

Inter-Organizational Ecosystems in Software Development

ABSTRACT OF THE INAUGURAL DISSERTATION

to obtain the title Doctor rerum oeconomicarum of the Faculty of Business,
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ZUSAMMENFASSUNG DER INAUGURALDISSERTATION

zur Erlangung der Würde eines Doctor rerum oeconomicarum der Wirtschafts-
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Dissertation Abstract

Companies are increasingly exposed to disruptive technologies and unexpected competitors that pose potential threats to their business success. To avert such threats, pressed companies increasingly create and transform goods together with other organizational actors in so-called inter-organizational ecosystems (Adner, 2006, 2017; Jacobides, Cennamo, & Gawer, 2018; Lumineau & Oliveira, 2018). These inter-organizational ecosystems describe groups of interacting organizational actors that are mutually dependent on each other's activities (Jacobides et al., 2018). The growing prevalence of inter-organizational ecosystems builds on information systems (IS), which allow a distribution of innovation agency across multiple organizational actors by means of digital technology (Nambisan, Lyytinen, Majchrzak, & Song, 2017) for co-creating value (Sarker, Sarker, Sahaym, & Bjørn-Andersen, 2012). These advantages are of particular importance in software development and have contributed much to the popularity of platform ecosystems (i.e., Tiwana, Konsynski, & Bush, 2010) and innovation ecosystems (i.e., Adner & Kapoor, 2010). The three studies of this dissertation (see Table 1) focus on platform ecosystems (i.e., studies 1 and 2) and innovation ecosystems (i.e., study 3).

Platform Ecosystems

Platform ecosystems describe one-to-many structures between one platform owner that provides a platform with a range of development and marketing resources (Gawer, 2009; Ghazawneh & Henfridsson, 2013; Tiwana et al., 2010), and many complementors that draw on these resources to extend the platform with own complements, often aimed at niche markets (Boudreau, 2012; Tiwana et al., 2010). Prominent examples of platform ecosystems are the software systems on contemporary smartphones that allow users to combine mobile operating systems (i.e., the platforms), such as iOS by Apple or Android by Google (i.e., the platform owners), with millions of different applications (i.e., the complements) from several thousand application developers (i.e., the complementors) (AppBrain, 2019; Liao, 2018). Although this unique one-to-many structure allows to create added value for the users, it also leads to a situation of asymmetric dependence between the platform owner and the complementors, where the platform owner depends on an ecosystem as a whole and the complementors on a specific platform owner (Kude, Dibbern, & Heinzl, 2012). This asymmetric dependence presents two major challenges for platform ecosystems. First, the asymmetric dependence vests platform owners with power over their ecosystems, which suggests a certain impuissance of the complementors toward the platform owner. Although this power imbalance could pose a major threat to platform ecosystems and their successful survival, still little is known about how power

manifests in platform ecosystems, how and why power changes over time, and how such power dynamics feed into the continued thriving of platform owner–complementor partnerships. The first study of this dissertation addresses these questions by means of a longitudinal multiple-case study with six platform owner – complementor dyads (Yin, 2009). The resulting process model suggests that power in platform ecosystems evolves through a reciprocal process, shaped by both the powerful platform owners and the complementors. More specifically, platform owners can only play to their—in principle—powerful position if their complementors decide to subjectify themselves. As to whether or not complementors subjectify themselves, builds on an evaluation process in which they weigh the potential disadvantages against the benefits. Interestingly, complementors can take measures to mold the power of their platform owner in their favor, while platform owners can lure complementors into subjectification by episodically switching between different faces of power. Eventually, the process model suggests that platform partnerships only thrive if platform owners and complementors are mutually responsive to each other in the reciprocal process of power enactment and subjectification.

Second, the asymmetric dependence confronts platform owners with the challenge of designing efficient and effective rules for governing their platform ecosystems (Tiwana et al., 2010; Wareham, Fox, & Giner, 2014), without causing platform desertion (Tiwana, 2015). In other words, platform owners need to design and practice the rules of their platform ecosystems in ways that allow them to increase complementor dedication, i.e., the extent to which complementors are devoted and faithful to a particular platform, and continuously willing to invest in the partnership with the platform owner. Complementor dedication is a highly desirable governance objective that comes with the promise of an ongoing generation of add-on value to the platform (Benlian, Hilkert, & Hess, 2015; Boudreau & Haigu, 2009; Sarker et al., 2012; Tiwana, 2013). Yet, little is known about how the interplay between designing rules and practicing them influences complementor dedication to a platform. The second study of this dissertation aims at answering this question by means of survey data from 181 complementors, each collaborating with a platform owner. The results of the second study show that rule adequacy independently strengthens complementor dedication. Thus, the more adequate complementors perceive the design of the rules, the more likely they dedicate themselves. However, this relationship is strongest if rule practices are simultaneously benevolent and flexible in contrast to being either benevolent or flexible. Thus, the more benevolent and simultaneously flexible complementors perceive the rule practice by a platform owner, the stronger the relationship between the perceived rule adequacy and complementor dedication becomes.

Innovation Ecosystems

Innovation ecosystems describe multilateral sets of organizational actors that need to cooperate in order for coherent and customer-oriented digital innovation to materialize (Adner, 2006, 2017; Adner & Kapoor, 2010). Relations between organizational actors build on a highly flexible orchestration that allows a coopetitive (i.e., simultaneously cooperative and competitive) generation and modification of digital innovation (Furr & Shipilov, 2018). Although innovation ecosystems have become increasingly important, still little is known about their emergence or has only been analyzed from the perspectives of dominant actors who purposely attempt to create them (e.g., Dattée, Alexy, & Autio, 2018), which does not do justice to the complexity of innovation ecosystems (Lumineau & Oliveira, 2018). First, organizational actors in innovation ecosystems not always pursue the same goals and motives. While some organizational actors undoubtedly seek to orchestrate the innovation ecosystems (Dattée et al., 2018; Paquin & Howard-Grenville, 2013), others pursue common (i.e., cooperate) and individual (i.e., compete) goals at the same or various times (Hannah & Eisenhardt, 2018). Second, innovation agency in innovation ecosystems is distributed among all organizational actors. However, little is known about the distribution and redistribution of innovation agency to organizational actors with different goals, motives and abilities (Nambisan et al., 2017). Third, innovation ecosystems aim at materializing coherent and customer-oriented innovations through ongoing cooperation of all involved organizational actors (Adner, 2006, 2017; Adner & Kapoor, 2010), which blurs the line between the innovation process and its outcome (Nambisan et al., 2017). Understanding how central organizational actors create innovation ecosystems and how and why such innovation ecosystems progress in their emergence over time and through the interplay of all involved organizational actors that pursue both common and own goals is paramount. The third study of this dissertation addresses these questions by means of a longitudinal single-case study on an emerging innovation ecosystem (Yin, 2009). Our results indicate that an innovation ecosystem progresses to emerge in three different phases, from the creation, to the adaptation (i.e., refinement and stabilization), and finally toward the exploitation of the basic structure and procedures. More particularly, central organizational actors can create the basic structure and procedures of an innovation ecosystem. However, for an innovation ecosystem to progress in its emergence, central organizational actors need to stabilize the basic structure, while all other organizational actors need to help refine the basic procedures. The better adapted the structure and the processes, the better organizational actors can exploit them to materialize coherent and customer-oriented digital innovation.

Table 1: Overview of the Studies

	Study 1:	Study 2:	Study 3:
<i>Title</i>	Power Dynamics in Software Platform Ecosystems	Complementor Dedication to Software Platforms: Rule Adequacy and the Moderating Role of Flexible and Benevolent Practices	Emerging Innovation Ecosystems: The Critical Role of Distributed Innovation Agency
<i>Research Question</i>	How does power manifest in platform ecosystems, how and why does power change over time, and how do such power dynamics feed into the continued thriving of platform owner–complementor partnerships?	How does the interplay between designing rules and how these rules are practiced influence complementor dedication to a platform?	How do central organizational actors create innovation ecosystems and how and why such innovation ecosystems progress in their emergence over time and through the interplay of all involved organizational actors that pursue both common and own goals?
<i>Method</i>	Qualitative Theory-building	Quantitative Theory-testing	Qualitative Theory-building
<i>Data Sources</i>	<ul style="list-style-type: none"> - 24 Semi-structured Interviews - Extensive Secondary Data 	<ul style="list-style-type: none"> - 181 Complete Surveys 	<ul style="list-style-type: none"> - 34 Semi-structured Interviews - Observational Data - Extensive Secondary Data
<i>Major Results</i>	<ul style="list-style-type: none"> - Power in platform ecosystems evolves through a reciprocal process shaped by both the powerful platform owner and the seemingly powerless complementors. - Platform partnerships only thrive if platform owners and complementors are mutually responsive to each other. 	<ul style="list-style-type: none"> - To strengthen complementor dedication, governance design should not exclusively strive for standardization but remain sensitive to complementor needs. - To maximize complementor dedication, rules need to be practiced situationally in both a flexible and a benevolent way. 	<ul style="list-style-type: none"> - Innovation ecosystems progresses to emerge in three phases, from the creation, over the adaptation (i.e., refinement and stabilization), toward the exploitation of the basic structure and procedures. - The better the structure and procedures, the more progressed the emergent innovation ecosystem.
<i>Previous Versions & Publication Status</i>	<ul style="list-style-type: none"> - European Conference on IS (ECIS) 2014 - Doctoral Consortium of the Swiss Chapter of the Association for IS (CHAIS DC) 2014 - Currently under review (VHB A) 	<ul style="list-style-type: none"> - Organizations and Society in IS Workshop (OASIS) 2014 - Currently under review (VHB A) 	<ul style="list-style-type: none"> - International Conference on IS (ICIS) 2015 (VHB A) - CHAIS DC 2016 - Global Sourcing Workshop (GSW) 2015, 2017, and 2018 - To be submitted (VHB A+)

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