorough understanding of digital platforms as socio-technical systems entails the need for their investigation from the standpoint of all the ecosystem's actors (i.e., platform owner, complementors, and users). Thus, we call for more studies on the ecosystem level to account for a triangulation of perspectives from different actors and their reciprocal impacts in delineating an ecosystem's status-quo and evolution. When the role of individual ecosystem's actors is concerned and considering the current status of research, we further suggest that future research focuses more on complementors due to their essential role in co-creation of value in platform ecosystems (Cennamo & Santaló, 2019; Ghazawneh & Henfridsson, 2013). Examining complementors helps better understand their motivation to join a platform in different settings (e.g., platform types), specifically in the abovementioned cases of a company's transition from a product-based to a platform-based competition strategy whose success is very much contingent on attracting complementors to conduct their business on the platform.

Table 10 gives an overview of our main suggestions for future digital platform research.

Table 10: Suggestions for Future Research on Digital Platforms

Research focus		**Suggested avenues**	**Suggested foci**
Digital platforms	Platform cases	- Major obstacles in the early maturity phase of platforms - Platform's diverse characteristics to increase the comparability of platform studies	- Study cases of failure - Study cases in B2B contexts - Study cases of platformization -
	Research methods and contribution types	- Design knowledge and principles to guide the design and evolution of platforms	- Employ prescriptive approaches (e.g., DSR)
	Theories	- Theoretical perspectives for addressing paradoxical platform design decisions	- Employ relevant theoretical lenses to inform theory building on managing paradoxical tensions inherent in the design and evolution of platforms
	Unit of analysis	- A platform ecosystem view as well as complementors' strategic reactions to platformization	- Study platforms with a multi-actor view (i.e., platform owner, complementors, users)

B.5.4 Implications for Practice

Our insights on platform governance mechanisms also have practical implications. Due to the necessity of both generativity (to facilitate innovation) and control (to enable structural stability), platform owners constantly encounter paradoxical design decisions in their ecosystems. Thus, platform owners benefit from our comprehensive overview of the major mechanisms to govern their platform ecosystems with respect to each mechanism's role in fostering generativity and/or control. In particular, the discussed governance mechanisms serve as guidance for digital platform designers that consider building a digital platform (and define an appropriate governance structure) as well as for digital platform managers that aim to identify possible adaptations of their current portfolio of governance mechanisms.

Further, our study gives rise to the double-sidedness of governance mechanisms, requiring platform designers and managers to take into account each mechanism's contextual and temporal conditions as well as the potential dynamics of their interaction effects. Therefore, we call for practitioners' particular attention to the contextual use of each mechanism along with the purposeful bundling of mechanisms into a portfolio to effectively address the generativity-control tension. While our results are important for platform owners, complementors can also benefit from our research. Specifically, a more detailed understanding of the potential motivations (generativity and/or control) of platform owners to employ or alter certain governance mechanisms may support complementors' strategic positioning in a platform ecosystem.

B.5.5 Conclusion

Our literature review consolidates fragmented academic discourses on platform governance mechanisms that have been accumulated in different literature streams. The main result of our literature analysis is to show which mechanisms from the existing platform research are most relevant with regard to the generativity-control tension as well as how each of them can be applied by platform owners to account for both aspects of the tension. Lastly, we provide avenues for prospective research and discuss our results in terms of the importance of contextual factors when designing and implementing governance mechanisms as well as their mutual interrelatedness when applied in a portfolio.

B.6 Appendix A: Analysis Framework

Table 11: Analysis Framework

Coding item		Explanation and examples	References
Tensions		*Tensions refer to conflicting aspects, competing demands or opposing perspectives.* - Generativity vs. control - Autonomy vs. control - Openness vs. control - Generativity vs. stability - Ability to charge vs. openness - Governance costs vs. control - Individual vs. collective - Old identity vs. new identity - Securing vs. resourcing	Ghazawneh and Henfridsson (2013), Huber et al. (2017), Jain and Ramesh (2015), Karhu et al. (2018), Lewis (2000), Lindgren et al. (2015), Parker and Van Alstyne (2018), Smith and Lewis (2011), Wareham et al. (2014), Ye and Kankanhalli (2018)
Governance mechanisms	Boundary resources	*Boundary resources refer to resources that are used by external developers to support their development work.* - Intellectual property rights - Interfaces (e.g., APIs) - Licensing - Programming resources	Ghazawneh and Henfridsson (2013), Foerderer et al. (2018)
	Decision rights	*Decision rights refer to the division of authority and responsibilities between the platform owner and complementors.* - App implementation - App strategic - Platform implementation - Platform strategic	Thies et al. (2018), Tiwana (2014)
	Gatekeeping	*Gatekeeping (i.e., input control, bouncer rights) refers to the degree to which platform owners use predefined acceptance criteria to judge what complementors are allowed into the ecosystem.*	Boudreau (2010), Evans et al. (2006), Tiwana (2014)
	Metrics	*Metrics (i.e., output control) refer to the degree to which the platform owner rewards or punishes complementors based on the degree to which their outcomes achieve performance metrics.*	Tiwana (2014), Wareham et al. (2014)

	Ownership	*Platform ownership goes beyond the legal entity that owns the digital platform (owner, group of partners or peer-to-peer network); it also refers to centralized or decentralized distribution of power in ecosystems.*	Hein et al. (2020)
	Pricing	*Pricing policies are used by the platform owner to create incentives for complementors to invest their resources to ensure prosperity of their own offerings and in turn the whole ecosystem.* - Access or usage fees - App pricing model - Subsidy-side - Symmetry	Tiwana (2014)
	Process control	*Process control refers to the degree to which a platform owner rewards or punishes complementors based on their success/failure in following prescribed methods, rules, and procedures.*	Rochet and Tirole (2003), Tiwana (2014)
	Revenue sharing	*Revenue sharing represents the degree to which the platform extracts revenue that is co-created with the complementors.*	Oh et al. (2015)
	Relational control	*Relational control fills the gaps left by formal agreements and refers to the degree to which platform owners rely on shared norms and values with complementors to influence their behavior.* - Organizing socialization - Setting examples - Reinforcing common identity	Dhanaraj and Parkhe (2006), Tiwana (2014)
Research specificities	Units of analysis	- Complementors - Ecosystem - Platform - Platform owner - Users -	Gregor (2006), Hein et al. (2020), Nicholson et al. (2018)
	Research methods	- Analytical modeling - Case study - Case survey - Conceptual - Design science research - Experiment - Grounded theory - Literature review - Longitudinal - Mixed methods - Simulation - Survey	
	Theories	*We applied open coding to capture any theoretical lenses that are employed by the reviewed studies. Some examples are the following:* - Ambidexterity theory - Complex adaptive systems theory - Game theory - Institutional theory	
	Contribution types	- Conceptualization - Confirmation of hypotheses - Design artifact - Design principles - Propositions	

B.7 Appendix B: Overview of Digital Platform Research

Besides the major findings on platform governance mechanisms, our literature review provides several insights with respect to the research specificities applied by digital platform researchers (Table 12).

Table 12: Overview of Digital Platform Research[5]

Research methods	**Count and share of publications**		**Theories**	**Count and share of publications**	
Analytical modeling	60	45.1%	Game theory	5	3.8%
Case study	45	33.8%	Complex adaptive systems theory	5	3.8%
Longitudinal	26	19.5%	Modular systems theory	4	3.0%
Survey	16	12.0%	Social capital theory	3	2.3%
Experiment	8	6.0%	Institutional theory	3	2.3%
Conceptual	7	5.3%	Resource dependency theory	3	2.3%
Literature review	6	4.5%	Signaling theory	2	1.5%
Design science research	5	3.8%	Technology acceptance model	2	1.5%
Simulation	5	3.8%	Social exchange theory	1	0.8%
Grounded theory	3	2.3%	Expectancy theory	1	0.8%
Delphi study	2	1.5%	Control theory	1	0.8%
Units of analysis			**Contribution types**		
Platform	88	66.2%	Conceptualization	57	42.9%
Platform owner	36	27.1%	Confirmation of hypotheses	56	42.1%
Complementors	32	24.1%	Propositions	16	12.0%
Users	31	23.3%	Design artifact	2	1.5%
Ecosystem	7	5.3%	Design principles	2	1.5%

First of all, our review indicates that digital platform researchers adopted a variety of different methods. Analytical modeling (quantitative, mathematical equations that specify parametric relations among different variables), such as panel analyses or different variations of regression analysis, was the most common method, followed by case

[5] The percentage values indicate the share out of the total number of papers. Regarding the research methods, theories, and units of analysis, multiple choices for one paper are possible (e.g., case study *and* longitudinal). Besides the 122 reviewed papers, the table includes literature review (5) and conceptual/editorial (6) papers that were excluded from the literature analysis.

studies and surveys. Within case studies, single case studies (25; 18.8%) were the most common option, followed by multiple case studies (13; 9.8%) and field studies (7; 5.3%). Many of the case studies applied a longitudinal analysis. Few studies made use of other methods such as simulation or design science research (DSR).

Several of the papers applied at least one specific theory. The most frequently used theories were game theory, complex adaptive systems theory, modular systems theory, social capital theory, institutional theory, and resource dependency theory. Regarding the contribution types, research focused on the conceptualization before confirmation of hypotheses and derivation of propositions.

Moreover, prior research has focused on digital platforms as a major unit of analysis, followed by the platform owner, complementors, users, and the ecosystem. In addition, we identified Google Android (12; 9.0%), Apple iOS (10; 7.5%), Kickstarter (5; 3.8%), Taobao (3; 2.3%), and Firefox (3; 2.3%) as the major cases in our sample.

B.8 Appendix C: List of Papers

Table 13: List of Papers

Outlet	Year	Publication
EJIS	2015	Jain, R. P., & Ramesh, B. (2015). The roles of contextual elements in post-merger common platform development: An empirical investigation. *European Journal of Information Systems, 24*(2), 159-177.
EJIS	2019	Bogusz, C. I., Teigland, R., & Vaast, E. (2019). Designed entrepreneurial legitimacy: The case of a Swedish crowdfunding platform. *European Journal of Information Systems, 28*(3), 318-335.
EJIS	2021	Hurni, T., Huber, T. L., Dibbern, J., & Krancher, O. (2021). Complementor dedication in platform ecosystems: Rule adequacy and the moderating role of flexible and benevolent practices. *European Journal of Information Systems, 30*(3), 237-260.
ISJ	2013	Ghazawneh, A., & Henfridsson, O. (2013). Balancing platform control and external contribution in third-party development: The boundary resources model. *Information Systems Journal, 23*(2), 173-192.
ISJ	2016	Giessmann, A., & Legner, C. (2016). Designing business models for cloud platforms. *Information Systems Journal, 26*(5), 551-579.
ISJ	2017	Huang, Q., Chen, X., Ou, C. X., Davison, R. M., & Hua, Z. (2017). Understanding buyers' loyalty to a C2C platform: The roles of social capital, satisfaction and perceived effectiveness of e-commerce institutional mechanisms. *Information Systems Journal, 27*(1), 91-119.

ISJ	2018	Thies, F., Wessel, M., & Benlian, A. (2018). Network effects on crowdfunding platforms: Exploring the implications of relaxing input control. *Information Systems Journal, 28*(6), 1239-1262.
ISJ	2019	Foerderer, J., Kude, T., Schuetz, S. W., & Heinzl, A. (2019). Knowledge boundaries in enterprise software platform development: Antecedents and consequences for platform governance. *Information Systems Journal, 29*(1), 119-144.
ISJ	2019	Tan, F. T. C., Pan, S. L., & Zuo, M. (2019). Realising platform operational agility through information technology-enabled capabilities: A resource-interdependence perspective. *Information Systems Journal, 29*(3), 582-608.
ISJ	2021	Bonina, C., Koskinen, K., Eaton, B., & Gawer, A. (2021). Digital platforms for development: Foundations and research agenda. *Information Systems Journal, 31*(6), 1-34.
ISR	2010	Tiwana, A., Konsynski, B., & Bush, A. A. (2010). Platform evolution: Coevolution of platform architecture, governance, and environmental dynamics. *Information Systems Research, 21*(4), 675-687.
ISR	2014	Anderson, E. G., Jr., Parker, G. G., & Tan, B. (2014). Platform performance investment in the presence of network externalities. *Information Systems Research, 25*(1), 152-172.
ISR	2015	Tiwana, A. (2015a). Evolutionary competition in platform ecosystems. *Information Systems Research, 26*(2), 266-281.
ISR	2016	Hann, I. H., Koh, B., & Niculescu, M. F. (2016). The double-edged sword of backward compatibility: The adoption of multigenerational platforms in the presence of intergenerational services. *Information Systems Research, 27*(1), 112-130.
ISR	2017	Huber, T. L., Kude, T., & Dibbern, J. (2017). Governance practices in platform ecosystems: Navigating tensions between cocreated value and governance costs. *Information Systems Research, 28*(3), 563-584.
ISR	2017	Qiu, Y., Gopal, A., & Hann, I. H. (2017). Logic pluralism in mobile platform ecosystems: A study of indie app developers on the iOS app store. *Information Systems Research, 28*(2), 225-249.
ISR	2018	Cennamo, C., Ozalp, H., & Kretschmer, T. (2018). Platform architecture and quality trade-offs of multihoming complements. *Information Systems Research, 29*(2), 461-478.
ISR	2018	Constantinides, P., Henfridsson, O., & Parker, G. G. (2018). Platforms and infrastructures in the digital age. *Information Systems Research, 29*(2), 381-400.
ISR	2018	Foerderer, J., Kude, T., Mithas, S., & Heinzl, A. (2018). Does platform owner's entry crowd out innovation? Evidence from Google photos. *Information Systems Research, 29*(2), 444-460.

ISR	2018	Gal-Or, E., Gal-Or, R., & Penmetsa, N. (2018). The role of user privacy concerns in shaping competition among platforms. *Information Systems Research, 29*(3), 698-722.
ISR	2018	Karhu, K., Gustafsson, R., & Lyytinen, K. (2018). Exploiting and defending open digital platforms with boundary resources: Android's five platform forks. *Information Systems Research, 29*(2), 479-497.
ISR	2018	Khern-am-nuai, W., Kannan, K., & Ghasemkhani, H. (2018). Extrinsic versus intrinsic rewards for contributing reviews in an online platform. *Information Systems Research, 29*(4), 871-892.
ISR	2018	Kumar, N., Qiu, L., & Kumar, S. (2018). Exit, voice, and response on digital platforms: An empirical investigation of online management response strategies. *Information Systems Research, 29*(4), 849-870.
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JSIS	2019	Gol, E. S., Stein, M. K., & Avital, M. (2019). Crowdwork platform governance toward organizational value creation. *The Journal of Strategic Information Systems, 28*(2), 175-195.
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ICIS	2016	Hahn, C., Huntgeburth, J., Winkler, T. J., & Zarnekow, R. (2016). *Business and IT capabilities for cloud platform success* [Paper presentation]. 37th International Conference on Information Systems (ICIS 2016), Dublin, Ireland.
ICIS	2016	Qi, H., & Mao, J. (2016). *Facilitating transactions on a crowdsourcing platform: A cognitive frame perspective* [Paper presentation]. 37th International Conference on Information Systems (ICIS 2016), Dublin, Ireland.
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ICIS	2017	Bender, B., & Gronau, N. (2017). *Coring on digital platforms: Fundamentals and examples from the mobile device sector* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2017	Geva, H., Barzilay, O., & Oestreicher-Singer, G. (2017). *A potato salad with a lemon twist: Using supply-side shocks to study the impact of low-quality actors on crowdfunding platforms* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2017	Karunakaran, A. (2017). *In Cloud we trust? Normalization of uncertainties in platform services* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
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ICIS	2017	Nischak, F., Hanelt, A., & Kolbe, L. M. (2017). *Unraveling the interaction of information systems and ecosystems: A comprehensive classification of literature* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2017	Rhyn, M., Blohm, I., & Leimeister, J. M. (2017). *Understanding the emergence and recombination of distant knowledge on crowdsourcing platforms* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2017	Saadatmand, F., Lindgren, R., & Schultze, U. (2017). *Evolving shared platforms: An imbrication lens* [Paper presentation]. 38th

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ICIS	2017	Schreieck, M., Wiesche, M., & Krcmar, H. (2017). *The platform owner's challenge to capture value: Insights from a business-to-business IT platform* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2017	Schultze, U., & Bhappu, A. (2018). *Organization-sponsored sharing platforms: Managing the dialectics of conflicting institutional logics* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2017	Staykova, K. S., & Damsgaard, J. (2017). *Towards an integrated view of multi-sided platforms evolution* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2017	Vassilakopoulou, P., Grisot, M., Blegind Jensen, T., Sellberg, N., Eltes, J., Thorseng, A. A., & Aanestad, M. (2017). *Building national eHealth platforms: The challenge of inclusiveness* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2017	Wang, G., & Nandhakumar, J. (2017). *Strategic swaying: How startups grow digital platforms* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2017	Wessel, M., Thies, F., & Benlian, A. (2017). *Competitive positioning of complementors on digital platforms: Evidence from the sharing economy* [Paper presentation]. 38th International Conference on Information Systems (ICIS 2017), Seoul, South Korea.
ICIS	2018	Blaschke, M., Haki, K., Aier, S., & Winter, R. (2018). *Capabilities for digital platform survival: Insights from a business-to-business digital platform* [Paper presentation]. 39th International Conference on Information Systems (ICIS 2018), San Francisco, USA.
ICIS	2018	Lueker, N., Foerderer, J., & Heinzl, A. (2018). *App superstars: Are high-status complementors a sustained source of innovation in platform ecosystems* [Paper presentation]? 39th International Conference on Information Systems (ICIS 2018), San Francisco, USA.
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ICIS	2018	Um, S., Kang, D., Hahn, J., & Yoo, Y. (2018). *Popularity and competition in a digital platform ecosystem: A network perspective* [Paper presentation]. 39th International Conference on Information Systems (ICIS 2018), San Francisco, USA.

ICIS	2019	Alhauli, A., Gopal, A., & Elmaghraby, W. (2019). *Open versus closed? On the effects of mobile phone platform openness in B2B secondary market online auctions* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Bender, B., Thim, C., & Linke, F. (2019). *Platform coring in the browser domain-an exploratory study* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Fuerstenau, D., Rothe, H., Abayomi, B., Schulte-Althoff, M., Masak, D., Schewina, K., & Anisimova, D. (2019). *The digital platform Otto.de: A case study of growth, complexity, and generativity* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Gustavsson, M., & Ljungberg, J. (2019). *Platformization of a cloud service* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
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ICIS	2019	Hodapp, D., Hawlitschek, F., & Kramer, D. (2019). *Value co-creation in nascent platform ecosystems: A Delphi study in the context of the internet of things* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Karanasios, S., Cooper, V., Hayes, P. A., & Adrot, A. (2019). *"An iron hand in a velvet glove": The embodiment of the platform logic in the emergency sector* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Luo, D., Fang, Y., Song, P., & Wang, C. A. (2019). *The impact of digital platform rapid release strategy on app update behavior: An empirical study of Firefox* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Mini, T., & Widjaja, T. (2019). *Tensions in digital platform business models: A literature review* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Nischak, F., & Hanelt, A. (2019). *Ecosystem change in the era of digital innovation: A longitudinal analysis and visualization of the automotive ecosystem* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Pena, M. T., Breidbach, C. F., & Turpin, A. (2019). *Crafting agent-based models to analyze service platforms* [Paper presentation]. 40th

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ICIS	2019	Schaarschmidt, M., Stol, K. J., Walsh, G., & Bertram, M. (2019). *Lead users' innovative work behavior in digital platform ecosystems: A large scale study of app developers* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Tofangchi, S., Hanelt, A., & Li, S. (2019). *Advancing recommendations on two-sided platforms: A machine learning approach to context-aware profiling* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Venkataraman, V., Ceccagnoli, M., & Forman, C. (2018). *Multihoming within platform ecosystems: The strategic role of human capital* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2019	Wessels, N., Gerlach, J., & Wagner, A. (2019). *To sell or not to sell–antecedents of individuals' willingness-to-sell personal information on data-selling platforms* [Paper presentation]. 40th International Conference on Information Systems (ICIS 2019), Munich, Germany.
ICIS	2020	Asadullah, A., Faik, I., & Kankanhalli, A. (2020). *Can digital platforms help SMEs develop organizational capabilities? A qualitative field study* [Paper presentation]. 41st International Conference on Information Systems (ICIS 2020), Hyderabad, India.
ICIS	2020	Chai, S. H., Nicholson, B., Scapens, R., & Yang, C. (2020). *Digital platforms, surveillance and processes of demoralization* [Paper presentation]. 41st International Conference on Information Systems (ICIS 2020), Hyderabad, India.
ICIS	2020	Fürstenau, D., Auschra, C., & Klein, S. (2020). *A configuration approach to multi-sided platforms in healthcare*: *An ALS platform case* [Paper presentation]. 41st International Conference on Information Systems (ICIS 2020), Hyderabad, India.
ICIS	2020	Glaser, K. (2020). *Governance of internal complementors in platform ecosystems* [Paper presentation]. 41st International Conference on Information Systems (ICIS 2020), Hyderabad, India.
ICIS	2020	Petrik, D., & Herzwurm, G. (2020). *Boundary resources for IIoT platforms - A complementor satisfaction study* [Paper presentation]. 41st International Conference on Information Systems (ICIS 2020), Hyderabad, India.
ICIS	2020	Wu, X., Kumar, S., & Pang, M.-S. (2020). *Tackling Android fragmentation: Mobile apps' dilemma and the platform's strategies* [Paper presentation]. 41st International Conference on Information Systems (ICIS 2020), Hyderabad, India.

ICIS	2020	Zhou, Z., Zhang, L., & Van Alstyne, M. W. (2020). *How users drive platform value* [Paper presentation]. 41st International Conference on Information Systems (ICIS 2020), Hyderabad, India.

Paper C – Implementation of Platform Governance Mechanisms: Insights from a B2B Platform Ecosystem

Table 14: Bibliographic Metadata Paper C

Title	Implementation of Platform Governance Mechanisms: Insights from a B2B Platform Ecosystem
Authors	Staub, Nicola University of St.Gallen, Institute of Information Management, St.Gallen, Switzerland
Selected approach for order of authors	Sequence determines credit
Publication outlet	Sustainable Digital Transformation: Paving the Way Towards Smart Organizations and Societies (Lecture Notes in Information Systems and Organisation – LNISO)
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Abstract

Platform ecosystems are complex ecologies of firms with individual, sometimes conflicting, interests and goals. A platform owner as orchestrator of the ecosystem needs to constantly align the ecosystem actors' individual interests towards common objectives. To achieve such alignment of interests, platform owners rely on a purposefully defined governance structure, which is implemented through a set of governance mechanisms. Despite a variety of mechanisms being discussed in the existing research, little is known about platform owners' main activities to implement such mechanisms in their specific platform contexts, particularly in a B2B platform ecosystem context. To bridge this gap, we conduct an in-depth study of Salesforce, a thriving B2B platform ecosystem in the enterprise software industry. We find that the platform owner made significant resource investments to implement governance mechanisms based on innovative activities and we provide detailed empirical accounts on each of the main activities. Our findings

indicate that governance mechanisms are implemented differently in B2B platform ecosystems compared to consumer-focused platform ecosystems, which should be examined in more detail by future research.

Keywords

Digital Platform, Platform Ecosystem, Platform Governance

C.1 Introduction

Platform ecosystems are becoming the new organizing logic of many industries as illustrated by telecommunications (e.g., iOS, Android), video games (e.g., PlayStation, Xbox), and enterprise software (e.g., Salesforce, SAP) (de Reuver et al., 2018; Yoo et al., 2010). In a platform ecosystem, a *platform owner* offers a digital platform as a software-based technological foundation upon which third-party *complementors* can produce complementary applications (Gawer, 2009; Tiwana et al., 2010). Ultimately, *customers* derive certain values from the offerings jointly provided by the platform owner and the complementors. As each of these actors pursue their own, sometimes conflicting interests and goals, a platform owner, as the ecosystem's orchestrator, needs to align the actors' diverse interests toward achieving collective objectives (Cennamo & Santaló, 2019). Hence, managing a digital platform and the various actors in its ecosystem is a dynamic process that requires substantial resources (Gawer, 2014; Tiwana, 2014).

To allocate these resources in a structured way, platform owners rely on a purposefully designed governance structure, enabling them to attract, coordinate, and control different groups of actors (Tiwana, 2014). As complementors are generally not dependent on a single platform, platform owners need to incentivize complementors to provide their applications on the platform rather than directing them with command-and-control structures known from traditional organizations (Tiwana, 2014). Such a governance structure is usually implemented through a portfolio of mechanisms (Schilling, 2005; Staub, Haki, Aier, & Winter, 2022; Weill & Ross, 2004).

A fragmented set of studies in existing platform research has discussed various governance mechanisms as enablers of effective design and management of digital platforms (e.g., Benlian et al., 2015; Ghazawneh & Henfridsson, 2013; Schmeiss, Hoelzle, & Tech, 2019), resulting in a growing body of implicit knowledge accumulated from different platform types. However, scholars have recently asked for a more detailed view on the implementation of platform governance mechanisms to gain a deeper understanding of the specific activities available to platform owners to implement each mechanism

(Jacobides et al., 2018; McIntyre & Srinivasan, 2017; Staub et al., 2022). Therefore, the existing body of knowledge needs a consolidated view to illustrate how the major mechanisms can be implemented in specific platform contexts.

One important platform type that received considerably less attention in existing research is the B2B platform ecosystem. The implementation of governance mechanisms in the B2B context may differ from other contexts (e.g., consumer-focused platform ecosystems like Apple’s iOS or Google’s Android) due to several of the distinct characteristics of B2B platform ecosystems, which make the platform owner more dependent on complementors and customers (e.g., Ceccagnoli et al., 2012; Foerderer et al., 2019; Staub et al., 2021c). For example, the provision of highly complex products and services, which require diligent integration of resources from the ecosystem’s various actors. Therefore, as B2B incumbent firms from several industries (e.g., manufacturing, real estate, chemical) aim to transition into the platform economy (Hermes et al., 2021), it is of value for both research and practice to obtain a coherent understanding of how governance mechanisms can be implemented in a B2B platform ecosystem context.

To bridge this gap, this study aims to provide insights into B2B platform owners’ main activities to implement the major governance mechanisms which are discussed in the existing platform research. Therefore, we specify the following research question: *How are platform governance mechanisms implemented by platform owners in a B2B platform ecosystem context*? To answer the research question, we conduct an in-depth study of Salesforce, a B2B platform ecosystem that has thrived considerably over the last years. We find that Salesforce relies on several major proprietary developments and acquisitions to implement the major platform governance mechanisms and provide detailed empirical accounts of Salesforce’s activities to achieve this implementation. We further provide initial insights about how the implementation of these governance mechanisms might differ in B2B platform ecosystems as compared to consumer-focused platforms, which should be examined in more detail by future research.

C.2 Research Background

In this section, we present our conceptualization of platform ecosystems, the main discourses on platform governance, and the particularities of B2B platform ecosystems.

C.2.1 Platform Ecosystems

Platform ecosystems are complex ecologies of firms with individual and collective, intertwined interests (Cennamo & Santaló, 2019). Each platform ecosystem is marked by a central digital platform that provides a software-based technological foundation upon which third-party actors can produce their complementary extensions (Gawer, 2009; Tiwana et al., 2010). Actors of a platform ecosystem include the platform owner (i.e., operator), complementors (e.g., developers), and customers. Even though the engaged actors pursue their own, sometimes conflicting, interests and goals, they have a common interest in the survival and prosperity of the platform for materializing and selling their own products and/or services (Selander et al., 2013).

C.2.2 Governance

Governance in organizational contexts has been defined from different perspectives. From a corporate governance point of view, governance is defined as "providing the structure for determining organizational objectives and monitoring performance to ensure that objectives are attained" (Weill & Ross, 2004, pp. 4-5). From an IT governance standpoint, governance refers to "specifying the decision rights and accountability framework to encourage desirable behavior in using IT" (Weill & Ross, 2004, p. 2) in order to ensure that individual IT decisions are consistent with a firm's strategic objectives (Weill & Ross, 2005). Both these two perspectives illustrate the use of a set of mechanisms to encourage desirable behavior (De Haes & Van Grembergen, 2009; Weill & Ross, 2004). Consequently, a *mechanism* can be conceptualized as a means to implement a governance structure (e.g., Staub et al., 2022).

However, governance in the context of platform ecosystems differs from traditional organizational contexts (Tiwana, 2014; Tiwana et al., 2010). The survival of a platform ecosystem is considerably contingent on the contributions provided by loosely coupled and independent third-party complementors that each pursue their own interests and goals (Selander et al., 2013; Tiwana, 2014). Therefore, the platform owner needs to *incentivize* complementors to create their complementary applications rather than direct them with command-and-control structures. One major challenge of platform owners is to simultaneously facilitate complementors' value co-creation (i.e., generativity) while retaining sufficient stability over how their interactions take place (i.e., control) (Eaton et al., 2015; Ghazawneh & Henfridsson, 2013; Tiwana et al., 2010). Ultimately, platform governance encompasses the need for innovative governance mechanisms to align the platform owner's own interests with those of the complementors (Schilling, 2005; Staub et al., 2022).

Tiwana (2014) applied the concept of governance to platform ecosystems and derived three dimensions of platform governance, namely the allocation of decision rights to decide how responsibility is divvied up among the ecosystem's actors, the configuration of a control portfolio to ensure sufficient complement quality, and pricing to ensure each of the actors receive their fair share of the revenue generated on the platform (2014). Another major contribution was Ghazawneh and Henfridsson's (2013) boundary resources model which refers to the resources that should be provided by platform owners to complementors to encourage them to make their contributions (Ghazawneh & Henfridsson, 2013). Table 15 provides an overview of the major mechanisms discussed in the literature. These mechanisms are accumulated from studies focusing on different platform contexts. As their implementation may differ across different platform contexts, we aim to complement the existing research by providing insights on the implementation of these mechanisms in the understudied context of B2B platform ecosystems.

Table 15: Governance Mechanisms in Digital Platform Ecosystems[6]

Governance Mechanism		Definition	References
Boundary resources		*Refer to resources that are provided by the platform owner to complementors to support their development work.*	(Foerderer et al., 2019; Ghazawneh & Henfridsson, 2013)
	Programming resources	*Refer to resources that help complementors build their applications (e.g., software tools, software development kits).*	
	Interfaces	*Refer to resources that help complementors connect with the platform core (e.g., application programming interfaces).*	
	Knowledge resources	*Refer to resources that help complementors understand the platform ecosystem (e.g., documentation, workshops).*	
Pricing & revenue sharing		*Refers to the degree to which the platform extracts revenue that is co-created with the complementors as well as to the creation of financial incentives for complementors to provide their complements.*	(Oh et al., 2015; Tiwana, 2014)
Gatekeeping (i.e., input control)		*Refers to the degree to which platform owners apply predefined criteria to decide which complementors are allowed into the platform ecosystem.*	(Boudreau, 2010; Evans et al., 2006; Tiwana, 2014)
Relational control		*Refers to the degree to which the platform owner relies on the establishment of norms and values shared with complementors to influence their development work.*	(Dhanaraj & Parkhe, 2006; Tiwana, 2014)

C.2.3 B2B Platform Ecosystems

To study the implementation of governance mechanisms in a specific context, our focus is on B2B platform ecosystems. The latter are particularly suitable to answer our research question because of their distinct characteristics, which make the platform owner more dependent on the other ecosystem actors (i.e., complementors and customers), therefore requiring a specific approach to governance and potentially resulting in novel insights on the implementation of appropriate mechanisms. Some of these particularities

[6] These governance mechanisms are derived from a comprehensive literature review on platform governance mechanisms (Staub et al., 2022).

are as follows: the provision of highly complex and industry specific products and services to customers that requires diligent integration of complementary resources contributed by various ecosystem actors; the broad spectrum of complementary resources provided by the external actors (e.g., development, implementation, or consultancy); the negligible power distance between the ecosystem actors as the platform owner (e.g., Salesforce), complementors (e.g., Accenture), and customers (e.g., ABB) are often all big players in their respective industry (Blaschke et al., 2018; Ceccagnoli et al., 2012; Foerderer et al., 2019; Hein et al., 2019; Riemensperger & Falk, 2020; Schreieck et al., 2017; Staub et al., 2021c).

C.3 Methodology

The investigation of how platform governance mechanisms manifest in the B2B context requires the in-depth study of a B2B platform ecosystem from the perspective of all engaged ecosystem actors (de Reuver et al., 2018; Tilson et al., 2010). This would allow to gain detailed insights about a platform owner's specific activities to implement governance mechanisms. Therefore, we opt for a single case study approach (Eisenhardt, 1989) to gain insights on how the major governance mechanisms from the existing platform research manifest in a specific B2B platform ecosystem.

C.3.1 Case Selection and Description

We opt for Salesforce, a prime example of a thriving B2B platform ecosystem in the enterprise software industry. Salesforce has a more than 15-year long history as a platform ecosystem. In addition, due to the company's continuous development of the platform's technology and functionalities that considerably influenced the ecosystem actors' contributions, the study of Salesforce specifically enables us to investigate how the ecosystem is governed through mechanisms[7].

Salesforce is a leader in the global customer relationship management (CRM) market. While in Salesforce's early stages, its main value proposition was a sales-related software module (today known as *Sales Cloud*), Salesforce has since evolved into an integrated CRM offering (called *Customer 360*) with a broad range of modules related to sales, customer service, marketing, analytics, collaboration, and e-commerce. Besides this, complementors offer complementary applications in Salesforce's commercial

[7] For a more detailed overview of Salesforce's history, please see the following article: https://www.salesforce.com/news/stories/the-history-of-salesforce/

marketplace for enterprise software applications called *AppExchange*. The latter has become the world's largest enterprise software marketplace, with more than 3'500 registered complementors as of today. These offerings jointly provided by the platform owner and complementors have attracted more than 150'000 customers, including both small businesses and multinational large enterprises. Customers can buy licenses for individual modules on a pay-per-use basis and can extend these modules with complementary applications. In the interplay of these different actors, Salesforce as platform owner orchestrates the ecosystem's actors with various targeted activities.

C.3.2 Data Collection

We collected data from July until October 2020 by means of semi-structured interviews in order to obtain first-hand insights from experts in the Salesforce ecosystem. We conducted 15 interviews with an average duration of 63 minutes per interview.

We derived interview questions based on the roles, interests, and concerns of the ecosystem's actors to explore each actor's perspective on Salesforce's platform governance decisions. More specifically, we collected data on the following points: How does each of the actors (i.e., platform owner, complementors, and customers) understand the ecosystem (e.g., the core and side offerings); What is each actor's role in the ecosystem and in relation to the other actors; What were the major developments in the ecosystem that considerably impacted the roles of actors and the values that they derive from the ecosystem; What are the platform owner's main activities to manage the ecosystem and align the various ecosystem actors' interests.

In the following, we describe the steps that we conducted as part of our interview series to ensure consistent data collection according to our research objective. To obtain a comprehensive understanding of all perspectives in the ecosystem, we collected data from all three engaged actor groups (i.e., platform owner, complementors, and customers). Owing to Salesforce's role as the ecosystem's orchestrator, we decided to conduct a large portion of the interviews with Salesforce employees in various roles. For identifying potential interviewees, requirements were business and/or technology roles in relation to Salesforce as well as in-depth familiarity with the Salesforce ecosystem. Table 17 in the appendix provides an overview of our interviewees and their organizations. We also developed a comprehensive interview guideline that contains the interview questions and an introduction to the research objectives. In accordance to our ecosystem view in data collection, we adapted the interview guideline and its constituent questions with the role of each interviewee's organization in the Salesforce ecosystem (owner, complementor, or customer). In the case of interviews with Salesforce employees, we also adapted the interview guideline depending on their functional area inside Salesforce. We shared this interview guideline several days in advance with interviewees along with an interviewee factsheet (to collect interviewee's demographic data such as position, department, location, and years of experience). Further, we recorded all interviews with the approval of the interviewees and later transcribed them verbatim, except for one interview for which we created notes during the session.

C.3.3 Data Analysis

To analyze the data, we relied on a-priori and open coding (Eisenhardt, 1989). We used an a-priori coding scheme based on the governance mechanisms that we derived from the existing platform research (Table 15). This approach enabled us to capture all data directly related to each of the governance mechanisms. We also followed the approach of open coding to capture other aspects related to the general orchestrating initiatives of the platform owner. During this procedure, we maintained a broad perspective in the sense that we did not merely code aspects explicitly related to the governance mechanisms identified in the existing research. For instance, we also coded *transparency*, which was mentioned by several interviewees as a specific means that helped the platform owner incentivize complementors for their development work. In this regard, our multi-actor perspective was beneficial as it allowed us to capture relevant aspects from the perspective of all actors (i.e., platform owner, complementors, and customers). Subsequently, we categorized these open codes into the major governance mechanisms (Table 15) in a step-by-step coding of the data (Eisenhardt, 1989). For instance, in the above-mentioned example of *transparency*, while the term was mentioned several times, we observed that transparency primarily relates to Salesforce's upfront communication before major releases, enabling complementors to prepare for important changes in advance. Therefore, we categorized *transparency* into the *boundary resources* mechanism, more specifically into the *knowledge resources* mechanism. This approach enabled us to capture all activities related to the platform owner's efforts to align the ecosystem's various actors.

C.4 Platform Governance Mechanisms at Salesforce

In this section, we present our results on how the governance mechanisms, which are discussed in the existing platform research, are implemented in the context of the

Salesforce platform ecosystem. Specifically, we describe Salesforce's main activities to implement each of the major governance mechanisms (see Table 16 for an overview).

C.4.1 Boundary Resources

Salesforce provides several boundary resources to support complementors in their development work as well as to provide some standardization on how their interactions take place in the ecosystem.

Programming Resources. Salesforce provides several types of programming resources to complementors to facilitate their development work. To provide complementors with a technological foundation upon which they can create their own applications, Salesforce offers two main options. The first one is a proprietary development environment called *Force.com*. The *Force.com* usually has three releases each year and the applications can be created using an object-oriented programming language called *Apex*. To give more flexibility and additional options to complementors in their application development, Salesforce later acquired an additional development environment called *Heroku,* which enables complementors to use a variety of open source programming languages to build their applications. A Director of Applications at a large Salesforce customer described the benefits of *Heroku* for complementors as follows:

> *"You can also write applications outside the Force.com platform. You can use Heroku and you can run whatever, Heroku is just an environment to run Python or [...] other development platforms. And they will run on Salesforce modules. [...] You can write applications that are connected to Salesforce. Everything is possible." (Director Applications, Customer, CU-2)*

Interfaces. To provide complementors with a standardized form of platform access as well as to facilitate data exchange and seamless integration, Salesforce acquired *MuleSoft*, a leading integration platform with several interface builders as well as its own marketplace for application programming interfaces (APIs) called *Anypoint Exchange*. MuleSoft enables complementors to connect any two IT systems both inside and outside of the Salesforce ecosystem and particularly supports complementors in connecting their applications to the Salesforce core platform.

Knowledge Resources. Salesforce also provides several knowledge resources to complementors. Specifically, Salesforce launched an online learning system called *Trailhead*, which contains various online courses and certificates that enable complementors to gain a deeper understanding of Salesforce's major functionalities and identify possible ways to extend these offerings:

> *"We recognized that we weren't reaching enough people to allow them to learn about Salesforce and our products. Trailhead came as a result of our desire to grow our footprint and knowledge in the wider business and technology communities. So, now you will see a lot of people that made their first experience at Salesforce [...] via Trailhead". (Senior Director, Solution Engineering, Platform owner, PO-4)*

Besides this self-information tool, Salesforce actively provides information to complementors as part of their various complementor enablement programs focusing on both technical and business aspects. In this regard, Salesforce developed a four-tier model to distinguish between four levels of complementors; the higher the level, the more enablement services will be provided by Salesforce.

C.4.2 Pricing and Revenue Sharing

Salesforce's pricing and revenue sharing policies create incentives for complementors to produce their own applications in two main ways. First, the development environments *Force.com* and *Heroku* can be used for a relatively small fee. Second, complementors only need to pay a commission for applications that were actually sold. In general, complementors are able to sell their own licenses on top of Salesforce's basic *platform license*. In this regard, Salesforce makes an important distinction between two groups of complementors, namely independent software providers (ISVs) and original equipment manufacturer (OEMs). The former, ISVs, are registered in Salesforce's *AppExchange,* extend Salesforce's core products, and need to share 15% of their revenue generated through selling applications in the Salesforce ecosystem. The latter, OEMs, which merely access Salesforce's customer base to leverage their previously existing offerings (outside of the Salesforce ecosystem), need to share a higher amount of 25%.

C.4.3 Gatekeeping

To control for complement quality, Salesforce established a structured onboarding process which complementors must go through in order to be able to sell their applications in the *AppExchange*. This process includes both technical and business aspects. The technical part includes a compliance check, signing a distribution agreement, and a security review. Complementors must also meet certain business-related requirements, such as undergoing a business plan assessment or an alignment with upcoming changes to Salesforce's product roadmap.

C.4.4 Relational Control

Salesforce facilitates relational control in various ways by organizing social events and reinforcing a common identity among complementors. During its annual *Dreamforce* conference, several sessions are organized to foster exchange among Salesforce complementors. In addition, Salesforce launched various developer enablement programs, such as a program called *Developer Experience (DX)*, which plays an important role in connecting complementors among each other and further supports complementors with enablement services. A Vice President of Product Management at Salesforce explained the benefits of this program as follows:

> *"That was a big turn for our community […]. For a very long time, we had focused on the end user configuring, but we had not done a lot of investment in developer tooling, sort of professional developer tooling to help them build around Salesforce implementations. […] What we did, we went through a big program, worked a lot with our partners around the types of developer tooling that they would need to really kind of take a professional developer lens on how to improve support for our platform. […] For years and years, we've been getting asked to build more declarative tools and services." (Vice President, Product Management, Platform owner, PO-3)*

In addition, Salesforce offers several online forums to facilitate discussions and the exchange of ideas among complementors. For example, to enable complementors to contribute new feature ideas for future releases, Salesforce launched *Trailblazer*, an online voting system. *Trailblazer* allows complementors to post and upvote feature ideas, thereby contributing to Salesforce's product roadmap planning process.

Table 16: Platform Governance Mechanisms in the Salesforce Ecosystem

Governance Mechanism		Platform Owner's Main Implementation Activities
Boundary resources	Programming resources	- A development environment upon which complementors build their applications (*Force.com*) - A more flexible development environment enabling complementors to access open source development languages (*Heroku*)
Boundary resources	Interfaces	- An API platform to enable complementors to connect their applications to the Salesforce core platform (*MuleSoft*)
Boundary resources	Knowledge resources	- An online learning system to enable complementors to gain a deeper understanding of Salesforce's various features (*Trailhead*) - Various complementor enablement programs with extensive support related to both technical and business aspects
Pricing & revenue sharing		- Salesforce's two major development environments can be used by complementors for a relatively small fee - A commission-based licensing revenue model that charges complementors only on actual applications sold
Gatekeeping		- A structured onboarding process with various obstacles that must be overcome in order to become a Salesforce complementor
Relational control		- Various social events during a major conference (*Dreamforce*) or as part of experience programs to facilitate the complementor community - An online voting system to enable complementors to provide feedback on ideas of other complementors (*Trailblazer*)

C.5 Discussion and Conclusion

We started with the premise that the major governance mechanisms from the existing platform research need to be considered in specific platform contexts to gain a more detailed understanding of the required activities to implement these mechanisms. Despite the fact that B2B incumbents from various industries increasingly aim to transition into the platform economy (Hermes et al., 2021), B2B platform ecosystems received relatively little attention in the existing research. By conducting an in-depth analysis of Salesforce, a thriving B2B platform ecosystem in the enterprise software industry, we shed light on B2B platform owners' activities to implement the major governance mechanisms. In the following, we discuss the results of our study, elaborate on their boundary conditions, and provide avenues for future research.

C.5.1 Contributions to Research

Our study provides two main contributions to the existing platform research. First, we provide an overview of the major governance mechanisms in the existing research and provide detailed empirical accounts on the implementation of each of the mechanisms in the B2B platform ecosystem context as one exemplary platform context (Table 16). Our findings illustrate that Salesforce as the platform owner put great emphasis on the implementation of these governance mechanisms as several of them required major proprietary developments or acquisitions. For example, to provide *knowledge resources* to complementors, Salesforce created an online learning platform (i.e., *Trailhead*) that helps complementors gain deep expertise about Salesforce's various features and identify possible ways to extend these features with complementary applications. Another example is the provision of *interfaces*, where Salesforce conducted a major acquisition of a leading integration technology (i.e., *MuleSoft*) with a marketplace for application programming interfaces (APIs) and several interface builders. These are just two examples to illustrate that Salesforce made significant resource investments to implement each of the governance mechanisms and planned required activities well in advance.

Second, we provide evidence that the implementation of several of the governance mechanisms may manifest differently in the B2B context compared to consumer-focused platform ecosystems (e.g., Apple's iOS, Google's Android). On the one hand, B2B platform ecosystems, similar to their consumer-focused counterparts, facilitate complementor and customer transactions through innovative activities (e.g., app stores, rating systems). On the other hand, there are important commonalities in the governance mechanisms between Salesforce and other B2B platform ecosystems such as SAP (e.g., Ceccagnoli et al., 2012) and Siemens *MindSphere* (e.g., Petrik & Herzwurm, 2020), which do not apply to consumer-focused platforms: (a) In B2B platform ecosystems there are often multiple types of complementors. For example, in the Salesforce context, complementors include independent software vendors (ISVs), original equipment manufacturers (OEMs), and implementation consultancy services providers. In the Siemens *MindSphere* context, complementors further include data and hardware providers (Pauli et al., 2021; Petrik & Herzwurm, 2020). Due to this, platform owners' governance mechanisms need to take the specific complementor groups into account. For example, Salesforce applies different licensing models to different types of complementors (i.e., ISVs are required to share 15% and OEMs 25% of their revenue generated in the Salesforce ecosystem). Salesforce further developed a four-tier model to incentivize complementors in different ways. The higher the level, the more enablement services will be provided by the platform owner. (b) Another aspect in which B2B platform ecosystems differ from consumer-focused platform ecosystems is the relatively higher need for integration of platform offerings with customers' diverse applications. To enable seamless integration, Salesforce conducted a major acquisition of a leading integration platform (i.e., *MuleSoft*). SAP also made considerable resource investments into its *SAP Integration Suite*, which ensures integration with other cloud or on-premise systems. (c) The onboarding process is slower in the B2B context due to relatively higher quality requirements. In contrast to, for example, Google's Android, which is considered as relatively open in various studies (e.g., Karhu et al., 2018), B2B platform ecosystems generally apply several predefined criteria to judge which complementors can access the ecosystem. Salesforce, for instance, relies on a structured onboarding process during which multiple technical (e.g., compliance check, signing a distribution agreement, and a security review) and business (e.g., business plan check) requirements must be met in order to be granted access to the platform ecosystem. Ultimately, all of these differences highlight the need for additional research on platform governance in the context of B2B platform ecosystems.

C.5.2 Contributions to Practice

Our study also provides recommendations for practitioners. We enable practitioners to learn from a platform leader like Salesforce as our detailed insights into Salesforce's activities to implement major governance mechanisms can support their own platform design and governance. Specifically, the main results of our study may guide B2B platform owners in defining an appropriate governance structure as a set of mechanisms and in implementing it with targeted activities. This is beneficial for both platform designers that aim to derive an initial governance structure and estimate potential activities to implement such a structure through appropriate mechanisms as well as for platform managers that aim to derive possible adjustment variants to alter their current portfolio of governance mechanisms.

C.5.3 Limitations

This paper also faces some limitations. While we are confident that our study captures Salesforce's current activities to implement the governance mechanisms, these activities may change over time. Such changes can either be due to the general evolution of the platform ecosystem (e.g., evolving needs and governance preferences) or by specific events during the evolution (e.g., regulatory changes such as the recent removal of *Parler* from Apple's App Store after its users increasingly published posts that spread misinformation and incited violence[8]). Further, we acknowledge that the data used in this study was only collected from a retrospective. While this may be of limited relevance with respect to the platform owner, the study may lack data on former complementors, which may have potentially resulted in additional insights on how Salesforce implemented the platform governance mechanisms.

C.5.4 Future Research

To overcome these limitations, we encourage future research to conduct longitudinal in-depth case studies to also capture the platform owner's changes in governance mechanisms to illustrate evolving governance needs and preferences. Another fruitful avenue for prospective research is to study other B2B platform ecosystems to provide additional insights on B2B platform ecosystems as well as on how they can be differentiated from other platform types based on their distinct governance practices. Lastly, future research may link platform owners' activities for implementing governance mechanisms to performance outcomes in certain contexts in order to obtain insights on systematic performance differences based on selected governance choices.

[8] For more information about the *Parler* case, please visit the following article: https://www.nytimes.com/2021/01/09/technology/apple-google-parler.html

C.6 Appendix

Table 17: Organizations and Profiles of the Interviewees

Eco-system Actors	Organization (or pseudonym); Interviewee (Position / Unit / Experience[9])
Platform owner (Salesforce)	*Platform owner* (Salesforce) - Program Architect Director / Customer Success / 20, 5 (*PO-1*) - Senior Director, Product Management / Community Cloud / 16, 5 (*PO-2*) - Vice President, Product Management / Developer Platform / 19, 10 (*PO-3*) - Senior Director, Solution Engineering / Solution Consulting / 30, 12 (*PO-4*) - Business Architect Director / Customer Service / 32, 5 (*PO-5*) - Senior Executive, Global Services / Customer Success / 29, 12 (*PO-6*) - Program Architect Director / Customer Service / 20, 6 (*PO-7*) - Senior Executive, ISV Enablement / AppExchange / 19, 16 (*PO-8*)
Complementors	*Complementor* #1 (Developer): A USA-based provider of an end to end DevOps solution with over 100 employees and offices in the US and Europe. - Chief Technology Officer / Product Development / 19, 7 (*CO-1*)
	Complementor #2 (Developer): A USA-based provider of industry-specific cloud and mobile software with more than 500 employees and offices in North America, Europe, Asia, and Latin America. - Chief Digital Transformation Officer / Customer Success / 25, 2 (*CO-2*)
	Complementor #3 (Developer): A USA-based provider of integration software for applications, data, and devices with more than 2’000 employees and offices in North America, Europe, and Latin America. - Senior Customer Success Architect / Customer Success / 23, 10 (*CO-3*)
	Complementor #4 (Implementation consultant): A Spain-based provider of Salesforce consulting with over 120 employees and offices in two countries. - Chief Executive Officer / 21, 12 (*CO-4*)

[9] Years of professional experience, years of experience in current firm.

Customers	*Customer #1:* A Germany-based producer of building materials and construction systems with more than 35’000 employees and offices in over 85 countries. - Senior Manager, Sales Excellence / Group Marketing / 6, 6 (*CU-1*)
	Customer #2: An Ireland-based industrial gases and engineering firm with almost 80’000 employees in more than 100 countries. - Director, Applications / IT / 20, 15 (*CU-2*)
	Customer #3: A Kenya-based non-for-profit organization that has developed several funding programs to support education and to fight famine. - Founder & Sponsor Development / 30, 8 (*CU-3*)

Paper D – Acquisition of Complementors as a Strategy for Evolving Digital Platform Ecosystems

Table 18: Bibliographic Metadata Paper D

Title	Acquisition of Complementors as a Strategy for Evolving Digital Platform Ecosystems
Authors	Staub, Nicola[1]; Haki, Kazem[2]; Aier, Stephan[1]; Winter, Robert[1]; Magan, Adolfo[3] [1]University of St.Gallen, Institute of Information Management, St.Gallen, Switzerland [2]Geneva School of Business Administration (HES-SO, HEG Genève), Geneva, Switzerland [3]salesforce.com, Munich, Germany
Selected approach for order of authors	Sequence determines credit
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Abstract

By acquiring complementors, digital platform owners can facilitate rapid advances in the evolution of their platform ecosystems. We describe how Salesforce has successfully evolved its platform ecosystem through the acquisition of complementors. Based on insights from the Salesforce case, we provide recommendations for acquiring complementors, for aligning acquisitions with the platform owner's proprietary developments, for integrating the acquired complementors and for retaining the coherency of the platform's offerings even after diverse acquisitions.

Keywords

Digital Platform, Platform Ecosystem, Acquisitions, Platform Strategy, Platform Evolution

D.1 Acquiring Complementors Is Crucial for Platform Ecosystem Evolution

Digital platforms are transforming many industries. Examples include mobile telephony (e.g., iOS, Android), video games (e.g., PlayStation, Xbox) and enterprise software (e.g., Salesforce, SAP) (de Reuver et al., 2018). As software-based systems, digital platforms offer a core functionality upon which peripheral firms or individuals can develop complementary add-ons and extend the functionality of the platform (Tiwana et al., 2010). A digital platform sits at the center of an ecosystem that includes the platform owner (i.e., operator), complementors (e.g., third-party developers) and customers (Jacobides et al., 2018).

A platform ecosystem evolves as the owner continually improves the platform's technology and functionalities, as complementors make new and diverse contributions to the ecosystem and as customers' requirements change. To guide the evolution of the ecosystem, the platform owner needs to act as an orchestrator as it continuously improves the platform's technology and functionalities in response to complementors' and customers' needs.

Platform owners commonly orchestrate the evolution of ecosystems through proprietary developments to improve their platforms' technology and functionalities. However, a platform owner's ability to keep up with fast and diverging technological changes through internal innovation is limited because proprietary developments are often time-consuming and have uncertain outcomes (Toppenberg et al., 2016). To complement their proprietary developments, platform owners therefore often choose to acquire complementors so they can include already-developed innovations and capabilities in the platform. Examples of this evolution strategy include Microsoft and Sony acquiring game developers for their gaming platforms, Netflix acquiring content providers for its streaming platform (Miric et al., 2021), Salesforce acquiring online marketing software provider ExactTarget, SAP acquiring e-commerce software provider Hybris, and Adobe acquiring marketing automation software provider Marketo.

In general, acquisitions help organizations to quickly grow their market share and to realize synergies with respect to size, geography, assets, people or competencies, thereby creating value (Epstein, 2005). Our focus, however, is on digital (i.e., software) markets where acquisitions can be more flexibly absorbed compared to traditional markets (Gao & Iyer, 2006). Digital markets are shaped by digital technologies, which are inherently dynamic because they can be reprogramed, for instance by implementing new interfaces or updating the firmware. This reprogrammable nature, in combination with a modular technological architecture that allows a system to be decomposed into loosely coupled components, enables a digital platform to evolve because it can be continually reconfigured with new components from acquired complementors (Yoo et al., 2010).

Moreover, digital platform markets have important additional properties. In particular, they are characterized by "winner-take-all" competition, often with only a few thriving platforms surviving, resulting in fierce competition among platform owners to be the first in securing (i.e., acquiring) essential resources. Hence, the attraction of acquisitions, which enable a platform owner to quickly lock-in key third-party complementors' resources in the ecosystem and integrate their solutions into the platform's core offerings. Examples of platform owners competing to acquire complementors include Microsoft and Salesforce competing to acquire Slack and LinkedIn, and Adobe and Salesforce competing to acquire ExactTarget and Marketo.

Furthermore, the evolution of a platform ecosystem is contingent on a plethora of loosely coupled and independent players that opportunistically pursue their own goals and interests. These ecosystem players are essential for the overall value provided by a digital platform, so the platform owner must continuously align all the players' interests to ensure they are motivated to participate in the ecosystem. As a consequence, acquisitions also entail risks, because they may unintentionally change the dynamics within and between ecosystem players and influence some of their incentives for participating in the ecosystem.

However, a challenge for platform owners is not having control of potentially crucial resources that are owned by complementors. The winner-take-all nature of digital markets and the fact that complementors are often involved in several competing platform ecosystems, means that platform owners must aggressively pursue acquisitions to ensure they can exclusively own (and control) certain resources before their competitors. Thus, the way in which platform owners conduct acquisitions significantly shapes their competitive position and how their ecosystems evolve.

In this article, we provide guidance for digital platform owners on how to strategically acquire complementors, how to leverage those acquisitions for major advances in the platform ecosystem's evolution, and how to manage the implications of acquisitions for both acquired complementors and customers. This guidance is derived from our analysis of Salesforce's acquisitions of several platform complementors. (The research carried out for this case analysis is described in the Appendix A, and the relationship between our study and other research on platform ecosystems is described in Appendix B.) Salesforce is a provider of enterprise software and, as such, its platform ecosystem delivers complex products and services that require numerous highly specialized complementary resources that cannot be provided by the platform owner alone.

After a brief overview of the Salesforce platform ecosystem, we describe the key acquisitions that have significantly influenced Salesforce's evolution. For each acquisition, we identify what motivated Salesforce to acquire the complementor, the integration approach adopted and the added value gained. Next, we analyze how Salesforce employed the acquisitions, both as a strategy and as a mechanism for enabling platform ecosystem evolution. We then identify the ecosystem-wide challenges that Salesforce faced with regard to its clients and acquired complementors. Based on our analysis of Salesforce's acquisitions, we provide four recommendations for platform owners for acquiring platform complementors.

D.2 Brief Description of the Salesforce Platform Ecosystem

Salesforce is a prime example of a thriving platform ecosystem in the enterprise software industry. The business originated in 1999 when its primary value proposition was a sales-related software module (now known as Sales Cloud). Today, Salesforce has evolved into a firm that provides integrated customer relationship management (CRM) solutions with a diverse set of modules and capabilities. Its main offerings are packaged together as Customer 360, with different core modules related to a broad range of functionalities such as sales, customer service, marketing and e-commerce (see Table 19). The cross-module capabilities offer functionalities that can be accessed within the different core modules. All customer data can be aggregated across the different modules to create an innovative cross-channel customer experience through the combination of functionalities from different modules.

Table 19: Salesforce's Customer 360 Modules and Capabilities[10]

CRM Core Module or Capability		**Description**
CRM Core Modules	Sales Cloud	- Includes tools for contact management, sales force automation, sales forecasting and productivity - Prioritizes tasks and manages sales cycles and customer relationships
	Service Cloud	- Enables customer service efficiency across channels both by creating a single view of a customer's activity and by the use of tools for field service, web chat and social-media based customer service
	Marketing Cloud	- Includes tools for email marketing, social media marketing, mobile marketing, online advertising and marketing automation - Provides a unified view of customers to create personalized, omni-channel customer journeys
	Commerce Cloud	- Comprises Salesforce B2C Commerce and Salesforce B2B Commerce, which are often used together - Creates personalized and unified buying experiences across multiple channels (e.g., mobile, social media, web and store)
	Analytics Cloud	- Connects data from different sources to bring CRM data together in one place - Creates visualizations to turn complex data into digestible snapshots
	Integration Cloud	- Connects systems, Salesforce or not, whether in the cloud or on-premise, on a unified platform - Discovers and reuses integration assets to build upon prior projects
	Platform	- A single and scalable development environment on which businesses can build and deploy their own applications - Enables Salesforce products to be customized to business needs
	Industry Cloud	- Customizes Salesforce's core modules for specific industries to streamline workflows, deliver targeted service and drive customer engagement

[10] Modules and capabilities shown in bold are derived from, or considerably influenced by, acquisitions

	Learning Cloud	- A mobile-friendly learning platform to enable employees to learn Salesforce, with assignments, ranks and leader-boards
	Employees Cloud	- Leverages team productivity by enabling teams to work together and by combining documents, spreadsheets and real-time chat inside Salesforce
	Partners Cloud	- AppExchange, Salesforce's marketplace for complementary applications with a plethora of solutions
Cross-Module Capabilities	**Einstein**	- Enables the use of AI technology across Salesforce CRM core modules - Enables Salesforce clients to identify patterns, trends and the cause of unexpected business outcomes
	Single Source of Truth	- Allows Salesforce clients to create a single source of truth for their data

To enable complementors to sell complementary enterprise applications to its clients, Salesforce launched AppExchange, its commercial marketplace, in 2005 (notably before big players in the business-to-consumer (B2C) market such as Apple's App Store in 2008 or Google Play for Android in 2012). To date (2021), Salesforce has attracted more than a million registered developers, with over 3,000 enterprise applications currently offered on AppExchange. Furthermore, Salesforce has several collaborations with partners external to its ecosystem to integrate their offerings into the Salesforce platform ecosystem (e.g., with Microsoft to integrate its calendar). Moreover, Salesforce can call on registered implementation consultancy providers, who support its clients in complex implementation projects. These offerings, provided both by Salesforce (the platform owner) and by complementors, have attracted more than 150,000 clients to the Salesforce platform ecosystem, ranging from small businesses to large multinational enterprises. Clients can license different modules on a pay-per-use basis and further extend the functionalities of these modules by licensing applications provided by complementors. Salesforce, as platform owner, plays the role of orchestrator in the interplay of the various players in the platform ecosystem.

D.3 Key Acquisitions Made by Salesforce

Salesforce's evolution to become a leading platform ecosystem in the enterprise software industry is due in no small part to over 60 acquisitions of complementors.[11] The acquisitions (some of which we classify as key) acquisitions) were made for different reasons, integrated into Salesforce's CRM core modules and capabilities in various ways and resulted in different added values for the ecosystem's players. Below, we describe the key acquisitions to illustrate how Salesforce used them to complement its proprietary developments in various areas. Together, these key acquisitions have had considerable impacts on the evolution of Salesforce's CRM core modules or capabilities.

D.3.1 Acquisitions of ExactTarget and Evergage

In 2012, Salesforce launched Marketing Cloud, a proprietary development to support marketing campaign management that enabled its clients to automatically contact selected target groups. Due to its limited capacity of about 2,000 emails per day, the tool mainly supported small and medium-sized firms and was only of limited use for large multinational enterprises.

One year after the launch of Marketing Cloud, Salesforce acquired ExactTarget, a leading provider of online marketing solutions. Through this acquisition, Salesforce's clients benefitted not only from increased capacity but also from additional functionalities. For example, ExactTarget provides a customer journey builder that allows Salesforce clients to filter potential leads according to predefined segmentation criteria (e.g., selected regions, industries) and observe the resulting segment size in real time.

By integrating ExactTarget's industry-leading cross-channel marketing automation and campaign management capabilities into Marketing Cloud, Salesforce's offering became a leading full-service digital marketing tool. Furthermore, the acquisition of ExactTarget enabled Salesforce to leverage its existing core modules (particularly Sales Cloud and Service Cloud) to build personalized customer engagement by integrating digital advertising with data across different modules.

Personalization, a key feature of Marketing Cloud, was also significantly influenced by the acquisition of Evergage. Prior to this acquisition, Salesforce had already developed Interaction Studio, a real-time engagement tool that helps clients visualize, track and

[11] For a full list of acquisitions, see Salesforce's Wikipedia entry, available at https://en.wikipedia.org/wiki/Salesforce#Acquisitions.

manage their customers' experiences so they can deliver relevant content at every stage of the customer journey. While Interaction Studio (a component of Marketing Cloud) already offered a few personalization features, clients increasingly required more advanced recommendation features to simplify the identification of promising products.

To meet this need, Salesforce acquired Evergage, a provider of omnichannel personalization and customer experience software that enables the creation of a single, comprehensive view of each customer and prospect across channels. Compared to the initial version of Interaction Studio, Evergage uses advanced deep analytics and machine learning to leverage customers' personalization and provide automated recommendations.

To start with, Salesforce offered Evergage to clients as an alternative version of Interaction Studio, before replacing it with Evergage and renaming it Interaction Studio (Version 2). A Master Enterprise Architect at Salesforce explained some of the improvements that resulted from the acquisition of Evergage:

> *"Evergage today is called Interaction Studio (Version 2). We had an Interaction Studio (Version 1), which is the one we developed ourselves. ... Version 2 is a completely different offering because we needed much more than just personalization. It's a real-time action, CDP [customer data platform] database, so anonymous, unknown profiles, and things that are not necessarily part of a narrow personalization tool. ... We phase out the old one [Version 1] if we see that the new one [Version 2] has an advantage. In between, we offer both ... to our customers and we position one or the other depending on the use case."* Master Enterprise Architect, Customer Success Group

D.3.2 Acquisition of Demandware

Initially, Salesforce did not have a full e-commerce solution. While some e-commerce features were already available in Salesforce's other core modules (e.g., a business-to-business (B2B) order management tool in Sales Cloud), these features did not fulfil the requirements of B2C transactions, which can reach a volume of millions of transactions per hour at peak times. Salesforce had lost several deals to Oracle, one of its main competitors, because Oracle already offered comprehensive e-commerce functionality.

To provide e-commerce functionality, Salesforce acquired Demandware, a provider of an industry-leading and cloud-based e-commerce solution. By enabling the management and execution of in-store transactions, as well as creating and coordinating digital transactions across all channels, Demandware allows Salesforce clients to merge physical and digital selling experiences.

Salesforce rebranded Demandware's offering as Commerce Cloud and launched this new CRM core module in 2016. Through the acquisition of Demandware, Salesforce was a step closer to becoming the one-stop-shop customer interaction ecosystem for enterprises.

D.3.3 Acquisition of Tableau

In 2014, Salesforce had launched Analytics Cloud, a proprietary development for data analysis and reporting, which was designed to operate with data generated in Salesforce's modules. However, clients often needed to leverage Salesforce data with data from other sources such as from structured databases, unstructured sources like spreadsheets or data warehouses.

To meet this requirement, Salesforce acquired Tableau, a leading provider of analytics software. This acquisition significantly boosted the capabilities of Analytics Cloud. As an enterprise-wide (and not merely CRM-focused) strategic data analysis tool, Tableau improves clients' ability to access data from different systems. This acquisition not only further reduced the data delivery time, but also made it possible for analytics to be developed and consumed by employees at all skills levels.

As well as deploying Tableau's technical functionalities, Salesforce also benefitted from Tableau's established position in the market—the company was already known to a large portion of existing Salesforce clients' senior executives. Salesforce currently still uses the Tableau brand because of its popularity among Salesforce clients.

D.3.4 Acquisition of MuleSoft

Salesforce needed to provide seamless integration among the platform's modules and with external IT systems, and thus needed to develop and improve integration technology. To provide the necessary technology, Salesforce acquired MuleSoft, a leading integration platform with its own marketplace for application programming interfaces (APIs). MuleSoft's ability to connect any two IT systems both inside and outside of the Salesforce ecosystem significantly extended Salesforce's integration capabilities. The MuleSoft technology also streamlined the integration of existing and prospective acquisitions with Salesforce's existing offerings.

Salesforce further developed MuleSoft's integration capabilities and used them as the basis for a proprietary development called Integration Cloud, which is now an integral part of Salesforce's CRM core modules. The MuleSoft capabilities were particularly useful for Salesforce's larger clients with complex IT infrastructures (e.g., on-premise software that needs to be connected to Salesforce modules). As with Tableau, Salesforce still uses the MuleSoft brand because of its global popularity.

D.3.5 Acquisition of Heroku

Back in 2005, Salesforce had launched a development environment called Force.com to enable complementors to create their own applications using an object-oriented programming language. However, complementors increasingly demanded more flexibility and further options in their application development.

In order to meet these demands, Salesforce acquired the Heroku development environment that enables complementors to use various open-source programming languages to build their applications. Heroku is a leading application platform for Ruby, a popular programming language for cloud-first applications that are collaborative and deliver real-time access to information across mobile devices.

With the Heroku acquisition, complementors benefitted from a more flexible development environment as well as from access to the rapidly growing community of Ruby developers. In addition, Heroku enabled Salesforce's clients to more flexibly customize their own applications.

D.3.6 Acquisition of Vlocity

Over the last five years, Salesforce has been strategically reorienting toward industry-specific offerings in response to its clients increasingly asking for more features tailored to their industries. A first major step was a proprietary development called Industry Cloud, with a focus on the financial services, healthcare, manufacturing and consumer goods sectors.

To gain a foothold in additional sectors, in 2021 Salesforce acquired Vlocity, one of the largest and fastest-growing complementors, which is active in six industries (communications, media and entertainment, energy and utilities, insurance, healthcare and government). A Senior Executive at Salesforce explained some of the reasons why Salesforce decided to acquire Vlocity:

> *"Salesforce has for the last ... five years been ... investing heavily into industries. That's from our go-to-market strategy of how we organize our sales teams and our marketing, but also in building products. There are so many business processes that a manufacturer expects and a financial services company expects. So, Salesforce has built a portfolio of industry solutions over the last five plus years, but if you go back in time [before] we partnered with Vlocity, basically we didn't have any, or we were just getting started. So, we needed kind of a multiple pass to get into the industry markets that we were not in previously or not to the extent that we needed and wanted to be."* Senior Executive, AppExchange & ISV Enablement

Salesforce's Industry Cloud greatly benefitted from Vlocity's expertise in vertical industries. Vlocity enables organizations to digitally transform while delivering industry-specific processes and data models across any channel, ultimately helping clients increase sales, and improve their service and marketing agility, and operational efficiency.

D.3.7 Acquisitions of Quip and Slack

In the area of collaboration tools, Salesforce first introduced Chatter, a social collaboration service that enabled employees of Salesforce clients to share expertise, documents and data. However, clients increasingly needed additional collaboration options for small and medium-sized teams, particularly to support the growing trend for working from home.

To meet this need, Salesforce acquired Quip in 2016, a productivity software company. The Quip tool allows Salesforce clients to standardize, automate and integrate documents into a central location for real-time collaboration. More recently, in 2020 Salesforce also acquired Slack, a provider of communication and collaboration software that offers a modern chat client to facilitate real-time interaction in teams, and thus helps clients to increase the productivity of their employees. Slack offers integration with leading document software (e.g., Google Drive) and has already created a strong developer community that provides complementary applications.

Based primarily on Quip's functionality and also on some of Chatter's social collaboration features, Salesforce launched Employees Cloud in 2017, a CRM core module that focuses on collaboration between employees and teams. Salesforce is currently planning to integrate Slack's features into Employees Cloud to extend the functionality of this module. Moreover, since a large number of developers providing complementary applications for Slack have joined the Salesforce ecosystem, Salesforce is also benefitting from a higher number of complementors.

D.3.8 Acquisition of Several Small AI Firms

Salesforce's CRM modules create massive amounts of sales data, and its clients often need to hire data scientists to analyze this data to predict outcomes. Salesforce recognized that this need presented a market opportunity and initiated the development of an automated, machine-learning-based platform that can predict outcomes in real time.

To facilitate this development, Salesforce acquired several small companies providing artificial intelligence (AI) solutions, and used their products and expertise as the basis for building Einstein. Einstein is an AI technology-enabled capability that is integrated into Salesforce's CRM core modules and can be accessed by clients through different modules and features. Because Einstein's AI capability can be used in all the core modules, it considerably increases clients' efficiency.

D.3.9 Summary of Impacts of the Key Acquisitions

Table 20 shows which of the CRM core modules or capabilities each of the key acquisitions described above was incorporated into, and summarizes the main drivers of the acquisitions and the impacts they had on different ecosystem players (i.e., Salesforce, complementors and clients).

Table 20: Salesforce's Key Acquisitions by Core Module or Capability, Main Acquisition Drivers, and Impacts on Ecosystem Players

Core Module or Capability: Acquisitions		**Acquisition Driver**	**Impacts of Acquisition on Ecosystem Players**
CRM Core Modules	Marketing Cloud: - ExactTarget - Evergage	- New client requirements: higher capacity and more recommendation features	- Increased client value: new functionality
	Commerce Cloud: - Demandware	- Increased competition: major competitors had already successfully entered the e-commerce market	- Increased client value: new functionality
	Analytics Cloud: - Tableau	- New client requirements: manage data from external IT systems, not only from existing core modules	- Increased client value: new functionality - Helped Salesforce considerably increase the number of clients
	Integration Cloud: - MuleSoft	- New client and complementor requirements: seamlessly integrate data across existing core modules and external IT systems	- Increased client and complementor value: improved integration of data and applications across internal and external IT systems
	Platform: - Heroku	- New complementor requirements: higher flexibility in application development	- Increased complementor value: more options to develop applications - Increased client value: more options to customize applications - Helped Salesforce increase the number of complementors (Heroku already had a large community)

	Industry Cloud: - Vlocity	- New client requirements: industry-specific functionalities - Phenomenal growth of a complementor in the ecosystem	- Increased client value: existing functionality is more tailored toward specific industries
	Employees Cloud: - Quip - Slack	- New client requirements: more tools for collaboration in teams - Market opportunity: trend toward working from home	- Increased client value: new functionality - Helped Salesforce increase the number of complementors (Slack already had a large community)
Cross-Module Capabilities	Einstein: - Several small AI firms	- Market opportunity: trend toward more automated analytics capabilities	- Increased client value: new functionality that can be used across core modules

D.4 Analysis of How Salesforce Employed the Acquisitions

Each of Salesforce's acquisitions was made for a specific strategic intent and each was purposefully integrated into Salesforce's proprietary developments. The acquisitions can therefore be perceived both as a *strategy* to delineate distinct strategic directions for the platform ecosystem's evolution, and as a *mechanism* for enabling advancements in each of the strategic directions of evolution.

Employing Acquisitions as a Strategy. Salesforce employed acquisitions as a strategy for evolving the platform's core offerings in three distinct strategic directions: 1) extending the platform's core technology; 2) extending the platform's functional scope; and 3) widening the platform's industry-specific specialization. The first strategic direction aims to add new or considerably improve the platform's existing core technology elements, such as the application development environment and integration technologies. A major objective of this direction is to provide capabilities that enable the different ecosystem players to leverage the integration of data and services.

The second strategic direction for platform ecosystem evolution (extending the platform's functional scope) aims to develop (or extend) platform modules or capabilities that are relevant for all clients. The third strategic direction (widening the platform's industry specialization) is characterized by acquisitions that focus on industry-specific features that are relevant for particular clients. From Salesforce's early days, its platform had evolved in the first two strategic directions in parallel. The third strategic direction has emerged over the last few years.

Employing Acquisitions as a Mechanism. Salesforce also employed acquisitions as a mechanism for implementing major advancements in each of the three strategic directions for platform ecosystem evolution. The mechanisms can be understood through the interplay between acquisitions and proprietary developments. Acquisitions can either boost existing proprietary solutions or trigger new proprietary developments. In the former case, Salesforce had initially developed proprietary solutions that were subsequently and significantly enhanced (or replaced) by acquisitions. In the latter case, Salesforce did not have existing proprietary solutions but created new ones based on the acquisitions. In both cases, the developments related both to CRM core modules and to platform capabilities that can be used across the core modules.

Table 21 illustrates how Salesforce's key acquisitions map onto the three strategic directions for platform ecosystem evolution, and how they initiated new or boosted existing proprietary developments. Note that because the third strategic direction (widening the platform's industry-specific specialization) is relatively new, there are fewer examples in this category.

Table 21: Salesforce's Use of Acquisitions as a Strategy and a Mechanism

Strategic Direction	Mechanism	Acquisition Employed
Extending the Core Technology of the Platform	Boost an existing proprietary development	Enabling complementors to access open-source development languages by acquiring a flexible development environment (Heroku) in addition to an existing proprietary development environment (Force.com)
	Trigger a new proprietary development	Developing a CRM core module (Integration Cloud) based on the offerings of an acquired complementor (MuleSoft) that provides an integration technology and features such as a marketplace for APIs and interface builders
Extending the Functional Scope of the Platform	Boost an existing proprietary development	Extending a CRM core module in the field of online marketing (Marketing Cloud) by acquiring ExactTarget, a provider of marketing automation and campaign management software
		Extending the functionalities of a real-time interaction feature (Interaction Studio) of a CRM core module (Marketing Cloud) by acquiring Evergage, a provider of an omnichannel personalization and customer experience software
		Extending a CRM core module providing data management and analytics (Analytics Cloud) by acquiring Tableau, a provider of data management and analytics software
		Extending a CRM core module providing collaboration features (Employees Cloud) by acquiring Slack, a provider of communication and collaboration software
	Trigger a new proprietary development	Developing an e-commerce CRM core module (Commerce Cloud) based on the solution provided by Demandware, an acquired complementor
		Developing a collaboration CRM core module (Employees Cloud) based primarily on Quip, an acquired productivity software company, but also on some of the functionalities of in-house developed social collaboration software (Chatter)
		Developing an AI technology-enabled platform capability (Einstein) based on the AI technologies of several acquired small complementors

Widening the Industry-Specific Specialization of the Platform	Boost an existing proprietary develop-ment	Extending a CRM core module with a focus on industry-specific functionality (Industry Cloud) by acquiring Vlocity, a provider of industry-specific solutions
	Trigger a new proprietary develop-ment	n/a

As well as employing acquisitions as a strategy and a mechanism for driving platform ecosystem evolution, Salesforce's acquisitions illustrate how they can also be used to expand the platform's *reach* (in terms of ecosystem player groups) and *range* (by providing new functionalities that were previously not included in the platform's scope). The majority of Salesforce's acquisitions increased the platform's range (e.g., Demandware provided e-commerce functionalities, Quip provided collaboration functionalities and ExactTarget provided additional marketing functionalities).

Some acquisitions expanded the platform's reach by increasing the number of platform users in at least one of the ecosystem's group of players (i.e., complementors or clients). Expanding reach is particularly important because of the winner-take-all nature of digital platform markets, and also the network effects that require platform owners to rapidly scale their platform business. Salesforce's acquisitions of Slack and Heroku increased the number of complementors in the ecosystem because both had already built strong developer communities, and the acquisition of Tableau increased the number of clients because Tableau had already attracted thousands of customers around the world.

Finally Figure 3, which also groups the key acquisitions described above by strategic direction for platform ecosystem evolution, shows the timeline for these acquisitions. The arrows in the figure indicate whether an acquisition initiated a new proprietary development (arrow starts at acquisition) or boosted an existing proprietary solution (arrow ends at acquisition).

Year	Extending the Core Technology of the Platform		Extending the Functional Scope of the Platform		Widening the Industry-Specific Specialization of the Platform	
	Proprietary Developments	**Acquisitions**	**Proprietary Developments**	**Acquisitions**	**Proprietary Developments**	**Acquisitions**
1999			Sales Cloud			
…						
2005	Force.com		AppExchange			
2006						
2007						
2008			Service Cloud			
2009						
2010		Heroku				
2011			Chatter			
2012			Marketing Cloud			
2013				ExactTarget		
2014			Learning Cloud, Analytics Cloud			
2015					Industry Cloud	
2016			Commerce Cloud	Demandware, several small firms, Quip		
2017			Einstein, Employees Cloud, Interaction Studio			
2018		MuleSoft				
2019			Single Source of Truth			
2020	Integration Cloud			Slack Evergage, Tableau		
2021						Vlocity

Figure 3: Salesforce's Acquisitions by Strategic Direction of Platform Ecosystem Evolution and Interplay with Proprietary Developments

D.5 Ecosystem-Wide Acquisition Challenges

Despite their undeniable potential for driving platform ecosystem evolution, acquisitions pose considerable risks and challenges for platform owners. These challenges are related to the implications of acquisitions both for its clients and the acquired complementors. Table 22 summarizes the two major ecosystem-wide acquisition challenges that Salesforce encountered and the actions it took in response to these challenges. These two challenges and actions are described in detail below.

Table 22: Ecosystem-Wide Acquisition Challenges Faced by Salesforce

	Context	**Challenge**	**Actions Taken**
Clients	- Dynamics of the platform's offerings: - Platform offerings grew rapidly over the last years - Several acquisitions mirrored existing proprietary developments	- Overlapping offerings caused confusion among clients: - Difficulty in understanding Salesforce's core offerings - Difficulty in identifying the right module or feature for a specific functionality	- Improve the implicit and explicit communication of offerings: - Present products and services in the comprehensive Customer 360 overview (including acquisitions) - Introduce new features to clients at major events - Support clients with an online learning platform - Enable architects and implementation partners to support clients
Acquired Complementors	- Diversity of acquired complementors: - Salesforce acquired various types of complementors - Variety of complementors has both technical and business implications	- No uniform integration strategy: - Diversity of complementors requires different integration processes - Not feasible to define an optimal, uniform integration strategy (i.e., a reference process)	- Apply a flexible approach to integration: - Adjust integration process depending on particularities of an acquired complementor (e.g., infrastructure, branding, licensing)

D.5.1 Clients Confused by Several Overlapping Offerings

Salesforce purposefully created synergies between acquisitions and its own proprietary developments. But because the platform offerings had been continuously extended over the years, there were several cases where the specific functionality provided by an acquisition overlapped existing functionality. As a result, it was challenging for clients to understand what Salesforce's core offerings were and which functionality can be found in which module or feature. In particular, there was confusion about three CRM core modules and the acquisitions relating to them: Analytics Cloud related to the acquisition of Tableau; Employees Cloud related to the acquisitions of Quip and Slack; and Marketing Cloud related to the acquisition of Evergage (specifically, Interaction Studio with its focus on personalization).

When Salesforce acquired Tableau to extend the functionalities of its existing Analytics Cloud CRM core module, it already had Einstein to provide AI capability. In general, Tableau and Einstein are tailored to different use cases. While Tableau helps to connect large data volumes from different Salesforce systems without the need for migrating to other clouds, Einstein is optimized to empower users to make predictions and drive actions. Nevertheless, clients sometimes confused the two:

> *"I think it is confusing because very often ... the path is not simple, because on one hand you have the business people, they know the requirements, but they don't know the technology. Then you have the people who know the technology, but who don't know the requirements. ... Often, I see architects [who] propose the wrong solution. For example, sometimes people use Einstein analytics to do enterprise end-to-end reporting and then collect tons of data, put it into Einstein, because Einstein has a global data warehouse and to do this type of reporting."* Salesforce's Program Architect Director, Customer Service Group

Despite the distinct functionalities of Tableau and Einstein, Salesforce needed to significantly improve the communication about these offerings to clients.

There was also client confusion about the functionality provided by Employees Cloud. When Salesforce acquired Quip and more recently Slack, it already had Chatter, its own proprietary system. Even though there are differences in their functionalities, there is also a degree of overlap when they are used for collaboration among small teams (i.e., between Quip and Slack) or as channels to structure group discussions (i.e., between Chatter and Slack). These overlaps led to some confusion among clients.

Clients were also confused by Salesforce's personalization offering, Marketing Cloud. Salesforce acquired Evergage to replace its in-house development, Interaction Studio. After a trial period during which both tools were offered as alternatives, the proprietary development was discontinued and Evergage was renamed as Interaction Studio (Version 2). From a client's perspective, it was particularly challenging to understand the differences between the two products during the integration process. As with the other two sources of client confusion, the problem was not related to missing features, but to the communication of the comparable functionalities to clients. Specifically, the provision of multiple offerings in the same CRM core module caused some confusion, thereby reducing clients' efficiency and increasing the need for Salesforce to provide services that enable clients to keep track of all the functionalities of the platform's various modules and capabilities.

In response to this need, Salesforce took several actions. First, it implemented the Customer 360 overview, which communicates to clients an all-embracing picture of all the various offerings. This one-stop-shop approach significantly increased convenience for clients, because all the modules and capabilities are consolidated into a comprehensive view regardless of their diverging technical infrastructures. Salesforce continuously integrates new acquisitions, or some of their functionalities, into Customer 360.

Second, in addition to the overview communicated through Customer 360, new features are also explicitly communicated to clients at Salesforce's major events, such as the annual Dreamforce conference, or during local road shows. The purpose of these events is to explain the new features, and their possible application areas and major functionalities. The information communicated at these events is complemented by a major proprietary development called Trailhead, which is an online learning system, with participants in the online courses being awarded certificates.

Third, Salesforce has launched several programs to enable clients to keep track of the offerings and to incentivize its implementation partners to communicate and explain new features.

D.5.2 Acquired Complementors Have Different Integration Requirements

Due to the diversity of the acquired complementors, Salesforce faced both technical and business challenges in integrating the acquisitions into its existing solutions and offerings. Salesforce adopted a flexible approach to the integration of acquired complementors because their diversity meant it wasn't possible to apply a uniform integration strategy.

Technical Aspects. From a technical perspective, one major factor was whether the acquired solution was built on Salesforce's technology or on an external technology stack (or a mix of both). For example, because Vlocity was built natively on the

Force.com platform and had been an active participant in the Salesforce ecosystem since its foundation, several technical experts reported a very smooth integration process:

> *"I think the process of integrating acquisitions into Salesforce is very, very streamlined and there is a great respect and a great communication. ... We had three integration task forces to carry it out and to manage all the tensions and to ensure that when we joined the company ... this tension would be worked around or we had a process to carry out that stuff. So, I think since we joined two or three months ago, I don't say we had zero problems, but I can say it's very smooth, very collaborative and we always find a solution. Very often in the interest of the client, there's always a good question to ask: What can we do in the interest of the clients? We try hard to find the answer."* Chief Technology Officer of an acquired complementor

Though the technical integration of Vlocity was accomplished in a very short time, the integration of other acquisitions was very challenging. In some cases, it did not even make sense for Salesforce to fully integrate an acquisition. For example, the full technical integration of Demandware, which was created on external technology, would not have been practical because of the high transaction volumes in consumer-focused e-commerce. Moreover, full integration would likely not have yielded greater benefits.

To provide the flexibility needed to integrate different types of complementors, Salesforce decided to extend its core digital infrastructure to include external providers such as Microsoft's Azure services or Amazon Web Services. As a consequence, several of Salesforce's key acquisitions (e.g., Heroku, MuleSoft, ExactTarget) now run on external infrastructures.

Business Aspects. There were also business challenges in integrating acquired complementors, specifically in the areas of branding and licensing. To address these challenges, Salesforce significantly adjusted the integration process according to the type of acquired complementor.

Some of the acquired complementors are now deeply integrated with Salesforce and the original brands are no longer used (e.g., Demandware, ExactTarget and several acquisitions that were used as a foundation to build Einstein). Sometimes, however, the original brands are still used and are even available outside of Salesforce as a standalone solution (e.g., Tableau, MuleSoft). In other cases, Salesforce applied a hybrid branding strategy. For example, the Evergage personalization solution was initially offered as an alternative to an existing Salesforce proprietary offering (Interaction Studio). Later, Salesforce decided to replace the proprietary solution with Evergage. Several re-brandings took place sometime after the acquisition. For example, the collaboration tool Quip was more deeply integrated into Salesforce's core offerings several years after its acquisition and is now part of the Employees Cloud module.

Thus, Salesforce took a flexible approach to branding issues, with decisions made on a case-by-case basis depending on, for instance, the reputation, market share and branding power of the acquired complementor.

To address the licensing challenges arising from acquisitions, Salesforce offers various licensing options. The first is Salesforce Platform licenses, which are designed for clients who do not need access to the functionality of CRM core modules but aim to use Salesforce's development environments to build custom applications. Second, it offers Salesforce licenses, which are designed for clients who require full access to the functionalities of CRM core modules and/or AppExchange applications. Complementors can also sell their own licenses on top of a Salesforce license. However, Salesforce applied different approaches for complementors whose offerings were later integrated into Salesforce's CRM core modules. While the licenses of some acquired complementors were directly integrated into the Salesforce license (e.g., Demandware), others are still offered to clients as an additional license (e.g., Tableau, Vlocity). In the latter case, clients need to buy a Salesforce license as well as a license from the acquired complementor.

D.6 Recommendations for Acquiring Platform Complementors

From our analysis of Salesforce's key acquisitions and how the firm addressed the resulting challenges, we have derived four recommendations for acquiring platform complementors. These recommendations will enable C-level decision makers in platform owners who are following a complementor acquisition strategy to evolve their platform business and ecosystem in beneficial ways. The first two recommendations provide advice on how platform owners should approach acquisitions. The second two provide guidance on addressing the ecosystem-wide challenges relating to clients and acquired complementors.

D.6.1 Make Acquisitions in all of the Platform Ecosystem's Strategic Directions of Evolution

Digital platform ecosystems encompass a wide variety of crucial technological and functional capabilities, with multiple possible directions of platform ecosystem evolution. We recommend that, instead of making acquisitions focused on a specific direction of evolution, organizations should consider a portfolio of acquisitions that will enable the platform ecosystem to progress along all the strategic directions of evolution. This is the approach followed by Salesforce. Its acquisitions contributed to all three evolution directions—extending the platform's core technology (e.g., MuleSoft), extending the platform's functional scope (e.g., Demandware) and widening the platform's industry-specific specialization (e.g., Vlocity). For Salesforce, these three directions were strategic because they address the need to grow all groups of ecosystem players—extending the core technology attracted more complementors, extending the functional scope attracted a wider range of clients and widening the industry-specific specialization attracted more industry verticals. Though these evolution directions might look somewhat different for other platform ecosystems, the same principles will apply.

As part of their complementor acquisition strategy, platform owners should therefore, determine the directions that are strategic for their platform ecosystem's evolution. These directions can be derived by considering the stakes and interests of all the ecosystem's players. While some of the strategic directions can be predefined, others will emerge from competition within and between platform ecosystems. At Salesforce, extending the platform's core technology and functional scope were predefined as strategic directions from the outset. However, the third direction (widening the platform's industry-specific specialization) emerged from a group of thriving complementors in the Salesforce ecosystem, and led to Salesforce acquiring a leading complementor from this group (Vlocity). Once Vlocity had been integrated into Salesforce's CRM core modules, Salesforce's internal industry teams benefitted enormously from the complementor's expertise, enabling them to better respond to shifting client requirements for industry-specific functionalities.

The experience of Salesforce shows that a shift in complementors' or customers' requirements, or the rapid growth of a complementor in the ecosystem, can be a signal for platform owners to identify a new strategic direction for platform ecosystem evolution.

D.6.2 Employ Acquisitions as a Mechanism to Boost Existing or Initiate New Proprietary Developments

Even though the strategic acquisition of complementors will enable rapid evolution of the ecosystem along all directions, the dynamics of the relationships between acquired innovations and proprietary developments is an integral part of the platform ecosystem's sustainable evolution. We recommend that platform owners should first integrate the acquired innovations into their existing offerings and eventually use them as the basis for new proprietary developments. Doing this will ensure the platform owner fully controls the acquired technological innovations and functional competencies.

Depending on the maturity stage of a functional area, platform owners should either leverage acquisitions to boost existing proprietary developments or initiate new ones. On the one hand, by acquiring a leading complementor in a certain area, platform owners can significantly extend their own offerings in the respective area by integrating the complementor's technology and functionalities. For example, in the field of online marketing, Salesforce not only employed key acquisitions to extend a CRM core module (the acquisition of ExactTarget to extend Marketing Cloud), but also to boost some of the same core module's features (e.g., the acquisition of Evergage to boost Interaction Studio).

On the other hand, the acquisition of a thriving complementor can enable platform owners to develop new functional areas and thus provide a more integrated offering to customers. For example, by acquiring MuleSoft, Salesforce was able to create Integration Cloud as a new core module. Salesforce also embedded acquisitions into the creation of cross-module capabilities (e.g., several small acquisitions to build the Einstein AI capability).

Thus, by boosting existing or initiating new proprietary developments, acquisitions can act as a mechanism for implementing major advancements in each of the platform ecosystem's strategic directions of evolution.

D.6.3 Prevent Diverse Acquisitions from Destroying the Coherency and Consistency of the Platform's Offerings

A fast-paced environment with multiple, diverse acquisitions made by the platform owner can be challenging from the customer's perspective. Customers need to constantly be able to understand the platform's core modules so they can know which capability can be found in which module or feature. However, if acquisitions and existing proprietary developments provide overlapping functionalities, it often becomes difficult for customers to distinguish between the different offerings. Therefore, a platform owner needs to ensure the coherency and consistency of the platform's offerings to customers. We recommend that platform owners should develop a comprehensive and exhaustive picture of all platform's offerings and establish processes to continuously attain and retain the coherency of the platform's offerings to clients.

In particular, platform owners should present their offerings in a comprehensive overview that enables customers to access all solutions from a central point, and continuously integrate newly acquired innovations into this overview. This approach will not only help to improve convenience for customers, but will also create the feeling of a one-stop-shop, even if there are different technologies behind the offerings. For example, Salesforce launched the Customer 360 overview, which incorporates all of its diverse modules and features, and continuously integrates new acquisitions into Customer 360. This approach is not entirely new and has also been followed by some of Salesforce's competitors (e.g., SAP, Microsoft, Oracle). However, Customer 360 is supported by data managers who match, reconcile and update customer data across the various core modules, and by an integration platform (MuleSoft) that enables Salesforce clients to connect the remaining information silos in their enterprise.

As well as developing and maintaining a comprehensive view on the platform's offerings, we recommend that platform owners launch programs that enable both customers and complementors to have a full understanding of the offerings. To continuously inform its clients about new features and the product roadmap, Salesforce runs a major annual conference (known as Dreamforce, which is now the world's largest software conference). In addition, self-information tools, such as Salesforce's online learning platform (Trailhead), can support clients in learning new features.

Platform owners should also incentivize complementors to significantly increase the support they provide to customers. For example, Salesforce launched several complementor programs with a particular focus on upcoming functionalities to enable complementors to support Salesforce (as the platform owner) in handling clients' potential difficulties.

D.6.4 Adopt a Flexible Approach to Integrating Acquired Complementors to Exploit their Individual Potential

Acquired complementors are distinct organizational and technological entities, and their diversity generally enables platform ecosystem evolution in different strategic directions. However, because complementors each have their own particularities, to exploit the potential of each acquisition, a platform owner should adopt a flexible approach to integration that handles each integration on a case-by-case basis. We therefore recommend that platform owners should consider the particularities of each acquisition and adopt an integration strategy that is consistent with both the technical and business environments of the acquired complementor.

When defining an appropriate integration strategy that takes account of the technical environment, platform owners should anticipate that the different technology stacks of acquired complementors will result in significant differences in the speed of integration. In the Salesforce case, acquired complementors whose offerings were natively built for the Salesforce ecosystem were integrated in a noticeably fast process (e.g., Vlocity), whereas other complementors' offering that ran on external infrastructure (e.g., ExactTarget) could not be integrated into the Salesforce core infrastructure. In the latter case, full integration would not have generated major benefits. Instead, Salesforce extended its core infrastructure with additional infrastructure from external providers (e.g., Microsoft's Azure). Opting for this flexible approach to integration also mobilized new resources in the ecosystem and incentivized some complementors to offer innovative solutions to overcome the underlying technical challenges of integration. One example is MuleSoft, which built an API platform that enables the integration of acquired technologies into the Salesforce platform's core technology.

When considering the integration approach from a business environment perspective, a platform owner should differentiate the use case and business model of the acquired complementor. In particular, we recommend that platform owners should opt for a flexible integration strategy with regard to branding and licensing. In the Salesforce case, three different strategies for branding of acquired complementors were applied, depending on the level of integration, overlap with existing offerings and branding power of the acquired complementor. With some acquisitions, the old brand was immediately dropped because the acquired complementor was strongly integrated into Salesforce's existing offerings (e.g., Demandware, ExactTarget and several acquisitions to build Einstein). With other acquisitions, the acquired brand was offered as an alternative to an existing proprietary development (e.g., Evergage and Interaction Studio), before the acquired offering replaced the proprietary development. And in some cases, Salesforce retained the acquired brand name because it was widely known (e.g., Tableau, MuleSoft) to take advantage of the complementor's market position in terms of platform reach.

The multiple strategy approach to integration also applies to licensing considerations. Salesforce generally sells a basic platform license with limited functionality, which allows other providers to build their offerings on the platform and sell their own license as an add-on. For some of the acquired complementors that were integrated into Salesforce's core modules (e.g., Demandware, Vlocity), clients do not need to buy an additional license, while for others there is a requirement to buy a second license (e.g., Tableau).

D.6.5 Recommendation Caveats

Our four recommendations were derived in the context of an enterprise software ecosystem and may need to be revisited when applied to other platform contexts.

Maintaining the coherency and consistency of platform offerings was a key challenge in the Salesforce ecosystem, where the platform owner aimed to provide its clients with a one-stop-shop for enterprise software. This challenge might not be so prominent for platform owners in other settings. In more consumer-focused platform ecosystems (Apple's iOS, for example), customers may not necessarily require consolidation and consistency of the platform's offerings because, unlike enterprise software, they can be used more independently.

Moreover, our analysis of Salesforce's acquisitions identified motivations for making acquisitions that were specific to enterprise software offerings. The motivations of platform owners in other contexts may well be different. For example, platform owners sometimes buy a competitor to acquire a similar platform operating in the same market niche (Miric et al., 2021). Such "killer acquisitions" (Cunningham, Ederer, & Ma, 2021) mainly occur in the context of transaction-oriented platforms, and are less prevalent in enterprise software ecosystems, which are dominated by giant competitors such as SAP.

We also acknowledge that our investigation focused on Salesforce's key acquisitions and only on clients and acquired complementors. Studying all the acquisitions made by Salesforce may have provided additional insights. Similarly, examining the implications for other ecosystem complementors not acquired by Salesforce may have revealed additional challenges and potential benefits. Such complementors may perceive an acquisition as the platform owner entering into competition with them to appropriate a share of their revenue (Zhu, 2019), especially if the acquired complementor competes in the same market niche.

Finally, while we are confident that the evolution of the Salesforce platform ecosystem was significantly influenced by the plethora of acquisitions, we acknowledge that there are other ways to extend a platform's technology and functionalities (e.g., partnerships with leading complementors or with other platform owners), which were not the focus of our study.

D.7 Concluding Comments

Digital platform markets are characterized by fierce competition, and a key differentiator of a platform over its competitors is the ability to evolve the ecosystem quickly along all the evolution directions. Relying just on new proprietary developments to drive this evolution is unlikely to be feasible because they take time and require a wide range of competencies that platform owners may not possess. However, complementary innovations to improve a platform's technology and functionalities may already exist in the market. Platform owners should therefore look to acquire complementors so they can incorporate and own these existing competencies, and thus enable rapid growth and a richer functionality in their platform offerings. But adopting a complementor acquisition strategy means facing various challenges in leveraging acquisitions to enable major advancements in the platform ecosystem's strategic directions of evolution.

In this article, we have analyzed a platform owner's (Salesforce) acquisitions of complementors in an enterprise software ecosystem. Based on insights from this analysis, we have provided recommendations on how platform owners should acquire complementors to develop their platforms' technology and core offerings, and evolve their ecosystems.

Complementors to digital platforms can also benefit from our recommendations. A better understanding of how platform owners conduct acquisitions supports complementors' strategic positioning and competitive moves in platform ecosystems. This specifically applies to complementors that seek to make their offerings strategically attractive to platform owners, and thus become potential targets for an acquisition competition among platform owners.

D.8 Appendix A: Research Method

D.8.1 Data Collection

This article is based on an exploratory study of the key acquisitions made by Salesforce. We collected data from July 2020 until January 2021 through 19 semi-structured interviews with experts from the Salesforce ecosystem, with an average duration of 63 minutes for each interview. The interview questions were built around the roles, interests, concerns and competencies of each group of ecosystem players (platform owner, complementors and clients). To start with, our aim was to focus on the evolution of the Salesforce ecosystem and to explore the contributions and perspectives of the different players in this evolution.

Specifically, we set out to collect data on the following:

1. Each player's understanding of the ecosystem (e.g., the core and additional offerings)
2. Each player's role in the ecosystem and in relation to the other players
3. The major developments in the ecosystem that considerably impacted the roles of players and the values they derive from the ecosystem
4. The major changes that considerably impacted the evolution of the ecosystem.

During each interview, we also collected data about the temporal sequence of the major changes in the ecosystem so we could later investigate their interrelationships and impacts on one another.

Because all the initial interviews mentioned acquisitions as a major influencing factor on platform ecosystem evolution, we decided to focus the remaining interviews on this topic. Some acquisitions were repeatedly mentioned by several interviewees from different player groups (Salesforce, complementors and clients), so we decided to focus on these *key* acquisitions, which are all closely related to Salesforce's CRM core modules and capabilities.

To ensure we obtained a comprehensive view of the different perspectives of the ecosystem, we identified interviewees from all three player groups: the platform owner (Salesforce), complementors (e.g., software developers, implementation consultancy service providers) and Salesforce clients. Interviewee selection criteria were to include both business and technology roles, and people with an in-depth familiarity with Salesforce and its ecosystem. This latter criterion was met by engaging an internal expert from Salesforce as a member of the research team and as a co-author of this article. Table 23 provides an overview of the interviewees and their organizations.

D.8.2 Interviewee Profiles

Table 23: Interviewee Profiles

Ecosystem Players	Interviewee Position/Unit/Experience[12]
Platform Owner	**Salesforce** - Program Architect Director/Customer Success Group/20; 5 - Senior Director, Product Management/Community Cloud/16; 5 - Vice President, Product Management/Developer Platform/19; 10 - Senior Director, Solution Engineering/Solution Consulting/30; 12 - Business Architect Director/Customer Service Group/32; 5 - Senior Executive, Global Professional Services/Customer Success Group/29; 12 - Program Architect Director/Customer Service Group/20; 6 - Senior Executive, AppExchange & ISV Enablement/AppExchange/19; 16 - Master Enterprise Architect/Customer Success Group/22; 7
Complementors	**Complementor 1 (Developer)**:[13] U.S.-based provider of an end-to-end DevOps solution with more than 100 employees and offices in North America and Europe. - Chief Technology Officer/Product Development/19; 7
	Complementor 2 (Developer): U.S.-based provider of industry-specific cloud and mobile software with more than 500 employees and offices in North America, Europe, Asia and Latin America. - Chief Digital Transformation Officer/Customer Success/25; 2
	Complementor 3 (Developer): U.S.-based provider of integration software for applications, data and devices with more than 2,000 employees and offices in North America, Europe and Latin America. - Senior Customer Success Architect/Customer Success/23; 10
	Complementor 4 (Implementation Consultant): Spain-based provider of Salesforce consultancy services with more than 120 employees and offices in two countries. - Chief Executive Officer/1; 12

[12] Years of professional experience; years of experience in current firm.

[13] Complementor and customer organizations wish to remain anonymous.

	Complementor 5 (Implementation Consultant): Ireland-based international provider of consultancy services with more than 500,000 employees. - Head Enterprise Architecture/13; 5 - Head Cloud First Go-To-Market Group/28; 2
	Complementor 6 (Developer): U.S.-based provider of customized software tailored for higher education and non-profit clients with more than 50 employees. - Chief Executive Officer/23; 9 (*CO-6*)
Clients	**Client 1**: Germany-based producer of building materials and construction systems with more than 35,000 employees and offices in more than 85 countries. - Senior Manager, Sales Excellence/Group Marketing/6; 6
	Client 2: Ireland-based industrial gases and engineering firm with almost 80,000 employees in more than 100 countries. - Director, Applications/IT/2; 15
	Client 3: Kenya-based non-profit organization that has developed several funding programs to support education and to fight famine. - Founder & Sponsor Development/30; 8

To ensure consistency of data collection, we developed a comprehensive interview guideline, which was customized according to the interviewee's organization's role in the Salesforce ecosystem (owner, complementor or client). For interviews with Salesforce employees, we also adapted the guideline according to their functional area.

The majority of interviews were conducted by two researchers (the co-author from Salesforce was not involved in the interviews). With one exception, the interviews were recorded and later transcribed (during one interview we took notes).

After each interview, the researchers involved immediately reflected on and documented the major insights that they had gained. In addition, after every few interviews, the whole research team met to discuss what new directions had emerged so far and had not been previously considered. The results of these discussions were documented in the form of notes and visualizations. These sessions stimulated the concurrent collection of data and analysis.

We also gathered secondary data including publicly available documents (e.g., business reports, news articles). This secondary data helped us to identify the temporal sequence and details of the major changes in Salesforce's platform ecosystem.

D.8.3 Data Analysis

The interview transcripts were used as the basis for data analysis. We employed process theory (Pettigrew, 1997) to analyze the longitudinal platform ecosystem evolution at Salesforce. Process studies analyze three main components—antecedents, events and outcomes. Antecedents, which trigger an event, consist of external contextual factors (e.g., the technological and business environments) and internal contextual factors (e.g., mechanisms imposed by the platform owner). In turn, outcomes are the results of each event. As such, a process represents a sequence of collective events unfolding over time to give meaning to a phenomenon's status quo. In the context of our research, each event corresponds to a major change in Salesforce's platform ecosystem (e.g., a key acquisition or proprietary development) that can be considered as a turning point in the way the ecosystem evolves and emerges over time.

After coding the main events and their corresponding antecedents and outcomes, we coded the relation between events with respect to, for instance, the engaged platform ecosystem players in the respective event. This approach enabled us to classify these major events according to their influence on the platform and the ecosystem. For example, we initially identified several different outcomes of events from a technical perspective (e.g., improved technology, higher integration capabilities, new programming language). We then analyzed the outcomes from the perspectives of the involved complementors (e.g., better enablement services, new business plan assessment, lower transaction fees) and clients (e.g., new features, improved documentation, improved client community). Finally, we categorized the codes into higher level meta-codes as part of an exploratory process of step-by-step coding of the data to derive major insights (Eisenhardt, 1989).

D.9 Appendix B: Relationship of our Study to Other Research on Platform Ecosystems

Our investigation of Salesforce's key acquisitions also contributes to the intersection of two emerging research streams, namely acquisitions in digital markets (i.e., software acquisitions) and platform ecosystem evolution. A considerable number of studies focuses on, for instance, why companies acquire firms in digital markets (Miric et al., 2021) but only a limited number focus on acquisition-induced platform ecosystem evolution and dynamics (Rietveld & Schilling, 2021). The few notable exceptions provide important insights. For example, with a focus on transaction-oriented digital platforms, some scholars have studied the acquisition patterns of digital platform companies and compared them with those of non-platform companies (Miric et al., 2021). They found that platform companies often first acquire competing platform companies from the same market niche (e.g., a housing portal acquires other smaller housing portals). As platforms mature, they begin to acquire non-platform companies from other market niches.

Another study suggests that acquisitions can be employed by platform owners to activate, alter or adjust the ties between their ecosystems' players, helping platform owners sustain a competitive advantage (Koch & Windsperger, 2017). Another contribution is a study of Cisco's platform ecosystem, which provides important insights on how a platform owner can create value through continuously integrating acquisitions into the platform's core technology (Toppenberg et al., 2016).

Our study complements these studies by providing recommendations to platform owners on how to employ acquisitions to drive the platform ecosystem's evolution. In addition, by taking a multi-player approach (from the perspectives of the platform owner, complementors and customers), we provide recommendations on how to deal with the impacts of acquisitions on the ecosystem's internal dynamics.

Paper E – Opportunity or Threat: A Complementors' Perspective on Platform Owner's Acquisitions

Table 24: Bibliographic Metadata Paper E

Title	Opportunity or Threat: A Complementors' Perspective on Platform Owner's Acquisitions
Authors	Staub, Nicola[1]; Haki, Kazem[2]; Aier, Stephan[1] [1]University of St.Gallen, Institute of Information Management, St.Gallen, Switzerland [2]Geneva School of Business Administration (HES-SO, HEG Genève), Geneva, Switzerland
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Abstract

Acquisition of complementors is a prevailing mechanism available to platform owners to leverage digital platforms' multidimensional growth. Notwithstanding platform owners' propensity to acquire complementors, little is known about the potential effects of such acquisitions on the non-acquired complementors. While a group of complementors may benefit from an acquisition, others may perceive an acquisition as the platform owner entering into competition with its own complementors. To address this gap, we examine the acquisition of complementors' effects on the other complementors in the context of a B2B innovation platform whose evolution is considerably influenced by a plethora of acquisitions. As part of an ongoing research project, in this paper we link academic discourses on acquisitions and platform owners' market entry to derive a set of hypotheses, which we plan to test in the respective B2B innovation platform ecosystem.

Keywords

Digital Platform, Platform Ecosystem, Acquisition, Market Entry

E.1 Introduction

Digital technologies have facilitated the reorganization of industries around platforms and transformed many firms into either platform operators (i.e., platform owners) or producers of complements (i.e., complementors) in a platform ecosystem (Rietveld & Schilling, 2021). In these complex ecologies of firms, complementors each pursue their own interests and goals, such that platform owners need to incentivize complementors to innovate while aligning the various actors' individual interests and competencies toward obtaining collective objectives (Cennamo & Santaló, 2019; Tiwana et al., 2010). Further, due to fierce inter-platform competition, platform owners also need to facilitate rapid growth and to secure critical resources for their digital platforms (Miric et al., 2021). Since platform owners' proprietary developments are often time-consuming and uncertain (Toppenberg et al., 2016), acquisition of complementors is one of the prevailing options to achieve fast, timely, and multi-faceted growth. Specifically, the acquisition of complementors enables platform owners to lock-in key complementors in the ecosystem and integrate their complements into the platform's core offerings (Miric et al., 2021).

Next to their undeniable potentials, acquisitions also entail risks as they may intervene the ecosystem's internal dynamics. While a group of complementors may benefit from an acquisition (e.g., through additional resources to perform their development work), others may perceive an acquisition as the platform owner entering into competition with them to appropriate a share of their revenue (Foerderer et al., 2018; Li & Agarwal, 2017). The latter specifically applies to the group of complementors that is affected by the acquisition of one of their competing complementors.

While there is surprisingly little research on the effects of acquisitions in platform ecosystems, a research stream on platform owner's entry to its own complementary markets discusses comparable market interventions. The effects of platform owner's entry on complementors reported in these studies are mixed. Some studies identify positive effects through, for instance, attention spillover effects from increasing customer demand (Foerderer et al., 2018) and others reveal negative effects, for example due to the platform owner increasing the entry frequency (Cennamo et al., 2018a). However, due to acquisitions' specific characteristics and platform owner's distinct motives to conduct acquisition of complementors, it is of value for both research and practice to obtain a coherent understanding of the potential effects of a platform owner's market entry from an acquisition perspective. Therefore, we specify the following research questions: *What are the effects of platform owner's acquisition of complementors on the non-acquired complementors in the platform ecosystem*? *Do complementors affected by the acquisition of one of their competitors (competing group) react differently than the other complementors (non-competing group)*? To answer these research questions, we plan to conduct a survey among complementors of a B2B innovation platform whose evolution has been considerably influenced by a plethora of acquisitions.

E.2 Research Background

In this section, we present our conceptualization of platform ecosystems, and introduce the main discourses on platform owners' acquisition of complementors and market entry.

E.2.1 Platform Ecosystems

Platform ecosystems are complex ecologies of firms with individual and collective, intertwined interests (Cennamo & Santaló, 2019). As the nexus of platform ecosystems, digital platforms are software-based systems that consist of a modular technological architecture and facilitate interactions between different actor groups (Gawer, 2009; Tiwana et al., 2010). Actors of a platform ecosystem include the platform owner (i.e., operator), complementors (e.g., developers), and customers. While each of these actors pursue their own, sometimes conflicting, interests and goals, they also have a common interest in the survival and prosperity of the platform for materializing and consuming their products or services (Selander et al., 2013). Therefore, a platform owner's role as orchestrator of the ecosystem is to align the diverse actors' interests toward obtaining collective objectives.

A platform that is the center of gravity of a platform ecosystem can have different functions (Bonina et al., 2021; Cusumano et al., 2020). A transaction platform (e.g., eBay, Amazon.com) serves as an intermediary for direct exchange or transactions. An innovation platform (e.g., Apple's iOS, Google's Android, Salesforce) serves as a technological foundation upon which external actors develop complementary add-ons and thereby extend the platform's scope of use and functionalities. Both these two fundamental platform functions can facilitate interactions between individuals and/or organizations.

To study the effects of platform owner's acquisition of complementors, our focus is on *business-to-business (B2B) innovation platforms* (e.g., SAP's Business Technology

Platform, Salesforce). Existing research highlights that B2B innovation platforms differ in their characteristics compared to consumer-focused innovation platforms (e.g., Apple's iOS, Google's Android) (Matzner et al., 2021; Schreieck et al., 2021; Staub et al., 2021c). For example, owing to the dynamics and complexity of customer requirements, complementors are highly specialized providers of products and/or services that require considerable resource investments (Blaschke et al., 2018; Staub et al., 2021c). This may lead complementors to even more carefully (re)evaluate new resource investments when being exposed to the threat of changing ecosystem dynamics through platform owner's acquisitions (Wen & Zhu, 2019). This indicates that the non-acquired complementors' reactions to platform owner's acquisitions may be distinct in the B2B innovation platform context, making it worthwile to analyze these effects in the given context.

E.2.2 Platform Owner's Acquisition of Complementors and Market Entry

Despite platform owners' propensity to acquire complementors, research on acquisitions and their potential effects in the platform context has been scarce (Miric et al., 2021). In general, acquisitions can help organizations to quickly grow their market share and act as a mechanism to realize synergies with respect to size, geography, assets, people or competencies, thereby creating value (Epstein, 2005). In addition, in the context of digital platform markets, acquisitions specifically enable platform owners to lock-in key third party complementors and flexibly integrate their solutions into the platform's modular core offerings (Miric et al., 2021).

Beyond the advantages for platform owners, acquisitions can also yield important benefits for complementors. For instance, complementors can obtain additional tools for developing their offerings on the platform, such as when Salesforce acquired *Heroku* or Cisco acquired several firms to improve their development environment (Staub et al., 2021c; Toppenberg et al., 2016). On the other hand, acquisitions may intervene within the dynamics of the platform ecosystem. If several complementors are active in a certain market niche (i.e., compete with one another) and the platform owner acquires one of them and deeply integrates that complementor's resources into the platform's core offerings, such an acquisition would erode some of the complementors' incentives to innovate. These complementors may subsequently reduce their development efforts or even leave the platform ecosystem. For example, *Meerkat*, a mobile app that enabled Twitter users to broadcast live video streaming to their followers, vanished after Twitter acquired *Meerkat*'s competitor *Periscope* (Zhu, 2019).

Thus, the complementors affected by acquisition of one of their competitors might perceive such acquisitions as the platform owner entering into competition with its own complementors. This has been conceptualized as the platform owner's market entry in a growing stream of literature in platform research (e.g., Gawer & Henderson, 2007; Zhu, 2019). Platform owner's market entry generally refers to the platform owner entering certain market niches of its own market by imitating complementors with similar offerings to appropriate a share of their revenue (Gawer & Henderson, 2007; Zhu, 2019). While existing studies on market entry highlight acquisitions as an alternative entry mode, they almost entirely focus on proprietary developments. Proprietary developments refer to the addition of a new or the considerable improvement of an existing product and/or service in a market niche through an internal development by the platform owner itself. With reference to different platform contexts, a number of studies on platform owner's entry have examined the impact of entry on complementors and reported mixed results (Table 25).

We acknowledge the importance and necessity of these studies as well as their ability to partially inform the effects of platform owner's acquisitions. Yet, it is worthwile to consider the platform owner's entry from an acquisition perspective (Zhu, 2019) because acquisitions have important particularities, which do not apply to proprietary developments. Specifically, both the motivation of platform owners to conduct acquisitions as well as the characteristics of acquisitions suggest that entry through acquisition has distinct effects on complementors. Regarding the motivation of the platform owner, acquisitions are often employed opportunistically such as to merely lock-in key complementors after increased competition with other platform owners in a certain market niche or to expand the reach of the platform by increasing the number of participants in one of the platform's actor groups (i.e., complementors or customers) (Miric et al., 2021; Staub, Haki, Aier, Winter, & Magan, 2021b). This may increase complementors' difficulty in assessing when and whether the platform owner enters their market niche through acquisition, which potentially influences their subsequent reactions and strategies. This is intensified by the characteristics of acquisitions such as the high confidentiality requirements that lead the platform owner to conduct acquisitions without providing upfront information to complements. This is in contrast to proprietary developments, which are often communicated by platform owners to complementors as part of complementor enablement programs (Staub et al., 2021c). Moreover, when the platform owner is increasingly conducting acquisitions, certain complementors might start positioning themselves to become attractive acquisition targets (Wen & Zhu, 2019). As such, the effects of platform owner's market entry through acquisitions are expected to differ from the effects of entry through proprietary developments.

We thus aim to complement the studies on platform owner's entry by focusing on entry through acquisitions in a B2B innovation platform context. In this context, complementors are specialized product and/or service providers investing a considerable amount of resources (Ceccagnoli et al., 2012), yet frequently competing with the platform owner. As an acquisition may manifest as entry only for some of the complementors, we aim to capture the effects on different groups of complementors, i.e., those affected by acquisitions in general and those affected by acquisition of one of their competing complementors in particular.

Table 25: Studies on Effects of Platform Owner's Market Entry[14]

Reference	**Context**	**Entry mode**	**Key findings for effects on complementors**
Cennamo et al. (2018a)	- Consumer-focused innovation platform - Video gaming	Proprietary development	Mixed effects: When the platform owner enters a market niche, complementors *release more* games. When the entry frequency increases, complementors *reduce their efforts* in producing games but *shift their efforts* to unaffected niches.
Foerderer et al. (2018)	- Consumer-focused innovation platform - Software development (Google's Android)	Proprietary development	Positive effects: Google's entry into its photo app market niche *increased* the customer demand and later also complementors' *development efforts* (app updates) in that niche, particularly for large complementors.

[14] We retrieved these key studies from Zhu's (2019) comprehensive literature review. Other studies included in his review have a different focus (e.g., the motivation of platform owner's entry), therefore we did not include them in our review.

Li and Agarwal (2017)	- Consumer-focused innovation platform - Social media (Facebook)	Acquisition	Mixed effects: Facebook's acquisition of Instagram increased the customer demand in its photo app market niche and later *positively* (*negatively*) affects the *number of large (small) complementor apps*.
Wen and Zhu (2019)	- Consumer-focused innovation platform - Software development (Google's Android)	Proprietary development	Mixed effects: When Google enters a market niche, developers in that niche *reduce development efforts* in the affected niche and *shift their efforts* to unaffected niches.
Zhu and Liu (2018)	- Consumer-focused transaction platform - E-commerce (Amazon.com)	Proprietary development	Negative effects: When Amazon enters a market niche, complementors *reduce the number of products* that they offer on the platform.

E.3 Hypothesis Development

In this section, we derive our research model (Figure 4) and its constituent hypotheses based on the digital platform research, specifically on platform owner's acquisitions and market entry. For the derivation of our hypotheses, we also consider the specificities of the B2B innovation platform context.

Although a platform owner's acquisitions can have diverse effects, complementors must still be able to generate innovations (value creation), and by doing so profitably capture a sufficient share of the market (value appropriation) (Cennamo & Santaló, 2019; Oh et al., 2015). Value appropriation concerns a fair *market share of complements* from the platform's total revenue and is a prerequisite for complementors to offer their complements on the platform over time (Zhu & Liu, 2018). As complementors' market share depends on how the revenue generated on the platform is appropriated among the different actors, platform owners need to ensure that complementors receive their fair share in order to maintain their incentives to innovate on the platform (Oh et al., 2015; Tiwana, 2014). As for value creation, each of the complementors contributes to the platform ecosystem's generativity (Cennamo & Santaló, 2019; Zittrain, 2006) by offering their complements. Existing research highlights that platform owners not only need to facilitate the quantity of complements, but also ensure the distribution of complements across heterogeneous market niches (Wareham et al., 2014). This is conceptualized as the *variety of complements*, i.e., the quantity of complements in certain product categories in relation to the quantity of complements in other categories (Wareham et al., 2014). However, the reliance on a plethora of autonomous complementors is not without risk (Boudreau, 2012; Wareham et al., 2014). Where generativity is desirable, uncontrolled creative output is not always positive for the survival and prosperity of the ecosystem (Hagiu & Halaburda, 2009). Stated colloquially, letting a thousand flowers grow (Boudreau, 2012) may produce a flooding of low-quality complements, resulting in a negative customer experience and lower platform reputation and may even lead to the platform's demise (Wessel et al., 2017). Therefore, another integral aspect to value creation is to control the *quality of complements* (Goldbach & Benlian, 2015b; Wareham et al., 2014). Complement quality specifically relates to enhancing the functionality (e.g., improve user interface, add new feature) of complements and enhancing the integrity (e.g., fix bug, ensure compatibility) of complements (Hilbolling, Berends, Deken, & Tuertscher, 2021).

On this basis, we argue that platform owner's acquisition of complementors leads to different outcomes (i.e., *market share of complements*, *variety of complements*, and *quality of complements*) when comparing the complementors affected by the acquisition of one of their competitors (*competing group*) to the other complementors (*non-competing group*).

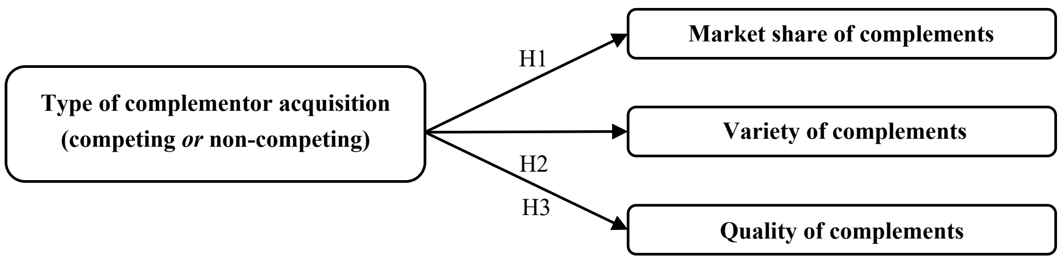

Figure 4: Research Model[15]

[15] In general, a complementor can be affected by both types of complementor acquisitions. As we expect a higher number of complementors affected by the non-competing type of complementor acquisition, we intend to ask the complementors affected by both types to only report their experienced effects related to the competing type of complementor acquisition.

E.3.1 Market Share of Complements

In the literature on platform owners' acquisitions and market entry, no study has systematically analyzed the resulting effects on complementors' market share. However, capturing a bulk of complementors' markets has been discussed as one of the major motivations of platform owners to enter their markets (Zhu & Liu, 2018). Further, existing research highlights that several complementors had to dissolve their companies because they were not able to compete with the entering platform owner (Zhu, 2019). Complementors affected by an acquisition of one of their competitors are likely to interpret market entry as the platform owner's intention to take a share of their revenue, i.e., their market share tends to decrease. This is particularly problematic in the context of B2B innovation platforms, where complementors are usually highly specialized, commercial firms. Therefore, we hypothesize:

H1: A platform owner's acquisition of complementors results in a lower market share of complements of complementors in the competing group compared to complementors in the non-competing group.

E.3.2 Variety of Complements

The variety of a complementor's innovation output has been conceptualized in the existing literature as the diversification of complements across different market niches (e.g., app categories) (e.g., Cennamo et al., 2018a). For example, in the case of Google's Android, Wen and Zhu (2019) find that once Google enters the market, complementors not only reduce the number of apps in the affected app category but also shift their efforts toward other app categories, which had not been affected by platform owner's entry. Similarly, in the video gaming industry, frequent releases of first-party games by the platform owner in a market niche drives complementors away from that genre to other genres (Cennamo et al., 2018a). In other words, complementors increase the diversification (variety) of their offerings. Due to the considerable resource investments of complementors in the B2B innovation platform context, we expect complementors affected by platform owner's acquisitions to shift their development efforts rather than exiting the platform ecosystem. Therefore, we hypothesize:

H2: A platform owner's acquisition of complementors results in a higher variety of complements of complementors in the competing group compared to complementors in the non-competing group.

E.3.3 Quality of Complements

Cennamo et al. (2018a) show that in video gaming platforms, platform owner's entry can have negative implications on the quality of the complements in the platform ecosystem, specifically in the case of a high entry frequency (i.e., several entries of the platform owner in the same market niche). In addition, research highlights that, compared to complementary apps, the products and services developed or acquired by the platform owner are often of superior quality because platform owners have full access to the platform's technical details, enabling the owners to build products and services that are more platform-compatible (Wen & Zhu, 2019). This, in turn, reduces the probability that complementors will make new resource investments to improve the quality of their complements. Therefore, in the context of B2B innovation platforms, where complementors are required to make substantial platform-specific investments, we hypothesize:

H3: A platform owner's acquisition of complementors results in a lower quality of complements of complementors in the competing group compared to complementors in the non-competing group.

E.4 Research Method

To test our hypotheses, we plan to conduct a survey among complementors of a B2B innovation platform. A survey research design specifically enables us to collect data from a large number of complementors whose complements were affected by platform owner's acquisitions. In doing so, we intend to focus on Salesforce, a leader in the global enterprise software market and a prime example of a thriving B2B innovation platform whose evolution is considerably influenced by a plethora of acquisitions. In the following, we briefly describe the context of our research, the data collection, and the planned analysis procedure.

Salesforce's main offerings are advertised as *Customer 360* with different core modules related to sales, customer service, marketing, and e-commerce. To enable complementors to build complementary apps, Salesforce launched a development environment called *Force.com* (i.e., its B2B innovation platform) to enable complementors to produce their own apps. Until today, Salesforce has attracted more than one million registered developers and more than 3,500 enterprise apps are currently offered on Salesforce's marketplace (*AppExchange)*. Salesforce's evolution to a leading platform ecosystem in the enterprise software industry has been considerably influenced by the platform owner's more than 60 acquisitions[16]. Several of these acquisitions have been leading complementors in the Salesforce platform ecosystem, such as *Vlocity* (a provider of industry-specific software solutions), *ExactTarget* (a provider of marketing automation and campaign management software), or *Evergage* (a provider of omnichannel personalization and customer experience software).

We plan to collect data on each of the constructs included in our research model (Figure 4). There is no study that applies a survey approach to analyze the effects of a platform owner's acquisitions on complementors from which measurement items for our model's constructs could be adopted. Therefore, building on existing research and following MacKenzie et al.'s (2011) guidelines, we derived and produced measurement items for our three constructs, namely the market share (Cennamo & Santaló, 2019; Oh et al., 2015) as well as variety (Boudreau, 2012; Wareham et al., 2014) and quality (Cennamo & Santaló, 2019; Wareham et al., 2014) of complements. While the unit of analysis is the complements, through analyzing the implications of platform owner's acquisition on complements we aim to capture the complementors' perspective and to eventually provide insights tailored to both platform owners and complementors. Besides the main constructs, we included several control variables to account for alternative explanations such as complementors' years of experience in app development and in the Salesforce platform ecosystem, and number of apps in the Salesforce platform ecosystem. Further, we collect data on additional variables that may have a moderating effect based on the existing research such as complementors' defense mechanisms to platform owner entry, i.e., intellectual property rights and downstream mechanisms (Ceccagnoli et al., 2012) as well as multihoming of complementors in several competing platform ecosystems (Cennamo et al., 2018b). This will give us the possibility to assess the impact of these variables on the differences between the two groups (i.e., *competing group* and *non-competing group*).

To ensure that our survey questions are relevant and clear for the target audience, we conducted a two-step pre-test before distributing the survey. First, we invited four researchers, who are highly knowledgeable in the field of platform ecosystems, to go through the survey and provide comments in a feedback template. Subsequently, we discussed open points with each of the researchers to ensure that the measurement items are mutually exclusive and collectively exhaustive for each of our constructs. In the

[16] For a full list of acquisitions, see Salesforce's *Wikipedia* entry: https://en.wikipedia.org/wiki/Salesforce#Acquisitions

second step, we distributed our survey questions and feedback template in an internal forum for Salesforce architects, who have an in-depth understanding of the complementors' perspective on Salesforce's acquisitions. Similar to the first step, we had follow-up discussions with Salesforce architects to clarify open points. The latter step enabled us to ensure that the survey questions are understandable from the perspective of the target audience.

Once a sufficient amount of data is collected, we will assess content validity, convergent validity, and discriminant validity for each of the constructs and measurement items (MacKenzie et al., 2011; Pinsonneault & Kraemer, 1993). Regarding the analysis and considering the design of the research model, our objective is not to test cause-and-effect relations. Instead, we intend to perform a one-way analysis of variance (ANOVA) to test the differences between the two types of complementors, i.e., the *competing group* and *non-competing group*.

E.5 Discussion and Next Steps

Digital platforms have gained significant interest in research and practice due to their transformative power across industries. One considerable gap in the existing research is the lack of insights on the effects of platform owner's acquisition of complementors, particularly in a B2B innovation platform context. In this study, we posit that acquisition of complementors causes diverging effects on the non-acquired complementors affected by acquisition of one of their competitors (*competing group*) compared to the other non-acquired complementors (*non-competing group*).

This study is part of an ongoing research project on the Salesforce platform ecosystem. We have already conducted case studies on the topics of platform ecosystem evolution as well as acquisitions as a strategy for platform owners (Staub et al., 2021b; Staub et al., 2021c), which provided us with a sound understanding of the Salesforce environment. Specifically, the initial discussions with complementors during our recent interview series indicated that the two groups of complementors experienced acquisitions in different ways. The latter, along with the outlined void in the extant research, served as the motivation to seek for answers to the research questions reported in the paper at hand. At this stage of the research, we believe that a survey approach is suitable to collect data from a relatively large number of complementors on their experience with the platform owner's acquisitions. At a later stage, conducting interviews with a selected number of complementors would supplement and contextualize the survey results, and eventually provide complementary insights.

Although our research is still in progress, it provides a preliminary contribution in its current state subject to further research. Our study's current contribution lies in connecting academic discourse on two important topics that have been mainly analyzed in isolation, namely the acquisitions and the market entry of platform owners. Specifically, with reference to the literature on platform owner's entry and from the complementors' perspective, we derived three major constructs that may potentially be influenced by platform owner's acquisitions. Therefore, these constructs may require the specific attention of platform owners when conducting their acquisitions. To the best of our knowledge, such a study would be the first to analyze the effects of platform owner's acquisitions on complementors, specifically in a B2B innovation platform context.

After analyzing the data, we expect three further contributions of our study. First, we expect insights into the effects of platform owner's acquisition of complementors on the non-acquired complementors. We specifically aim to contribute to a more coherent understanding of the effects on each of the three constructs in our research model (Figure 4). These insights will support platform owners by illustrating what are the main subjects of impact from the complementors' perspective that need to be considered when evaluating potential acquisitions. Second, we expect insights into the diverging effects of platform owner's acquisitions on the two groups of complementors (i.e., the *competing group* and the *non-competing group*). These insights will support platform owners in moderating potential negative effects of their acquisitions as well as in balancing their own interests and those of their diverse complementors. If it turns out that there are no significant differences in the effects on the two groups of complementors, our research will support platform owners with empirical evidence that acquisitions can be pursued even more aggressively. Third, we expect to contribute to the literature on platform owner's entry from the perspective of acquisition as an entry mode. Specifically, we aim to contribute on how platform owners can evaluate the application of different entry strategies (e.g., acquisition vs. proprietary development). In this regard, our study may further contribute to platform owners' decision-making processes when defining which products or services can or should be provided by the platform owner and which ones should be left to complementors to ensure their incentives to innovate on the platform. Similarly, complementors can benefit from understanding the effects of platform owners' acquisitions, specifically in terms of their strategic positioning and competitive moves in platform ecosystems.

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Curriculum Vitae

Personal Information

Name	Nicola Staub
Date of birth	19.03.1992
Place of birth	Brugg AG, Switzerland
Nationality	Swiss

Education

2019-2022	**University of St.Gallen (HSG)**, St.Gallen, Switzerland Doctor of Philosophy (Ph.D.) in Management (Business Innovation)
2022-2022	**London School of Economics (LSE)**, London, United Kingdom Doctoral Visiting Program
2017-2019	**University of St.Gallen (HSG)**, St.Gallen, Switzerland Master of Arts (M.A.) in Business Innovation
2018-2019	**Sophia University**, Tokyo, Japan Exchange Semester
2013-2016	**University of St.Gallen (HSG)**, St.Gallen, Switzerland Bachelor of Arts (B.A.) in Business Administration
2015-2016	**University of Technology Sydney (UTS)**, Sydney, Australia Exchange Semester
2008-2012	**Kantonsschule Baden**, Baden, Switzerland Swiss Matura

Professional Experience

2019-2023	**IWI-HSG**, St.Gallen, Switzerland Research Associate
2019-2019	**mm1 Schweiz AG**, Zurich, Switzerland Fellow
2017-2018	**Swiss Life Asset Management AG**, Zurich, Switzerland Intern
2017-2018	**ITEM-HSG**, St.Gallen, Switzerland Research Assistant
2016-2017	**Credit Suisse AG**, Zurich, Switzerland Intern
2013-2013	**Livit AG Real Estate Management**, Zurich, Switzerland Intern