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From Product Platform Ecosystem to Innovation Platform Ecosystem: An Institutional Perspective on the Governance of Ecosystem Transformations

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Abstract[1]: Incumbent companies across industries such as banking, insurance, and enterprise software have begun transforming their existing product platform ecosystems into innovation platforms ecosystems to increase generativity in their ecosystems. Such ecosystem transformations not only entail technological challenges as the underlying platform technology changes, but also organizational challenges as ecosystem actors such as partners and customers need to become part of the transformed ecosystem. To study how incumbent companies can govern ecosystem transformations successfully, we interpret ecosystems as organizational fields and ecosystem transformations as changes to the fields' institutional infrastructure. Based on a multi-year, grounded theory study of the transformation of SAP's on-premises ERP system, we first identify institutionalization challenges that arise when institutional infrastructure is changed during an ecosystem transformation. We then show how field-level governance mechanisms address these challenges and how the new institutional infrastructure gains legitimacy among ecosystem actors, ultimately leading to the institutionalization of the transformed ecosystem. These findings contribute to the literature on ecosystem transformations and platform governance by highlighting the role that institutional forces play in ecosystem transformations. Furthermore, we add to the literature on institutional theory by providing insights into the dynamics of institutional infrastructure as it becomes infused with digital technologies.

Keywords: Product platform; innovation platform; digital platform; ecosystem transformation; platform governance; grounded theory methodology; institutional theory; enterprise software

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1 Introduction

An increasing number of incumbent companies across industries such as banking, insurance, and enterprise software rely on digital technologies to transform their established ecosystems of partners, suppliers, consultants, and customers to become more innovative (Sandberg et al., 2020; Svahn et al., 2017). Their established ecosystems were built around product platforms such as core banking and insurance systems, and packaged enterprise resource planning (ERP) systems. These product platforms were suited to efficiently develop derivative products enhanced by extensions from selected partners (Meyer et al., 1997; Gawer et al., 2014), but they limited innovativeness in the ecosystem as they have grown increasingly complex.

Therefore, many incumbent companies have begun to transform established product platform ecosystems by opening them to loosely-coupled complementors (Cusumano et al., 2019; Constantinides et al., 2018). This change allows incumbent companies to generate innovation with complementors in the periphery of the ecosystem. To do so, they make the interfaces of the product platforms broadly available to complementors, turning their product platforms into innovation platforms (Gawer, 2020; Yoffie et al., 2019). Building on digital technologies such as application programming interfaces (APIs) and cloud computing, the innovation platforms serve as foundations upon which a larger number of complementors can develop complementary innovations (Gawer, 2020).[2] This transformation also helps incumbents to respond to the threat of innovative digital natives in their industry—such as fintech startups in the banking industry and software-as-a-service startups in the enterprise software industry.

However, the transformation of product platform ecosystems into innovation platform ecosystems has proven to be a huge challenge for incumbent companies (Sandberg et al., 2020;

[2] In information systems (IS) literature, innovation platforms are often referred to as digital platforms because of the important role of digital technology for the scalability of these platforms (Constantinides et al., 2018; Karhu et al., 2018; Hein et al., 2019). However, product platforms can also be of digital nature, for example in the banking, insurance, and enterprise software industries. For disambiguation we therefore use the term innovation platform (Thomas et al., 2014b; Gawer, 2014). We thank one of the anonymous reviewers for highlighting this issue.

Lindgren et al., 2015; Svahn et al., 2017), leading to numerous failed attempts (Yoffie et al., 2019). Besides addressing the technical challenges of developing a new platform, incumbent companies face the organizational challenges of making sure that their partners and customers become part of the transformed ecosystem. In the IS literature, the organizational challenges related to the transformation of established ecosystems have rarely been addressed (cf. De Reuver et al., 2018; Wang, 2021; Altman et al., 2020), with few notable exceptions (Sandberg et al., 2020; Svahn et al., 2017).

To study the transformation from product platform ecosystem to innovation platform ecosystem, we adopt an institutional perspective and interpret ecosystems as organization fields (Oppong-Tawiah et al., 2016; Thomas et al., 2014a). Following this perspective, ecosystems build on institutional infrastructure that provides structure and governance arrangements in the organizational field (Hinings et al., 2011; Greenwood et al., 2011). Ecosystem transformations thus represent a change of the institutional infrastructure. Such changes trigger institutionalization challenges along the three institutional pillars (regulatory, normative, cultural-cognitive; DiMaggio et al., 1983) and ecosystem orchestrators can address these challenges with field-level governance mechanisms (Frenken et al., 2020; Hinings et al., 2011). However, specific insights into institutionalization challenges and governance during ecosystem transformations have not yet been discussed in the literature on institutional theory. We thus pose the following research question: *How can an ecosystem orchestrator address institutionalization challenges when transforming a product platform ecosystem into an innovation platform ecosystem?*

To answer this question, we conducted a multi-year grounded theory study analyzing the transformation of SAP's on-premises ERP ecosystem (i.e., a product platform ecosystem) into an ecosystem built on a new cloud platform (i.e., an innovation platform ecosystem). We chose

the enterprise software industry as the context for this study because while incumbent enterprise software vendors such as SAP and Oracle have established ecosystems around their on-premises ERP systems over several decades, they have faced increasing pressure from digital-native newcomers such as Salesforce, Workday, and ServiceNow to transform these ecosystems. Transforming long-established product platform ecosystems is particularly challenging, and observing such transformations yields important insights that may potentially apply beyond the enterprise software industry.

We identified three institutionalization challenges along the institutional pillars that arose as SAP triggered the transformation of its product platform ecosystem: (1) rebalancing top-down control and bottom-up emergence (regulatory pillar), (2) reprofessionalizing ecosystem actors (normative pillar), and (3) redefining the organizing vision of the ecosystem. We then identify the field-level governance mechanisms that SAP applied to address these challenges and show how the new institutional infrastructure gained legitimacy among SAP's partners and customers, ultimately leading to the successful institutionalization of the transformed ecosystem.

Based on these findings, we develop a process model of ecosystem transformation that links institutionalization challenges and field-level governance mechanisms to the successful institutionalization of the transformed ecosystem. We contribute to the literature on ecosystem transformation by showing that a transformed ecosystem needs to become institutionalized, a process that can be supported by the ecosystem orchestrator through governance mechanisms. We add to the literature on platform governance by showing that governing an ecosystem transformation is different from governing the launch of an ecosystem on the green field. Finally, the model enriches the literature on institutional theory by providing insights into the dynamics of institutional infrastructure as it becomes infused with digital technologies.

2 Theoretical Foundations

To build a theoretical pre-understanding of ecosystem transformations from product platform ecosystem to innovation platform ecosystem, we first define and delineate the concepts of a product platform ecosystem and an innovation platform ecosystem. Second, we introduce institutional theory as a lens on ecosystem transformation and summarize previous work on ecosystem transformation in IS. The institutional theory emerged as a helpful lens for sense-making during the data analysis phase of our case study of SAP; for better readability, we describe institutional theory upfront (cf. Urquhart et al., 2013).

2.1 Product Platform Ecosystems and Innovation Platforms Ecosystems

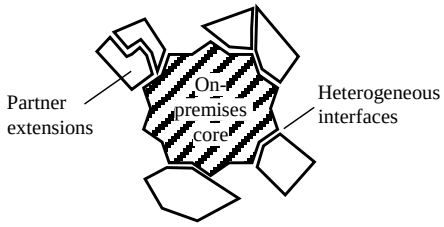
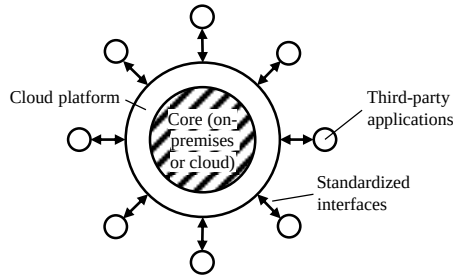
In the IS literature, the term platform ecosystem broadly refers to a set of companies that co-create value on a digital platform (De Reuver et al., 2018; Ceccagnoli et al., 2012; Gawer et al., 2008). Typically, one company owns the digital platform and acts as ecosystem orchestrator, while two other groups of actors interact on the platform: Complementors (also referred to as third-party developers) build applications that are complementary to the platform and are connected to the platform through interfaces, and customers buy and use these applications (Tiwana, 2014; Baldwin et al., 2009).

Platform ecosystems are characterized by their underlying digital infrastructure, that is the platform and its components (Eisenmann et al., 2009), the technology standards that define how different components interact (Eisenmann et al., 2009; Evans et al., 2006), and the business rules that orchestrate the ecosystem actors, often also referred to as platform governance (Eisenmann et al., 2009; Tiwana, 2014). These business rules include rules on which actors can join the platform ecosystem, requirements their applications must fulfill, and revenue sharing between the ecosystem orchestrator and ecosystem actors (Tiwana, 2014; Ghazawneh et al., 2013). Depending on how ecosystem orchestrators implement the digital

infrastructure, technology standards, and business rules, different types of platform ecosystems emerge (cf. Gawer, 2014; Thomas et al., 2014b).

Drawing on the literature on platform ecosystems, we establish product platform ecosystems and innovation platform ecosystems as two distinct types of platform ecosystems (Table 1). These two types have become particularly visible in the enterprise software industry which has seen the emergence of product platform ecosystems in the 1990s (Kumar et al., 2000) and a shift towards innovation platform ecosystems with the rise of cloud computing technologies since the 2000s (Nieuwenhuis et al., 2018). We, therefore, illustrate the platform ecosystem types with examples from the enterprise software industry.

Table 1. Product Platform Ecosystems and Innovation Platform Ecosystems

	Product platform ecosystems	**Innovation platform ecosystems**
Illustration of platform architecture		
Digital infrastructure	▪ An on-premises core that represents a product platform, i.e., a modularized software product that can be enhanced by partner extensions to create customized products	▪ A cloud platform that represents an innovation platform, i.e., a platform that serves as a technological foundation for decoupled third-party applications. ▪ The cloud platform builds on a core that can be deployed on-premises or in the cloud
Technology standards	▪ Heterogeneous interfaces with little standardization, using proprietary technology	▪ Standardized application programming interfaces (APIs) using established industry standards
Business rules	▪ Orchestrator restricts access for partners and the scope of their extensions ▪ Orchestrator sells packages of the core product and partner extensions; revenue sharing according to individual contracts	▪ Third-party developers are free to join and to choose the scope of their application ▪ Third-party developers sell applications through a marketplace with standardized rates for revenue sharing
Literature	Meyer et al. (1997, p. 206ff.); Sprott (2000); Gawer et al. (2014); Iansiti et al. (2009); Møller (2005); Ceccagnoli et al. (2012); Swanson et al. (2005); Sarker et al. (2012)	Tiwana (2014); Gawer (2020); Gawer et al. (2014); Parker et al. (2018); Kuk et al. (2013); Eaton (2012)
Examples	SAP R3, Oracle E-Business Suite, JD Edwards EnterpriseOne	▪ Incumbent companies: SAP Cloud Platform, Oracle Cloud Platform ▪ Newcomers: Salesforce Platform, NOW Platform by ServiceNow

Product platform ecosystems build on an on-premises software core as underlying digital infrastructure. This core represents a product platform, that is, a modularized software product that can be enhanced by partner extensions to create a more customized product (Meyer et al., 1997; cf. Gawer et al., 2014). The core and partner extensions can be bundled to address the needs of niche markets and individual customers (Kumar et al., 2000; Staehr et al., 2012). Interfaces between the core and extensions are heterogeneous with little standardization and build on mostly proprietary technologies (Sprott, 2000; Sarker et al., 2012). As a result, partner extensions also have to be implemented based on the ecosystem orchestrators' proprietary technologies (Sprott, 2000).

Concerning business rules, the ecosystem orchestrator restricts both the access of partners (through its partner programs; Ceccagnoli et al., 2012) and the scope of partner extensions based on its own goals for the product platform ecosystem (Iansiti et al., 2009; Møller, 2005). The ecosystem orchestrator then sells packages of the core product and partner extensions through its sales force and shares revenue according to individual contracts with partners (Swanson et al., 2005; Sarker et al., 2012). Examples for product platform ecosystems include SAP's R/3 and Oracle's E-Business Suite which are also referred to as packaged ERP systems. Both companies established large ecosystems of partners that added extensions to their core ERP system and offered to consult on the implementation and customization of ERP systems.

The digital infrastructure of an **innovation platform ecosystem** is an innovation platform, that is, a platform that serves as a technological foundation for decoupled third-party applications (Gawer, 2020; Gawer et al., 2014). Thereby, the innovation platform is typically based on cloud computing technologies but it might connect to an underlying software core that can be deployed both on-premises or in the cloud. The third-party applications are connected to the platform through standardized application programming interfaces (APIs) using established

industry standards such as REST API (Tiwana, 2014). Given that the third-party applications are decoupled from the core platform, they do not need to build on the ecosystem orchestrator's proprietary technology stack. Business rules in innovation platform ecosystems establish a high degree of openness towards third-party developers to foster participation and generativity (Tiwana, 2014; Kuk et al., 2013) and do not limit the scope and technology of their application, within certain boundaries (Parker et al., 2018). Third-party developers sell applications through a marketplace with standardized rates for revenue sharing (Tiwana, 2014). Examples for innovation platform ecosystems in the enterprise software industry include market newcomers such as Salesforce (for customer relationship management) and ServiceNow (for workflow management). In response, incumbent companies, such as SAP with its SAP Cloud Platform and Oracle with its Oracle Cloud Platform, have introduced innovation platform ecosystems by transforming the ecosystems established on-premises ERP product platforms (Kumar et al., 2000; Ng et al., 2010).

2.2 An Institutional Theory Lens on Ecosystem Transformations

The transformation from product platform ecosystems to innovation platform ecosystems has been particularly visible in the enterprise software industry but spans across industries such as banking, insurance, and manufacturing (Sebastian et al., 2017; Choudary, 2021; Sandberg et al., 2020). Such ecosystem transformations are challenging because they not only require the implementation of novel technologies, they also require ecosystem actors such as partners and customers—who are involved in a network of complex interactions (Tanriverdi et al., 2017)—to adapt to the transformed ecosystem (cf. Sandberg et al., 2020). Consequently, many ecosystem transformations fail (Reeves et al., 2019; Yoffie et al., 2019). To identify the reasons for failure and provide guidance for companies, a better understanding of ecosystem transformations is indispensable.

We propose to use institutional theory to shed light on the challenges of ecosystem transformations and how they can be addressed. In institutional theory, organizations are viewed as social phenomena rather than just as functional structured (Tolbert et al., 1999). Organizations strive for legitimacy, which they gain by being perceived as in consonance with important rules, norms, and beliefs by relevant actors in their environment (Scott, 2014; Suchman, 1995). Organizations can be considered as embedded in an organizational field—that is, their environment (Zucker, 1987). Organizational fields build on institutional infrastructure, which "bind a field together and govern field interactions" (Hinings et al., 2011, p. 170; see also Greenwood et al., 2011). The field-level governance thereby builds on normative, cognitive, and regulatory forces, which are also referred to as the three institutional pillars (Hinings et al., 2011; cf. Scott, 2014; Jennings et al., 2003; DiMaggio et al., 1983).

Recent work both on institutional theory and on platform ecosystems suggests that ecosystems can be interpreted as organizational fields (Thomas et al., 2014b; Lindgren et al., 2015; Oppong-Tawiah et al., 2016; Altman et al., 2020; Greenwood et al., 2011) and that digital platforms act as institutional infrastructure in these ecosystems (Hinings et al., 2018). In ecosystems, a set of organizations, or ecosystem actors, interacts within a commonly recognized area. A digital platform as an institutional infrastructure enables, constrains, and coordinates the ecosystem actors and is used by the ecosystem orchestrator to govern the ecosystem actors (Hinings et al., 2018).

Thus, an ecosystem transformation—such as a transformation from product platform ecosystem to innovation platform ecosystem—represents a change of the ecosystem's institutional infrastructure (Hinings et al., 2011). For the transformation to be successful, the transformed ecosystem must be recognized by the ecosystem actors as the new organizational field that they see themselves as being part of, in other words, the transformed ecosystem must

become institutionalized. It has been shown that actors can change institutional infrastructure depending on their position in an organizational field (Battilana, 2006) but that these changes create institutionalization challenges (Frenken et al., 2020; Hinings et al., 2011)—for example, SAP as an ecosystem orchestrator can transform the product platform ecosystem into an innovation platform ecosystem but institutionalization challenges arise as partners and customers react to the transformation.

Given that field governance builds on normative, cognitive, and regulatory forces, we suggest that institutionalization challenges and the governance to address them can be structured along these three pillars of institutional theory (cf. Oppong-Tawiah et al., 2016; Haki et al., 2020).

The regulatory pillar refers to coercive top-down pressures, both formal and informal, that organizations or regulators can exert on other organizations. It also includes pressure created by expectations of the society in which the organization is located (DiMaggio et al., 1983, p. 150; Mignerat et al., 2009). In ecosystems, the regulatory pillar mainly comprises standardization of the core technology underlying the ecosystem, which restricts actors who develop or use applications in the ecosystem (Oppong-Tawiah et al., 2016; Haki et al., 2020). During ecosystem transformation, the digital institutional infrastructure's standard-setting technologies change, resulting in institutionalization challenges related to adapting existing and implementing new mechanisms of enforcement (Greenwood et al., 2011; Trank et al., 2009; Haki, 2021).

The normative pillar is based on the professionalization of organizational actors, which refers to their "collective struggle" to find a common cognitive base and legitimacy for their activities in their network (DiMaggio et al., 1983, p. 152; Mignerat et al., 2009). In ecosystems, the normative pillar includes design rules, norms, and values to coordinate how ecosystem actors interact. As orchestrators transform their ecosystem, these rules, norms, and values change, and

ecosystem actors must re-professionalize to be a part of the transformed ecosystems. Emerging institutionalization challenges are therefore related to how the orchestrator can facilitate the reprofessionalization of ecosystem actors.

The cultural-cognitive pillar builds on the uncertainty that organizational actors face. As a reaction to uncertainty, organizational actors tend to mimic other actors, contributing to a movement of isomorphism (DiMaggio et al., 1983, p. 151; Mignerat et al., 2009). In ecosystems, the cultural-cognitive pillar refers to actors imitating the successful behavior of other actors with regard to developing, using, and maintaining applications in the ecosystem (Oppong-Tawiah et al., 2016; Haki et al., 2020). During ecosystem transformations, it becomes more difficult for ecosystem actors to identify successful actors they could mimic. An organizing vision on the ecosystem level could guide the movements of isomorphism, but especially in a dynamically changing environment, establishing an organizing vision becomes an institutionalization challenge (Swanson et al., 1997).

Work on ecosystem transformation in the IS literature is limited because studies either focus on ecosystems that have already been established or assume that ecosystems are created on a green field (Altman et al., 2020). However, several recent studies of ecosystem transformations point to institutionalization challenges during ecosystem transformation (Table 2).

Table 2. IS Literature on Ecosystem Transformations

Ecosystem transformation	Key challenge related to the transformation	Relevant pillars of institutional theory	Reference
A road administration agency transforms its ecosystem through the introduction of a digital traffic information service	Identity tension between the old inherited and the new identity of the ecosystem orchestrator	Normative and cultural-cognitive	Lindgren et al. (2015)
A car manufacturer transforms its ecosystem through the introduction of a connected car initiative	Competing concerns related to capability, focus, collaboration, and governance	Regulatory and normative	Svahn et al. (2017)
An electrical equipment manufacturer transforms its ecosystem through the digitization of its automation product platform	Increasing complexity of the interactions in the ecosystem drive a shift in the orchestrator's organizing logic	Regulatory and normative	Sandberg et al. (2020)

The work by Lindgren et al. (2015) has shown that an identity tension arose as a road administration agency transformed its ecosystem through the introduction of a digital traffic information service. The identity tension relates to the normative and the cultural-cognitive pillar of institutional theory because it refers to the ecosystem orchestrator searching for the legitimacy of its new identity and facing uncertainty about internal resistance and relationships with external actors. The competing concerns that Svahn et al. (2017) have identified during a car manufacturers ecosystem transformation relate to the regulatory and the normative pillar of institutional theory. Along the regulatory pillar, the car manufacturer must balance control and flexibility when generating innovation with external actors. Along the normative pillar, the car manufacturer must establish norms for collaboration with internal and external actors simultaneously. In a case study on an electrical equipment manufacturer that digitized an automation product platform, Sandberg et al. (2020) have highlighted that the increasing complexity of the interactions in the ecosystem drives a shift in the orchestrator's organizing logic. Along the regulatory and normative pillar of institutional theory, the orchestrator redefined interaction rules, decentralized design control, and opened the platform towards external stimuli.

In sum, taking on an institutional theory perspective on ecosystem transformation, we propose that ecosystem transformations represent changes of institutional infrastructure that create institutionalization challenges along the three pillars of institutional theory. While existing work in IS points to such challenges, a systematic approach to capture institutionalization challenges and how they can be addressed through governance is missing. This understanding is crucial because it helps to understand how the transformed ecosystem can become institutionalized, making the transformation successful. We thus take on an empirical study that focuses on how institutionalization challenges unfold and are addressed by the ecosystem orchestrator.

3 Empirical Approach

To shed light on the transformation of a product platform ecosystem into an innovation platform ecosystem, we conducted a multi-year grounded theory study on the transformation of SAP's on-premises ERP system (Glaser et al., 1967; Wiesche et al., 2017; Sarker et al., 2018). SAP is one of the most successful vendors in the enterprise software industry as its software is used by 92% of Forbes Global 2000 companies and by many small- and medium-sized companies (SAP SE, 2018b). Its third-generation ERP system (SAP R/3, launched in 1992) has become the de facto standard for corporate ERP from the 1990s onward.

Following the engaged scholarship paradigm (Van de Ven, 2007), our research was motivated by a real challenge that we observed at SAP through exchange with key informants: SAP introduced an innovation platform (the cloud platform) to transform its product platform ecosystem, which had formed around its on-premises ERP system. However, in its early years, the cloud platform struggled to attract partners and customers, illustrating the institutionalization challenges involved in transforming an established ecosystem.

The transformation of an established ecosystem is a recent phenomenon in the enterprise software industry that is dynamically evolving. It is therefore advisable to study this phenomenon in its context with an iterative interplay of data collection and analysis (Seidel et al., 2013; Urquhart, 2013). Our study focuses on seven years, beginning with the announcement of SAP's cloud platform in 2012, and includes retrospective data collection. This longitudinal perspective helped us understand the ecosystem transformation and the ongoing interplay between SAP as an ecosystem orchestrator and its partners and customers as ecosystem actors.

3.1 Data Collection

We followed grounded theory methodology procedures for data collection and analysis (Urquhart, 2013; Wiesche et al., 2017; Corbin et al., 1990). We conducted 66 interviews with an average length of 58 minutes in three series between early 2016 and mid-2019 following guidelines for semi-structured interviews (Spradley, 1979) and selecting interview partners based on theoretical sampling considerations (Walsham, 1995). The first two series included most of the interviews (27 interviews from early 2016 to early 2017 and 34 interviews from late 2017 to late 2018), while the last series included five interviews in the first half of 2019. The first series focused on the introduction and evolution of SAP's cloud platform and mainly included interviews with SAP employees, along with a few partners involved in the platform project. Given that the implications for partners were an important part of the interviews, we conducted a second interview series focusing on partners. Both SAP employees and partners described implications for their customers in detail, which we triangulated with several interviews with customers as part of the second and third interview series. In sum, 29 interviews were with SAP employees, 32 with partners, and 5 with customers. We stopped interviewing when all co-authors agreed on theoretical saturation regarding our understanding of the ecosystem transformation.

All interviews except for two were recorded and transcribed, resulting in 823 pages of transcripts[3]. For the interviews that were not recorded, we composed detailed memos during and immediately following the interviews. The interview questions covered the history of the cloud platform project, the interaction between SAP, partners, and customers, the projects that partners and customers implemented on the platform, and the interviewees' assessment of the cloud platform. While the interviews took place from 2016 to 2019, we were able to capture the evolution of the platform project since its launch in 2012 through the interviewees' retrospective (Langley, 1999).

In addition to the interview data, we gathered secondary data. Secondary data covered internal documents, such as presentations and meeting minutes, and publicly available documents, such as business reports and blog posts. The blog posts were collected by regularly crawling blogs from SAP bloggers and popular tech blogs based on keywords such as "SAP" and "SAP cloud platform." Overall, the secondary data included 172 documents, 2.5 hours of video, and 155 blog posts.

3.2 Data Analysis

To analyze the case data, we first constructed a timeline of the cloud platform's evolution based on important events (Langley et al., 2013; Yin, 2014). For this timeline, we relied mostly on secondary data such as SAP's press releases and blog posts. We validated the timeline with insights from the interviews. The timeline helped us trace the ecosystem transformation, from a product platform ecosystem based on SAP's on-premises ERP system to an innovation platform ecosystem based on SAP's cloud platform.

[3] 52 interviews were conducted in German, 14 interviews in English. Quotes taken from interviews conducted in German were translated.

Then, we applied coding procedures from grounded theory methodology to the interview transcripts and to those parts of the secondary data that we identified as providing insights into the transformation (Wiesche et al., 2017; Corbin et al., 1990; Strauss et al., 1990). We followed the guidelines by Seidel et al. (2013) for a rigorous application of the Strauss & Corbin approach to coding (see Table A1 in the Appendix for a summary of how we followed these guidelines). Our goal was to understand how the ecosystem transformation unfolded and how the actors involved in the ecosystem—SAP, partners, and customers—interacted.

As a first step, we applied open coding and created 336 codes associated with 413 quotes. Then, we engaged in axial coding to identify categories of open codes and integrate our findings with theory. Institutional theory (Tolbert et al., 1999; Zucker, 1987; DiMaggio et al., 1983) emerged as a helpful theoretical lens to trace and make sense of the interplay of the different actors in the ecosystem (cf. Gregory et al., 2018; Levina et al., 2008; Klein et al., 1999). We built on the three institutional pillars (regulatory, normative, cultural-cognitive) as a scaffolding for our analysis (Strauss et al., 1990) to make sense of our data on the institutionalization challenges that SAP faced, how SAP addressed these challenges through field-level governance, and how partners and customers reacted. To avoid forcing the scaffolding onto our data, we established the scaffolding only after several rounds of data analysis (cf. Sarker et al., 2012; Strauss et al., 1990). Lastly, in the step of selective coding, we related the field-level governance mechanisms that SAP applied along the regulatory, normative, and cultural-cognitive pillars to legitimacy gains of the transformed institutional infrastructure. As a result of axial and selective coding, we constructed a process model that connects institutionalization challenges and field-level governance mechanisms applied by SAP to the legitimacy gains of the transformed ecosystem among ecosystem actors.

4 Findings

In this section, we first describe how SAP's ecosystem transformation from product platform ecosystem to innovation platform ecosystems can be viewed as a change of institutional infrastructure. We then show the institutionalization challenges that result from this change and how SAP addressed these challenges through field-level governance mechanisms. Finally, we provide indications for the successful institutionalization of the transformed ecosystem as the new institutional infrastructure gains legitimacy among ecosystem actors.

4.1 SAP's Ecosystem Transformation as Change of Institutional Infrastructure

With the introduction of its cloud platform, SAP began to transform the product platform ecosystem that had formed around its on-premises ERP system into an innovation platform ecosystem based on its cloud platform. This transformation represents a change of institutional infrastructure (Hinings et al., 2011; Hinings et al., 2018).

The on-premises ERP system, SAP R/3, was a modular or packaged ERP system in the form of a product platform (Thomas et al., 2014b; Gawer, 2014). While the core of that ERP system was designed to cover the standard processes of manufacturing companies, it could be bundled with various modules to create derivatives for different industries. Customers with specific requirements or those from niche industries customized these derivatives further with extensions developed on their own or by associated implementation partners. For example, partners could offer an extension to help customers comply with country-specific tax regulations or to help companies document a continuous cold chain throughout the logistics processes. These extensions were typically developed with SAP's proprietary programming language ABAP[4] and interacted directly with the core ERP system. However, the extensibility led to increasingly complex installations at customer sites that comprised the ERP system and

[4] ABAP stands for „Advanced Business Application Programming" (formerly "Allgemeiner Berichtsaufbereitungsprozessor") and is remotely similar to COBOL.

deeply intertwined extension. As a result, the costs of maintaining and upgrading the ERP system, both on the vendor and customer sides (Ng et al., 2010; Glass et al., 1999) increased. Furthermore, the increasing complexity hampered innovation because customers became more reluctant to add additional features to the system.

To address these issues, SAP introduced a cloud platform in 2012 that enabled cloud-based applications as extensions to an ERP core that was still deployed on-premises. The cloud platform serves as an *"innovation layer"* on top of the *"slow-ticking"* core system, as one SAP product manager summarized. Thus, the cloud platform formed the basis for an innovation platform ecosystem.

From 2012 to 2019, SAP's cloud platform evolved from a small project driven by cloud computing enthusiasts within SAP to one of the central elements of SAP's overall business strategy, highlighting the success of SAP's platform strategy (Figure 1). After the official launch in 2013, SAP continuously expanded the scope of the cloud platform regarding underlying technologies (e.g., support for the open-source framework Cloud Foundry in 2014), and functionality (e.g., the launch of SAP HANA Cloud Platform for IoT in 2015). 2017 marked a major milestone with a rebranding of the platform and the launch of the SAP App Center, the central marketplaces for applications on the cloud platform. The platform's functionality was further expanded throughout 2018 and 2019.

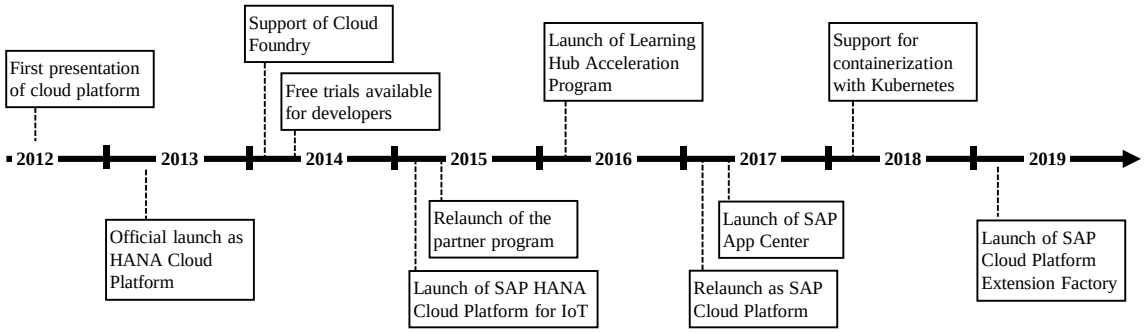


Figure 1. Timeline of SAP's Ecosystem Transformation

The transformation from product platform ecosystem to innovation platform ecosystem represented a change of institutional infrastructure. First, the underlying platform technology evolved, changing the structure of the ecosystem. The closely integrated ecosystem of partners that had formed around the on-premises ERP evolved into an ecosystem with loosely-coupled actors. This change was enabled by the cloud platform's standardized interface that decoupled the ERP core from the periphery of complementary applications. Second, SAP's approach to governing the ecosystem actors had to evolve as well as SAP no longer focused on close collaboration with selected partners but on loose collaboration with a larger number of partners.

4.2 Institutionalization Challenges

As SAP transformed its ecosystem by changing the underlying institutional infrastructure, it ran into institutionalization challenges. Institutional infrastructure includes governance arrangements along the regulatory, normative, and cultural-cognitive forces (Hinings et al., 2011; cf. Scott, 2014; Jennings et al., 2003; DiMaggio et al., 1983). A change of that institutional infrastructure can thus lead to institutionalization challenges along the three pillars (Table 3; see also Tables A1-A3 in the Appendix).

Table 3. Institutionalization Challenges during the Ecosystem Transformation

Institutionalization challenge		**Manifestations**
Regulatory	Rebalancing top-down control and bottom-up emergence	▪ Limited scalability and speed of top-down control processes ▪ For important business processes, control is seen as more important than innovation
Normative	Reprofessionalizing ecosystem actors	▪ Ecosystem actors hesitate to reprofessionalize due to a lack of resources and incentives ▪ Limited scalability of existing professionalization practices
Cultural-cognitive	Redefining the organizing vision of the ecosystem	▪ Long-established image of SAP as slow and inert with regard to innovation ▪ Uncertainty about the future of the cloud platform

Along the regulatory pillar, SAP faced the challenge to **rebalance top-down control and bottom-up emergence** in the ecosystem. The regulatory pillar entails governance by SAP to

lay out the rules of the game in the ecosystem including how SAP controlled the activities of other actors in the ecosystem and how much freedom SAP granted them.

Before the launch of its cloud platform, the regulatory pillar had been the key element of governance in SAP's product platform ecosystem. As the provider of the ecosystem's core—the ERP system—SAP controlled the access of partners to the ecosystem and defined requirements for extensions to the core. For example, SAP had assigned specific white spaces to partners that they could fill with extensions. With in-depth control processes, SAP ensured the quality of these extensions before selling them to customers through its own channels.

With the introduction of the cloud platform, SAP's ambition to establish a dynamic innovation platform ecosystem collided with the established approach of top-down control. The top-down approach did not provide the scalability and speed that would be required for an innovation platform ecosystem in which partners could generate a large number of applications:

> *[Quality control] is a massive effort. There is a big resource debate going on. On average we conduct about 65-75 qualifications of partner solutions a year. This year, I expect this number to go up to 90. On average, every qualification needs about one to two months. So, it is a highly manual and intense process that we try to automate but there is still a lot of manual testing. (Product manager certification, SAP)*

To add further complexity, many customers expected rigid control measures from SAP because they used the ERP software and its extensions for important business processes.

> *When you download an app on your smartphone, let's be honest, whether it works properly or not is not quite so crucial. But if a customer downloads a business application and uses it to control their processes or, as an extreme example, operates a nuclear power*

> *plant, then maybe that should work. Of course, this is always such a balancing act for SAP. (Program & partner manager, SAP)*

Thus, SAP had to find a new balance between top-down control to ensure quality and relaxing control to enable the bottom-up emergence of applications in the innovation platform ecosystem.

Along the normative pillar, SAP's challenge was to **reprofessionalize ecosystem actors**, that is, to create a common understanding of the ecosystem's goals and to enable ecosystem actors to achieve these goals. In its product platform ecosystem, SAP had established a large network of partners and customers who had become professionalized regarding SAP's on-premises ERP product portfolio. For these ecosystem actors, becoming part of the new innovation platform required reprofessionalization. However, many ecosystem actors initially were hesitant to reprofessionalize due to a lack of resources and incentives.

> *And [adopting the cloud platform] means you have a very high investment in your workforce, you have to make decisions in recruiting and employee development, not only training but employee development. At the same time, on the revenue side, there are first of all very big question marks. The revenues that do come, are usually not large in volume. Thus, you cannot assume over a relatively long period, that the whole thing is cost-covering for the time being. (Managing director sales, partner company)*

Furthermore, SAP's established practices to professionalize ecosystem actors were not scalable enough to support a large number of partners and customers in the innovation platform ecosystem. In the past, SAP had often invested significantly in supporting partners to develop high-quality extensions to SAP's on-premises ERP—such investment would not be possible when the number of partners would increase. Thus, to populate the innovation platform

ecosystem from its start, SAP had to develop alternatives as to how to reprofessionalize ecosystem actors efficiently.

The challenge related to the cultural-cognitive pillar was to **redefine the organizing vision of the ecosystem**. An organizing vision guides ecosystem actors who base their activities on their perception of the ecosystem and other actors in the ecosystem. The organizing vision of SAP's product platform ecosystem had to be redefined: Instead of focusing on SAP as the provider of a best-in-class ERP system extended by selected partner extensions, the redefined organizing vision put partners and customers more central as they should generate innovative applications in the transformed ecosystem.

However, redefining the organizing vision proved challenging. First, the redefined organizing vision was perceived as ambiguous by some partners and customers. Key elements of the redefined vision were contradicting advice SAP had given its partners and customers for years. For example, instead of advising customers to use the extensibility of SAP's ERP core system to represent every customer-specific detail in business processes, SAP had begun advocating for more standardized processes so that it was easier to use scalable applications from the cloud platform. Second, uncertainty about the future of the cloud platform limited the initial credibility of the redefined organizing vision:

> *I believe many [customers] still have fears or have not fully understood what you can do with [the cloud platform]. Should they play along? I can imagine that in some companies there is still resistance. They have built up on-premises landscapes for years and some may want to protect that, arguing that [the cloud platform] is uncertain; there is still much confusion. (Head of IT innovations, customer company)*

4.3 Field-Level Governance Mechanisms

To address the institutionalization challenges along the three institutional pillars, SAP applied field-level governance mechanisms (Table 4; see also Tables A4-A6 in the Appendix).

Table 4. Field-Level Governance Mechanisms in SAP's Ecosystem Transformation

Field-level governance mechanisms		**Manifestations**
Regulatory	Eased control of third-party applications	▪ Less strict control mechanisms than in the on-premises ecosystem ▪ Tools for self-service checks for partners and customers
	Standardization of third-party development processes	▪ Standard requirements for third-party development on the platform ▪ Implementation of processes close to standard
	Decoupling of core from periphery	▪ Cloud platform as decoupling layer between on-premises systems and cloud applications ▪ Enhanced API offering ▪ Virtualization and containerization
Normative	Technology-focused professionalization of partners	▪ Openness towards different programming languages ▪ Comprehensive development resources ▪ Possibilities for fast development and deployment ▪ Lower entry barrier for partner innovation ▪ Co-innovation projects with selected partners
	Individualized professionalization of customers	▪ Integration capabilities of the cloud ▪ Development resources adapted for the use by customers ▪ Support for employees' learning processes at customer companies
Cultural-cognitive	Proposing a new organizing vision	▪ Showcasing successful customer projects, partner projects, and joint projects ▪ Marketing campaign to adjust the image of SAP and the cloud platform ▪ Higher value services offered by SAP on the platform to enable innovative use cases
	Enhancing interaction among ecosystem actors	▪ Supporting joint partner projects ▪ Co-innovation projects between customers, partners, and SAP
	Reducing uncertainty among ecosystem actors	▪ Certification for partners to signal quality to risk-averse customers ▪ Leveraging SAP's image with regard to privacy and data protection

To rebalance top-down control and bottom-up emergence, SAP first **eased control of third-party applications.** With an increasing number of third-party applications, strict control in the form of manual checks of software code and user interfaces was no longer feasible. These lengthy and laborious control processes reduced the dynamic in the ecosystem because applications were available later and partners were discouraged from developing new applications. However, SAP still wanted to retain some control over the quality of third-party applications so as not to endanger the customers' trust in the platform. Over time, SAP

implemented less strict control mechanisms. For example, SAP provided tool support for a continuous delivery pipeline on the cloud platform, covering API usage and code checks:

> *We have already developed some tools [on the cloud platform] that check the requirements; we will carry out a code scan to determine whether it has also been developed according to the programming specifications. This is tool-based, the partner has direct access and can carry out the scan themselves. (Global Licensing Manager, SAP)*

The second governance mechanism SAP applied was to **standardize the third-party development processes**. Rather than focusing on the control of the outcome (the applications), SAP aimed at increasing standardization in the process of third-party development. To do this, SAP used the cloud platform to implicitly push partners and customers toward adhering to standards rather than explicitly enforcing adherence. While the cloud platform was open with regard to what partners and customers could develop, it was less open in terms of how they developed applications. The cloud platform's software development kit (SDK) provided libraries and blueprints for developers to, for example, implement recovery and backup features in a way that fulfilled SAP's requirements:

> *The great thing about [the cloud platform] is that it comes along with a lot of governance on its own because it enforces guidelines that you need to follow when you want to work with the platform properly. Thus, a lot of product standard requirements are automatically met when you develop on [the cloud platform] that you would have to pay attention to [when developing] in ABAP. If you use all the existing tools, you automatically get a lot for free: from monitoring to recovery to backup, everything is fully automated, you don't have to do much more. (Partner Manager, SAP)*

Thus, compared to the on-premises product platform, the cloud platform introduced guardrails for how developers could implement applications without limiting opportunities to come up with new, innovative applications.

Lastly, SAP implemented an effective regulatory mechanism by **decoupling the platform's core from the periphery of third-party applications**. SAP aimed to enable innovation by partners and customers on the platform without harming the core operations of customers. This also presented a major shift compared to the on-premises ERP system that typically had to be extended through extensions that interacted directly with the core. One interview partner summarized:

> *Overall, [decoupling] is the only way to be successful at all in a large system with a large outside ecosystem. This decoupling is the absolute prerequisite for it to scale, and I believe that the pressure is now so high that we have no choice but to succeed. We cannot say goodbye to partners and the ecosystem. (Products and Innovation Development, SAP)*

SAP used its cloud platform to enable such a strict between the core ERP functionality and any third-party application. To do so, SAP maintained and continuously expanded an extensive API offering. The decoupling was further supported by a microservice architecture that was introduced along with technologies such as virtualization and containerization that allowed for the encapsulation and orchestration of microservices.

Along the normative pillar, SAP addressed the challenge to reprofessionalize ecosystem actors with two governance mechanisms. On the one hand, SAP **supported the technology-focused professionalization of partners.** Intending to enable partners to join the transformed ecosystem, SAP supported them as they familiarized themselves with the cloud platform. First, SAP needed to accommodate the different technology expertise of their partners. SAP gradually increased technology choices for partners on the platform—for example, by offering

more options for programming languages and frameworks, beyond SAPs proprietary programming language ABAP. The first step was to allow Java applications:

> *These partners can develop extensions, and not only on-premises; there are enough expansion mechanisms based on ABAP, but also in the cloud and preferably in the programming language they understand. Java is simply the language that most people understand, outside of SAP at least, and this makes it easier to have partners. (Chief Architect Cloud Platform, SAP)*

SAP provided a growing amount of resources for partners to support their application development on the cloud platform. In September 2014, SAP introduced an SDK for applications that interact with the core EPR suite. The SDK was particularly praised because it offered comprehensive development tools that covered the whole delivery pipeline. Furthermore, SAP increased the technological openness of the platform and boundary resources to speed up the development and deployment of partner applications, reduced the entry barrier for partners by offering free trial accounts as part of its partner program, and collaborated with selected partners in co-innovation programs that were organized in several labs across the globe.

On the other hand, SAP **supported the individualized professionalization of customers.** Besides partners, customers were an important group of ecosystem actors that needed to make sense of the cloud platform as the new technological core of the ecosystem. Customers could not only use partner applications that were available on the platform but could also build their own applications, specific to their needs. SAP supported customers in this process by better integrating the cloud platform with the customers' diverse legacy IT landscapes, by providing resources dedicated to customers, and by supporting the customers' employees in their learning

processes with regard to the cloud platform. The more important a customer was, the more SAP would individualize these mechanisms.

To better integrate the cloud platform with the IT landscapes at customer companies, SAP first introduced compatibility with different cloud infrastructure providers. At SAP's SAPPHIRE NOW conference for customers and partners in May 2017, SAP announced the compatibility of the cloud platform with the Google Cloud Platform, in addition to Microsoft Azure and Amazon Web Services:

> *Now, enterprises around the globe often make strategic decisions about which hyperscale provider AWS [Amazon Web Services], [Microsoft] Azure, Google Cloud Platform they use for certain workloads. Many customers have actually asked us to extend their SAP Cloud Platform solutions next to those workloads in the public clouds. And we got that message and we went generally available on AWS and beta on Azure in May this year. Today, I am thrilled to announce SAP Cloud Platform on Google Cloud Platform as a public beta. (Björn Goerke, CTO of SAP and President of SAP Cloud Platform at TechEd 2017 in Las Vegas)*

In another step to improve integration with customers' IT landscapes, SAP introduced open connectors in June 2018. These connectors made it possible to link cloud platform applications with third-party software already being used by customers (e.g., SharePoint, Dropbox, Slack). With these integration services, it became easier for customers to develop an application on the cloud platform that integrated with their current IT landscape.

Furthermore, SAP adapted development resources already provided for partners for the use by customers. Compared to partners, customers expected more ease of use from development tools and more support from SAP in case they had any issues. Thus, SAP enhanced its resources dedicated to the support of customers, especially for important customers. To reach smaller

customers, SAP implemented scalable resources such as blueprints, that is, descriptions of customer use cases that other customers could use to develop their own applications. Lastly, SAP also supported the learning processes of individual employees at customer companies. Courses in SAP's free online training on the cloud platform were significantly expanded, covering introductory courses and more specific elements such as API management.

Regarding the cultural-cognitive pillar, SAP had to redefine the organizing vision of the ecosystem. To do so, SAP first **proposed a new organizing vision for the innovation platform ecosystem**. SAP launched a huge marketing campaign building on the term "Intelligent Enterprise" to introduce the new vision. With that campaign, SAP highlighted that customers need to embrace their innovative potential to remain successful:

> *According to Helen Dwight, global vice president, head of Intelligent Enterprise and Industries Marketing at SAP, innovation is what sets intelligent enterprises apart as the highest-performing businesses. "Intelligent enterprises are able to rapidly adapt to market conditions, whether that's driving new business models or pivoting rapidly, or scaling up or down as we've seen so many companies do in recent months," said Dwight. "More importantly, they're able to drive customer success for ultimately profitable and sustainable growth as a result." (Susan Galer, Brand Contributor SAP, at forbes.com; Galer, 2020)*

Furthermore, SAP showcased successful customer projects, partner projects, and joint projects to show what the cloud platform could be used for. These success stories inspired other partners and customers to move to the transformed ecosystem. For example, at a partner event with more than 100 participants in May 2018, partners that had already implemented applications on the cloud platform presented their solutions in small groups. The participants rotated through the groups and were inspired by dozens of different partner solutions.

SAP also offered an increasing number of higher-value services to support partners and customers in creating innovative solutions on the cloud platform. For example, in March 2017, SAP launched SAP Leonardo IoT services, a set of services such as analytics and machine learning targeted at industrial Internet of Things applications. These features could be leveraged by partners and customers to address specific business problems with applications on the cloud platform. Other higher-value services introduced by SAP covered big data processing, advanced analytics tools, and blockchain-based services. These services created new opportunities for customers who would not have been able to develop them on their own.

As a second governance mechanism, **SAP enhanced interaction among ecosystem actors**. While SAP laid the groundwork for such interaction, it had to wait for the interaction to play out and trigger isomorphic movements.

Interaction could happen among partners as they combined their different expertise to set up joint projects on the cloud platform. This interaction helped partners who might not have been able to adapt to the cloud platform's set of new technologies were still able to follow the ecosystem transformation. SAP organized dedicated partner events to create opportunities for partners to meet potential collaborators. As a partner manager at SAP stated:

> *That is yet another building block: all partners who are active in the IoT environment [on the cloud platform]have the possibility to, first, partner with other companies from the partner landscape. You can imagine it quite well: On the one hand, you might have a more technology-heavy partner—a classic example would be a gateway manufacturer—who maybe has less of an idea about SAP software implementation and, on the other hand, perhaps a very traditional SAP service provider, an implementer. (Partner Manager, Cloud Platform, SAP)*

Joint projects between SAP and both partners and customers increased interaction in the ecosystem. While co-innovation projects had also been part of SAP's ecosystem on its on-premises product platform, the cloud platform allowed for a faster and more scalable approach to such projects. In several co-innovation labs around the globe, SAP established compact formats where partners and customers created prototypes for applications on the cloud platform within a matter of days, rather than weeks or even months—a time span that had been typical for projects on the on-premises product platform. While mostly partners led these co-innovation projects, input and ideas often came from the customers because they recognized that they were able to generate solutions that supported their daily business with little effort.

As a third governance mechanism, SAP **reduced uncertainty among ecosystem actors.** The joint vision for a transformed ecosystem and interactions with others did not convince all ecosystem actors. Many longstanding SAP partners and customers were uncertain regarding the benefits and risks that the transformed ecosystem would entail for them. Thus, SAP tried to increase partners' and customers' trust in the cloud platform to reduce their perceived uncertainty. For example, SAP certified partner solutions on the cloud platform to signal that they were approved by SAP and fulfilled quality standards that customers were used to in the SAP environment. Furthermore, SAP leveraged its image with regard to privacy and data protection and positioned itself as a custodian of their customers' data:

> *When a customer uses SAP and builds a solution on the cloud platform—then they know the integration into the cloud and on-premises core systems works. Behind this is a large company that will support the platform in the long term, which adheres to European data protection laws, etc. That's the reason, why customers use such a platform from SAP. Because it will then be easier for the customer overall, more manageable, and safer. (Manager global licensing, SAP)*

4.4 Legitimacy Gains of the New Institutional Infrastructure

SAP's ecosystem transformation would only be successful if the ecosystem actors joined the transformed ecosystem. In the terms of institutional theory, the new institutional infrastructure that SAP had shaped with the introduction of the cloud platform and field-level governance mechanisms had to gain legitimacy among ecosystem actors. Our findings indicate that both partners and customers granted legitimacy to the new institutional infrastructure (Table 5).

Table 5. Evidence of the New Institutional Infrastructure Gaining Legitimacy

Evidence of legitimacy gains	Manifestations
Increasing adoption of the cloud platform	▪ Increasing number of partners (3,700 in December 2018; SAP SE, 2018c) ▪ Increasing number of applications (700 in May 2019; SAP SE, 2019) ▪ Increasing number of customers (1,400 in June 2015, 4,000 in September 2016, 10,000 in September 2018; SAP SE, 2018a)
Role change of partners towards resourceful partners	▪ New collaboration formats with customers ▪ Scaling of apps developed for individual customers through the ecosystem ▪ Increasing number of partners in the free trial program (850 in May 2019; SAP SE, 2019)
Role change of customers towards innovators	▪ Engaging in innovation activities in the cloud platform ▪ First app as a starting point for further projects on the cloud platform

The legitimacy gains of the new institutional infrastructure are, first, illustrated by the increasing adoption of the cloud platform by both partners and customers. According to SAP, the number of partners that worked with the cloud platform reached 500 in September 2016 and increased to more than 3,700 in December 2018 (SAP SE, 2018c). As of May 2019, more than 700 applications were available in SAP's app store that built on the cloud platform (SAP SE, 2019). The number of customers rose from 1,400 in June 2015 to 4,000 in September 2016 to more than 10,000 in September 2018 (SAP SE, 2018a).

Second, the legitimacy gain of the cloud platform among partners is illustrated by the partners' role change towards resourceful partners. Resourceful partners were partners that built on the resources provided by SAP on the cloud platform to quickly explore and seize opportunities in the transformed ecosystem. On the one hand, concerning collaboration with customers,

resourceful partners shifted the focus to supporting customers in developing customized solutions rather than just selling software products to them or implementing on-premises extensions. To do that, partners developed new formats for co-innovation with customers. For example, several SAP partners launched Design Thinking workshop series with their customers to create innovative use cases that could be implemented on the cloud platform.

On the other hand, resourceful partners sought to scale solutions in the ecosystem once a solution had proved valuable for one customer. Partners did this either by selling stand-alone applications on the platform's marketplace based on the initial solution or by leveraging synergies between use cases that they implemented for specific customers. In these cases, partners could reuse parts of the code or at least draw on knowledge about a specific use case:

> *From our own Software-as-a-Service solutions we could of course reuse building blocks in the form of libraries. That's what we do. That's how we implement the idea of reuse. (Project manager, partner company)*

The success of SAP's free trial program for partners on the cloud platform—more than 850 partners had joined the program as of May 2019 (SAP SE, 2019)—further underlines the legitimacy gains among partners as they explored the opportunities of the platform.

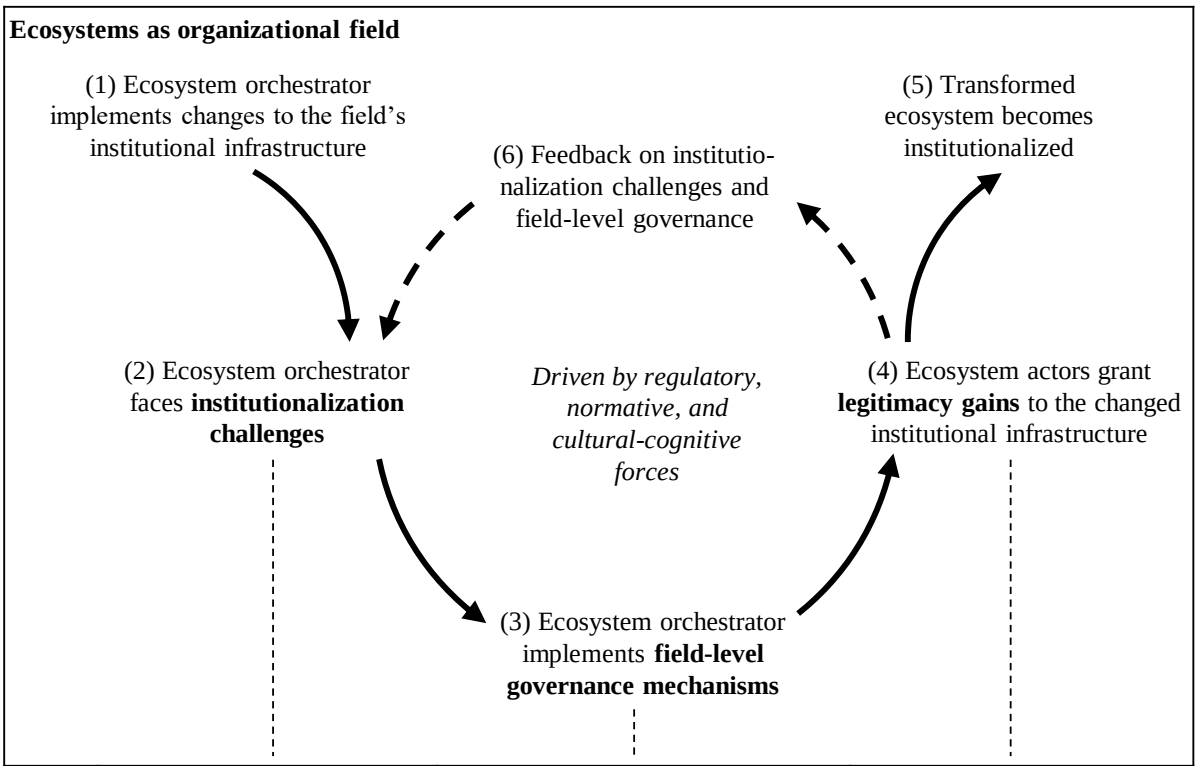
Third, the legitimacy gain of the cloud platform among customers is illustrated by the role change of customers towards innovators. The cloud platform allowed customers to take on an exploratory approach to innovating on the platform. The cloud platform provided access to the customers' ERP data through standardized interfaces, reducing the effort to develop and test prototypes. Often, the first solution developed on the cloud platform represented only the starting point. For example, after developing an application for predictive maintenance of remotely located wellhead compressors, one customer began exploring further use cases for other machines in their product portfolio:

> *We implemented SAP's cloud platform because of the integration capabilities and also because of future projects. With this solution, we have now created the basis for other use cases, which could also be related to various kinds of machinery and equipment. We can then simply connect them directly to the cloud platform. (Senior vice president, customer company)*

In sum, the cloud platform as the transformed ecosystem's institutional infrastructure gained legitimacy among ecosystem actors over time, ultimately leading to the institutionalization of the transformed ecosystem.

5 Discussion

We summarize our findings as a model of the ecosystem transformation process (Figure 2). The starting point of the process is the ecosystem orchestrator introducing a new platform and thereby changing the ecosystem's underlying institutional infrastructure (1). This causes institutionalization challenges (2) which the ecosystem orchestrator addresses through field-level governance mechanisms (3). Given that the three institutional forces drive the process (regulatory, normative, cultural cognitive; DiMaggio et al., 1983), we built on them to structure institutional challenges and governance mechanisms. Then, ecosystem actors grant legitimacy to the changed institutional infrastructure (4), leading to the institutionalization of the transformed ecosystem (5). Thereby, the behavior of the ecosystem actors provides feedback for the ecosystem orchestrator on the resolution of institutionalization challenges and the effectiveness of the field-level governance mechanisms (6).



Regulatory	Rebalancing top-down control and bottom-up emergence	▪ Eased control of third-party applications ▪ Standardization of third-party development processes ▪ Decoupling of core from periphery	▪ Increasing adoption of the cloud platform ▪ Role change of partners towards resourceful partners ▪ Role change of customers towards innovators
Normative	Reprofessionalizing ecosystem actors	▪ Technology-focused professionalization of partners ▪ Individualized professionalization of customers	
Cultural-cognitive	Redefining the organizing vision of the ecosystem	▪ Proposing a new organizing vision ▪ Enhancing interaction among ecosystem actors ▪ Reducing uncertainty among ecosystem actors	

Figure 2. Process of Ecosystem Transformation

This process model explains the ecosystem transformations of incumbent companies, triggered by enhanced digital technologies such as cloud platforms. Incumbent companies in the enterprise software industry and beyond are characterized by a complex interplay between technology and ecosystem actors that transforms as innovation platforms are introduced (Sandberg et al., 2020; Svahn et al., 2017; Lindgren et al., 2015). We thus suggest that our model generalized from the case at hand in its specific context (cf. Volkoff et al., 2013) and

provides guidance for other incumbent companies. We discuss the contribution to literature and praxis, and boundary conditions next.

5.1 Contributions to Literature and Practice

The process model of ecosystem transformations contributes to IS literature on ecosystem transformation and platform governance. It also adds to the current discussion in institutional theory literature on the impact of digital technologies on the dynamics of institutional infrastructure.

First, we contribute to the literature on ecosystem transformations. This stream has emerged in recent years (Sandberg et al., 2020; Lindgren et al., 2015; Svahn et al., 2017), building on earlier work that introduced the ecosystem notion to information systems research (e.g., Gawer, 2014; Gawer et al., 2014; Tiwana, 2014). Previous empirical studies on ecosystem transformation point to the complexity of such transformations but focus on the incumbent companies as ecosystem orchestrators and their challenges in adapting their organizational logic and identity (Sandberg et al., 2020; Lindgren et al., 2015; Svahn et al., 2017). Conceptual work (Tanriverdi et al., 2017) and calls for research (Altman et al., 2020; Li et al., 2021) emphasize that the dynamic interplay between ecosystem orchestrators and other ecosystem actors has to be studied to better understand how incumbent companies can successfully navigate ecosystem transformations.

Addressing these calls, we identify institutionalization challenges that incumbent companies face as they begin to transform an existing ecosystem. Assuming an institutional perspective and interpreting ecosystems as organizational fields (Oppong-Tawiah et al., 2016; Thomas et al., 2014a) allowed us not only to structure the ecosystem orchestrator's field-level governance along the three institutional pillars but also to make sense of the ecosystem actors' reactions to the governance mechanisms. Thus, an ecosystem transformation goes far beyond technological

changes that can be implemented in the ecosystem through regulatory mechanisms. By also considering normative and cultural-cognitive mechanisms, we show that the professionalization of ecosystem actors and their willingness to grant legitimacy to the transformed ecosystem are crucial elements of ecosystem transformations in incumbent companies.

Second, our work enhances the literature on platform governance. This literature stream generally focuses on business rules that are applied to attract and manage third parties in ecosystems that are either already established or emerge on green fields (Altman et al., 2020). By focusing on how existing ecosystems are transformed, we reevaluate and expand common challenges and mechanisms in platform governance.

Regarding the regulatory pillar, we confirm that incumbent companies need to decouple the ecosystem's core platform from the periphery and yield some degree of control of third-party applications while still establishing standards for the development of third-party applications (Tiwana, 2014; Benlian et al., 2015). The resulting institutionalization challenge of rebalancing top-down control and bottom-up emergence relates to the previously discussed tradeoff between control and openness—i.e., attracting third parties while maintaining the targeted level of quality on the platform (Wareham et al., 2015; Parker et al., 2018; Haki, 2021). In the case of ecosystem transformations easing formal outcome control not only opens the ecosystem for new actors but also offers existing partners and customers more freedom to innovate on the platform. Considering how these existing ecosystem actors react to the orchestrator's approach to balancing openness and control is indispensable for a successful ecosystem transformation and introduces a new variable in the balance of control and openness.

Along the normative pillar, the institutionalization challenge of reprofessionalizing ecosystem actors—is related to previous work on boundary resources that have been shown to support

third parties in developing applications (Eaton et al., 2015; Ghazawneh et al., 2013; Karhu et al., 2018). While we confirm the importance of boundary resources, we highlight that professionalization is an interactive process that requires more than a set of tools and resources. The incumbent company can support this process by conducting joint co-innovation projects and by considering the individual learning processes of their customers' employees. Furthermore, work on boundary resources has focused on complementors but we found that customers, acting as innovators in the transformed ecosystem require boundary resources as well. Compared to complementors, customers require different boundary resources to familiarize themselves with the new platform because they develop applications for their own use and are not interested in creating and marketing scalable applications.

The cultural-cognitive dimension has so far not been in the focus of the literature on platform governance. Few studies point to the importance of the interaction between complementors in ecosystems; Förderer (2020), for instance, shows that developers who participate in developer conferences produce higher-quality applications. Our findings suggest that an overarching organizing vision and mimetic effects among partners and customers are important factors for ecosystem transformations to gain traction. We showed that incumbent companies have some options to trigger cultural-cognitive forces during ecosystem transformation, for example by promoting a joint organizing vision and by enabling interactions between ecosystem partners.

Third, we add to the literature on institutional theory by providing insights into the dynamics of institutional infrastructure during ecosystem transformations. While prior work pointed out that platform ecosystems could be interpreted as organizational fields subject to institutional forces (Thomas et al., 2014b; Lindgren et al., 2015; Oppong-Tawiah et al., 2016; Altman et al., 2020), the institutional lens has not yet been applied to cases of ecosystem transformation. We suggest that ecosystem transformations represent changes in the ecosystems' underlying

institutional infrastructure (Hinings et al., 2011; Greenwood et al., 2011). Insights into the dynamic changes of institutional infrastructure as it becomes more digital are limited (Hinings et al., 2011; Hinings et al., 2018), a research gap that resides on the intersection of institutional theory and information systems literature. Our model shows what consequences a change of institutional infrastructure can have in an established ecosystem. As more and more organizational fields get infused with digital institutional infrastructure, ecosystem orchestrators must be aware of the challenges that emerge from such changes.

In sum, we highlight that institutional theory provides a useful framework to identify institutionalization challenges and field-level governance mechanisms that ecosystem orchestrators can rely on to foster the legitimacy of a transforming ecosystem. This is in line with previous work showing that organizations can use institutional pressures to advance the legitimization of an IT artifact within the organization (e.g., Kaganer et al., 2010 for physician order entry systems; and Liang et al., 2007 for enterprise software) but extends that notion to ecosystems with different groups of actors.

Finally, our findings on ecosystem transformation could prove helpful for practitioners across several industries. Increasingly, incumbent companies strive to transform their established product platform ecosystems into more open innovation platform ecosystems, a trend that is likely to continue (Shipilov et al., 2019; Choudary, 2021). However, many of these projects fail (Cusumano et al., 2019). We show that introducing an innovation platform has a multifaceted impact on the established product platform ecosystem and that the interactions between different ecosystem actors need to be considered. Our findings point ecosystem orchestrators toward institutionalization challenges and provide specific governance mechanisms that can facilitate ecosystem transformations.

5.2 Boundary Conditions and Limitations

A limitation immanent to grounded theory single-case studies relates to the generalizability of the findings (Yin, 2014; Corley et al., 2004). Our findings on ecosystem transformations result from the abstraction of the case of SAP. We suggest that it captures the ongoing shift towards cloud platforms that we observe across traditional industries, in line with our goal to provide a model that is specific concerning technology but generalizes from the case at hand (cf. Volkoff et al., 2013). Similar transformations occur, for example, in the banking industry (Choudary, 2021), the automotive industry (Svahn et al., 2017), the process automation industry (Sandberg et al., 2020), and the healthcare industry (Choudary, 2021). Ecosystem orchestrators in such industries face institutionalization challenges like those identified in this study and can draw on the field-level governance mechanisms that we derived to address these challenges. Specific manifestations of the mechanisms might differ from case to case, particularly beyond the enterprise software industry, but the overall framework based on our institutional theory will prove helpful for examining how transformed ecosystems gain legitimacy among ecosystem actors. Future research could analyze further ecosystem transformations and identify patterns underlying the success of such transformations—for example, by conducting multiple-case studies or qualitative comparative analysis (e.g., El Sawy et al., 2010).

Another limitation of our study is that we focused on partners and customers that had been active on SAP's cloud platform and could provide insights on the institutionalization of the transformed ecosystem. Partners and customers that refrained from using the cloud platform might have provided additional insights on the deinstitutionalization of the old ecosystem and the challenges from governing an old and a new ecosystem simultaneously, at least until the transformed ecosystem is sufficiently established. Future research could focus on ecosystem actors that were left behind and focus on the challenges this group adds to ecosystem transformations.

6 Conclusion

In this multi-year grounded theory study on the evolution of SAP's cloud platform, we took on an institutional theory perspective to understand how ecosystem transformations can be governed by ecosystem orchestrators. Interpreting ecosystem transformation as changes of institutional infrastructure, we identified three institutionalization challenges along the institutional pillars: (1) rebalancing top-down control and bottom-up emergence, (2) reprofessionalizing ecosystem actors, and (3) redefining the organizing vision of the ecosystem. We derived field-level governance mechanisms that address these challenges and provided insights on how ecosystem actors granted legitimacy to the new institutional infrastructure, leading to the institutionalization of the transformed ecosystems.

As incumbent companies across industries increasingly rely on digital technologies such as cloud platforms to transform their existing ecosystems, our findings point to potential challenges and provide specific governance mechanisms that facilitate ecosystem transformation. We hope to spark further research on the intersection of institutional theory and information systems, particularly concerning the dynamics of institutional infrastructure as it becomes increasingly digital.

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Appendix

1. Guidelines for Coding Procedures

Table A1. Guidelines for Strauss & Corbin Coding Procedures based on Seidel et al. (2013)

Guideline	Implementation
(1) Flexible use of axial coding	▪ During axial coding, we built on institutional theory and its three pillars (regulatory, normative, cultural-cognitive) as a scaffolding and meta-theoretical lens (cf. Gregory et al., 2018; Levina et al., 2008). ▪ We expanded the paradigm by focusing on institutionalization challenges and field-level governance mechanisms as instantiations of the institutional forces along the three pillars. We also considered the interplay of SAP, partners, and customers by coding whom SAP addressed with a specific governance mechanism.
(2) A rationale for adaptations	▪ We used the institutional theory as a scaffolding, which represents more theoretical priming than in the initial Strauss & Corbin approach but which is in line with more recent adaptations (e.g., Sandberg et al., 2020; Gregory et al., 2018). ▪ We share how we conducted the coding, contributing to transparency in an evolving method.
(3) Awareness of 'forcing' issues	▪ We did not select the coding paradigm a priori, it rather emerged as a result of several rounds of open and axial coding with different theoretical foci. We tracked this process with theoretical memos. ▪ We acknowledge that the three pillars can be overlapping on the empirical level, even though they appear distinct on the conceptual level (DiMaggio et al., 1983). Thus, we coded several empirical observations as manifestations of institutionalization challenges and governance mechanisms from different pillars.
(4) Theoretical sensibility towards causality	▪ We state that the way SAP implemented the governance mechanisms along the pillars increased the legitimacy of the new institutional infrastructure, leading to an institutionalization of the transformed ecosystem. But we also hint at the complex interplay of ecosystem actors that would need more in-depth analysis for each actor group to establish a direct causal relationship between a specific governance mechanism and legitimacy gains.
(5) Contextualization	▪ We describe the case with rich details, providing the context for our empirical analysis. ▪ We discuss the issue of context-specific findings and generalizability in the discussion section on boundary conditions and limitations.

2. Coding Excerpts

Table A1. Institutionalization Challenges—Regulatory Pillar

Manifestation	Exemplary quotes
Institutionalization challenge: Rebalancing top-down control and bottom-up emergence	
Limited scalability and speed of top-down control processes	*[Quality control] is a massive effort. There is a big resource debate going on. On average we conduct about 65-75 qualifications of partner solutions a year. This year, I expect this number to go up to 90. On average, every qualification needs about one to two months. So, it is a highly manual and intense process that we try to automate but there is still a lot of manual testing. (Product manager certification, SAP)* *We basically act as the first customer and try to encounter all the problems that a first customer would also encounter, in the first three to four months, let's say, we don't really have more time, but we find a lot there. And the tests then follow our product standard. (Partner manager, SAP)*
For important business process control is seen as more important than innovation	*The challenges are always related to the high requirements for the systems. This includes the product standards, which are ultimately beneficial but also very difficult for partners, especially for very small partners. There are requirements like the accessibility that always bothers us, further quality standards that require a lot more effort, the effort for documentation, and the detailed software development process that we have to adhere to. It's very exhausting, but we have mastered that again and again with every release. (Head of partner activities, partner company)* *I think you can learn from SAP what it means to develop "enterprise-ready" software. That there is a big difference whether I develop software for the end customer, which I deploy to the end customer on an Apple device, or whether I develop enterprise software, that is, for major customers and corporations, which will be in use for decades, which is business-critical, and which must also be flanked with appropriate processes. (Software engineer, SAP)* *When you download an app on your smartphone, let's be honest, whether it works properly or not is not quite so crucial. But if a customer downloads a business application and uses it to control their processes or, as an extreme example, operates a nuclear power plant, then maybe that should work. Of course, this is always such a balancing act for SAP. (Program & partner manager, SAP)*

Table A2. Institutionalization Challenges—Normative Pillar

Manifestation	Exemplary quotes
Institutionalization challenge: Reprofessionalizing of ecosystem actors	
Ecosystem actors lack resources for reprofessionalization	*Of course, I can try to re-train my employees. But it is relatively difficult because these people are usually 45 years and older. The young people have no interest in ABAP, they have not been interested in it for a long time and I won't be able to hire them. This means that the ABAP market is shrinking a bit, even if there is still a lot of business, but that is not attractive. So, re-training is difficult. Thus, you have to try to hire new colleagues who then bring these skills with them. Likewise, that is not easy. (Chief product owner, SAP)* *The 'new world' creates new opportunities, but it also creates certain requirements. Adopting that change along with SAP is not easy for partners because they still have the existing business. Then, it is also a question of investment. This is especially interesting now in terms of [human] resources because the market is now relatively narrow with regard to these new qualifications and we are in competition with all other companies which are looking for digitization talents. Who have already built up knowledge in this area as part of their university programs and through previous experience. One of the big challenges is to simply have the resources to be able to serve the projects that come to you in the future. (Partner manager, partner company)*
Hesitance of ecosystem actors to reprofessionalize	*And [adopting the cloud platform] means you have a very high investment in your workforce, you have to make decisions in recruiting and employee development, not only training but employee development. At the same time, on the revenue side, there are first of all very big question marks. The revenues that do come, are usually not large in volume. Thus, you cannot assume over a relatively long period, that the whole thing is cost-covering for the time being. (Managing director sales, partner company)* *[Developing on the cloud platform] is a challenge. Because you don't have much experience with it so far. For us personally, for our company, it is already a challenge, because we are no app developers. This means that if we really would want to offer solutions ourselves on the cloud platform, then we would also have to deal with app development and that would be a new step. (Senior SAP consultant, partner company)*
Limited scalability of existing professionalization practices	*When we talk about extensions, yes, we certainly provide both human and technical resources. But if you think more about the future, more into the mass business, it will certainly not be like that. There is standard support, there are standard resources, as there are already in the cloud platform model, standard contracts or packages that you can buy, licenses and they are then used accordingly. (Program & partner manager, SAP)* *This is a scope that is being discussed. In general, improvement of tools is certainly a topic which we have to work on. Of course, this directly relates to scalability. With how many partners can you handle doing a lot manually, by hand, simply in person? With 100 partners, things are slowly getting critical. With 1000 partners, it does no longer work without tools. (Partner manager, SAP)*

Table A3. Institutionalization Challenges—Cultural-Cognitive Pillar

Manifestation	**Exemplary quotes**
Institutionalization challenge: Redefining the organizing vision of the ecosystem	
Ambiguous organizing vision	*I think, if SAP wants to bring its platform to the cloud now, then this is a break in style to what SAP has told its customers so far. I know that's what SAP wants. Customers have been told so far: 'You can do everything with SAP, we have thousands of consultants available and every smallest solution can be integrated'. And, suddenly, SAP tells them: 'You don't need everything, because 60% of the functionality is actually enough, you don't need such a thick SAP system as we have told you the last 30 years'. I think that's a question of credibility and this will be difficult. (Founder and CEO, partner company)* *I was at a partner event the other day, there were twenty to thirty partners of which maybe three quarters already knew pretty well how the concept of the cloud platform works but everyone else was still very clueless. I think there is still a lack of information. In my opinion, SAP needs to take a more proactive approach to its partners, because there is a relatively high degree of uncertainty. And also, relatively much ignorance of what opportunities this can offer for the individual partner. (Senior SAP consultant, partner company)*
Uncertainty about the future of the cloud platform	*There are two points to that. On the one hand, you don't know when the market really goes off with regard to a certain cloud topic and on the other hand, you don't know how stable SAP's portfolio is at this point, they don't necessarily play with completely open cards. (Managing director sales, SAP)* *I believe many [customers] still have fears or have not fully understood what you can do with [the cloud platform]. Should they play along? I can imagine that in some companies there is still resistance. They have built up on-premises landscapes for years and some may want to protect that, arguing that [the cloud platform] is uncertain; there is still much confusion. (Head of IT innovations, customer company)*

Table A4. Governance Mechanisms—Regulatory Pillar

Manifestation	Exemplary quotes
Governance mechanism: Eased control of third-party applications	
Less strict control mechanisms than in the on-premises ecosystem	*In our customer use cases, we don't see that. Because customer applications must be a bit fancy and the Fiori is rather designed for enterprise topics. Our app developers did not want to be constrained by Fiori. (Head of IT innovations, customer company)*
Tools for self-service checks for partners and customers	*Specifically, with the continuous delivery pipeline of the SDK, we now also check extension-specific qualities, if only APIs are used that are whitelisted, i.e. that are released for use. Such checks are of course specifically built into the pipeline and only make sense in the context of building an extension. (Product owner of the cloud platform SDK, SAP)* *We have already developed some tools [on the cloud platform] that check the requirements; we will carry out a code scan to determine whether it has also been developed according to the programming specifications. This is tool-based, the partner has direct access and can carry out the scan themselves. (Manager global licensing, SAP)*
Governance mechanism: Standardization of third-party development processes	
Standard requirements for third-party development on the platform	*The great thing about [the cloud platform] is that it comes along with a lot of governance on its own because it enforces guidelines that you need to follow when you want to work with the platform properly. Thus, a lot of product standard requirements are automatically met when you develop on [the cloud platform] that you would have to pay attention to [when developing] in ABAP. If you use all the existing tools, you automatically get a lot for free: from monitoring to recovery to backup, everything is fully automated, you don't have to do much more. (Partner manager, SAP)* *If partners want to offer a cloud solution that only communicates via standard interfaces, a lot of problems disappear. And that makes it much easier for the customer to say, I still lack the little functionality X that runs on [my SAP system], I use the standardized interfaces that I license under a cloud solution and I do not come into conflict with the on-premise license conditions. (Manager global licensing, SAP)*
Implementation of processes close to standard	*In today's cloud business you say "fit-to-standard". In the past, in consulting, it was more like, 'What else do you need?'. Then you get the 'tailored suit' and they programmed everything in a customized way. Today the trend is that customers are a bit more cautious, they want more standardization. But this means that it can be painful for the organization because what does not work in the standard, might not be implemented and that makes the process perhaps a bit more complex. (Business development manager, partner company)* *In the cloud, I have standard processes, which can no longer be bent as was the case in the past. There were indeed some SAP solutions that were modified and customized up to a certain level that was beyond recognition. This is certainly less in the cloud environment, simply because the processes are standardized and offer fewer opportunities to be modified. But of course, on the cloud platform, you then have more opportunities with regard to additional solutions and with regard to functional extensions. (Partner manager, partner company)*
Governance mechanism: Decoupling of core from periphery	
Cloud platform as decoupling layer between on-premises systems and cloud applications	*Overall, [decoupling] is the only way to be successful at all in a large system with a large outside ecosystem. This decoupling is the absolute prerequisite for it to scale, and I believe that the pressure is now so high that we have no choice but to succeed. We cannot say goodbye to partners and the ecosystem. (Products and innovation development, SAP)* *SAP says "keep the core clean", which means no extensions build into the S/4 core. And I agree, the customer should not build extensions into the ERP core. Because that's exactly what hampered us in the past in the development of updates—customers were able to adapt the core to the last detail and breaking changes were inevitable in the end with updates. And therefore, the [decoupled] extension is the way to go for the customer and for us from the ERP perspective. (Project manager, partner company)*
Enhancing API offering	*When I want to write data back [to the backend] I can only do that in a very, very controlled environment. Then, I can—depending on the technology I use—build on the cloud connector and its precise white list of which backend services are available at all and for which application. The end-user has to go through the software stack on the cloud platform before the request gets to the backend system. (Project manager, partner company)*
Virtualization and containerization	*Each application gets a small 'virtual prison', where it can then run and is isolated from other applications. The second aspect is that the deployment format is with Docker. This has made it possible to share docker images which make deployment easier. (Chief product owner, SAP)* *[We] can develop specific modules and group solution modules on their own. And we just host the applications in [the] cloud and we can deploy Docker containers whatsoever and build and run them. We have to follow certain rules and architecture principles in terms of API management, security, coding guidelines. So, we have an area where we can build ourselves, we can use the standard offerings, reusing services, reusing deployment toolchain, docker container, standard templates… (Head of software application center, customer company)*

Table A5. Governance Mechanisms—Normative Pillar

Manifestation	Exemplary quotes
Governance mechanism: Technology-focused professionalization of partners	
Openness towards different programming languages	*These partners can develop extensions, and not only on-premises; there are enough expansion mechanisms based on ABAP, but also in the cloud and preferably in the programming language they understand. Java is simply the language that most people understand, outside of SAP at least, and this makes it easier to have partners. (Chief architect cloud platform, SAP)* *The new solution [on Cloud Foundry] is based on open technologies and provides more flexibility regarding technical possibilities. The advantage [of Cloud Foundry] simply is that it is newer, more flexible. With the current proprietary solution, we are limited regarding the support of runtimes, languages, and so on. For example, we support Java and JavaScript but there are many cases where someone wants to use Node.js because it scales better for scenarios with high load. (Vice president, SAP)*
Comprehensive development resources	*We work a lot with the [cloud platform's SDK], which is basically a library for Java projects and at the same time provides a delivery pipeline based on Jenkins and Docker containers. The whole topic of "continuous everything" is already solved pretty smoothly. From my point of view, SAP has provided a very powerful stack, which helped us as partners enormously. In the beginning, we had tried to establish the delivery infrastructure on our own; we would have succeeded at some point, but now we have access to a powerful tool for free. And with that tool, we are able to, from a purely technical perspective, have a smooth deployment from the Git repository on the [cloud platform]. (CEO, partner company)*
Possibilities for fast development and deployment	*You get an account within one day. By now we already have a self-service for that, formerly a request had to go through JIRA, taking a day or two, nowadays there is a self-service for it. Once you have a database, you just deploy your Java application and do the same later on the customer landscape and 'bang' you're online.' (Chief product owner, SAP).*
Lower entry barrier for partner innovation	*So, in the context of the [cloud platform], it is to develop something that potential partners for many simple ways. The barrier to entry is low. I have a web idea and get an account for free. I get all the information delivered for free. I can just start again and just try and I could imagine that it is attractive. One can first develop something and then look for customers for their solution. And that could also cause that we can carry out more certifications in the future. That's quite possible. (Manager for product and partner governance, SAP)*
Co-innovation projects with selected partners	*In Germany, we now have selected four or five joint customers in the life science industry, and we are getting together with the SAP industry [consultants], with SAP industry sales, so that we are really very, very close to the customer. We clarify the customer requirements, try to understand the respective situation the customer is in and where the customer wants to move to at the moment, and what we could offer him accordingly. (Partner manager for the relationship with SAP, partner company)*
Governance mechanism: Individualized professionalization of customers	
Integration capabilities of the cloud platform	*Now, enterprises around the globe often make strategic decisions about which hyperscale provider AWS [Amazon Web Services], [Microsoft] Azure, Google Cloud Platform they use for certain workloads. Many customers have actually asked us to extend their SAP Cloud Platform solutions next to those workloads in the public clouds. And we got that message and we went generally available on AWS and beta on Azure in May this year. Today, I am thrilled to announce SAP Cloud Platform on Google Cloud Platform as a public beta. (Björn Goerke, CTO and President of SAP Cloud Platform at TechEd 2017, Las Vegas).* *A lot of customers have come to us for SAP-to-SAP integration—typically connecting SuccessFactors with ERP. But a lot of our customers that don't have SAP wall-to-wall, use several third-party systems. So now they can use our cloud platform integration services to cover their entire landscape. (SAP senior director in a video interview at TechEd 2018).* *The major use cases for SAP Cloud Platform ABAP Environment are the development of new cloud apps in ABAP, which are decoupled from the digital core. Of course, customers and partners see a chance to leverage their existing ABAP know-how and want to reuse their existing on-premises assets in the SAP Cloud Platform ABAP Environment. (SAP Blog, 2018)*
Development resources adapted for the use by customers	*We are supported by our cloud customer engagement executive, who looks after us as the customers directly. We, as a reference customer, are very well cared for and in good hands. [The cloud customer engagement executive] always gets us in touch with the specialists from product management if we have questions or issues. We get some preferential treatment because we are one of the reference customers. Holding presentations at SAP conferences is one thing, but we also get benefits from it. (Head of IT innovations, customer company)*
Support for employees' learning processes at customer companies	*We use the API management [on the cloud platform] and in that regard we now educate ourselves. We are lucky that SAP addresses these topics that are important to us with open SAP courses. For example, for the cloud platform update in the second quarter, we learn what new databases it supports, what the latest UI5 application model looks like, etc. With these courses we can upskill on the go, we can do the courses in the evenings. We have weekly assignments to get a certificate in the end and that actually worked quite well. (Head of IT innovations, customer company)*

Table A6. Governance Mechanisms—Cultural-Cognitive Pillar

Manifestation	Exemplary quotes
Governance mechanism: Proposing a new organizing vision	
Showcasing successful customer projects, partner projects, and joint projects at dedicated community events	*We just started the promotion at TechEd last October. Since then, the DSAG Technology Days took plays, where I held two talks, which was new for me. We also always take part in the Cloud-Customer-Adoption-Days, these are events just for customers, four times a year and we always try to contribute something. Also, the reference customer program includes that you do further talks and reference customer calls. Every month there is something I have to do and, so far, this is interesting for us because we get to know what the others do. (Head of IT innovations, customer company)* *And you can see it now, over the last few years, there were a steadily increasing number of partners who are active in that context. Once a year, I do a central enabling session for the partners. That's really a physical event, we meet in Waldorf. From us internally, I invite the individual product owner, be it for individual solutions, such as perhaps the predictive maintenance and service or the asset intelligence network or other SAP solutions, and of course appropriate product owners for the cloud platform or application enablement. This way, partners get firsthand information on product updates, news on possible SAP solutions that will be launched, the roadmaps of existing solutions, and so on and so on. This is a pure partner event. (Partner manager cloud platform, SAP)*
Marketing campaign (the 'Intelligent Enterprise') to adjust the image of SAP and the cloud platform	*According to Helen Dwight, global vice president, head of Intelligent Enterprise and Industries Marketing at SAP, innovation is what sets intelligent enterprises apart as the highest-performing businesses. "Intelligent enterprises are able to rapidly adapt to market conditions, whether that's driving new business models or pivoting rapidly, or scaling up or down as we've seen so many companies do in recent months," said Dwight. "More importantly, they're able to drive customer success for ultimately profitable and sustainable growth as a result." (Susan Galer, Brand Contributor SAP, at forbes.com; Galer, 2020)*
Higher value services offered by SAP on the platform to enable innovative use cases	*With the [cloud platform], the possibilities to innovate new business models around Concur and the network are limitless. (Bill McDermott, then-CEO of SAP, September 2014).* *We provide different services, for example, the execute services, mobile, and analytical services, we have the IoT services… even in the future, the market is moving really fast… machine learning, deep learning… those will be coming together in the platform. Basically, the many different kinds of services that allow a customer or partner to quickly create an application, go to market, and capture the revenue. (Chief product owner cloud platform, SAP)*
Governance mechanism: Enhancing interaction among ecosystem actors	
Supporting joint partner projects	*That is yet another building block: all partners who are active in the IoT environment [on the cloud platform] have the possibility to, first, partner with other companies from the partner landscape. You can imagine it quite well: On the one hand, you might have a more technology-heavy partner—a classic example would be a gateway manufacturer—who maybe has less of an idea about SAP software implementation and, on the other hand, perhaps a very traditional SAP service provider, an implementer. (Partner manager cloud platform, SAP)* *You have to see, where can partner management have an impact. I think partner management can bring partners together, moderate and identify a lack of a solution for a specific audience, maybe one of the partners has it. And if not, then partner management can, in a targeted way, identify other partners to close this gap. (CEO, partner company)*
Co-innovation projects between customers, partners, and SAP	*What SAP did then, was it founded innovation centers that focused on generating innovative solutions. They are even closer to research and closer to SAP. Where ideas are generated and can live as long as possible and people can spend money on these ideas without someone coming around the corner with an Excel sheet and asking about whether you actually make money with it. […] That's one thing and then there are 'app houses' where Design Thinking is used as a method. Where you also spin ideas together with partners and customers. This is now the organizational setup. (Product manager, SAP)* *In India, we have a Touchstone Lab, which cooperates closely with the SAP Co-Innovation Lab in Bangalore. So, especially solutions related to the topic of life science, also the topic of farm-to-fork have been carried out in collaboration with SAP. Co-innovation means we derive the needs in conversation with SAP and with the different industries. There, we always get the input from SAP. On this basis, we then jointly position the solution for customers and implement the projects together. (Relationship manager for SAP partnership, partner company)*
Governance mechanism: Reducing uncertainty among ecosystem actors	
Certification for partners to signal quality to risk-averse customers	*[For customers] now the question arises, is the interface implemented correctly, yes or no? And these are the integration scenarios that we perform and we test the function. For the customers, of course, this is a great advantage because they have a guarantee that it works because otherwise, we would see as a result of our certification tests, that the partner uses the API but perhaps has not implemented it correctly. (Manager for partner certification, SAP)*
SAP image with regard to privacy and data protection	*When a customer uses SAP and builds a solution on the cloud platform—then they know the integration into the cloud and on-premises core systems works. Behind this is a large company that will support the platform in the long term, which adheres to European data protection laws, etc. That's the reason, why customers use such a platform from SAP. Because it will then be easier for the customer overall, more manageable, and safer. (Manager global licensing, SAP)* *Customers want to implement something and if I can say to the customer that the cloud platform has the advantage that the customer already knows SAP, then I don't need to explain that. But if I label it the [partner] cloud platform, then the customer will say: 'Wait a minute, I have never heard of it, what is this about?' But if I say SAP cloud platform, then just checks two boxes: First, it's cloud, second, it's by SAP and there are no questions whether this is secure. (Founder and CEO, partner company)*

Table A7. Legitimacy Gains of the Transformed Ecosystem

Manifestation	Exemplary quotes
Legitimacy gain: Increasing adoption of the cloud platform	
Increasing number of partners	*Now that over 3,700 SAP partners have joined our cloud strategy, the free resources will help them accelerate application development in a way that best fits their customer base. (Björn Goerke, chief technology officer and president, SAP Cloud Platform, SAP; (SAP SE, 2018b)*
Increasing number of applications	*Over 1,400 partners are building solutions on SAP Cloud Platform today, with more than 700 apps for SAP Cloud Platform already available on SAP App Center. SAP App Center is the digital enterprise marketplace with more than 1,800 SAP partner ecosystem solutions across a wide variety of SAP technologies and lines of business. (SAP SE, 2019)*
Increasing number of customers	*Innovation and the success of our customers are at the heart of everything we do at SAP. SAP Cloud Platform is designed to help our customers easily accomplish their digital transformation initiatives to become best-run businesses. Now more than 10,000 customers can testify to the flexibility and value SAP Cloud Platform delivers. (Björn Goerke, chief technology officer, SAP, and president of SAP Cloud Platform (SAP SE, 2018a)*
Legitimacy gain: Role change of partners towards resourceful partners	
New collaboration formats with customers	*We also offer innovation labs, with which you just go into the innovation phase with the customer. There is the 'Cookhouse Lab' in Toronto. There is the 'Minnosphere' in Passau. A whole range of centers for innovation, where these use cases can be developed together. This is similar to pop-up labs, where you try to do innovation workshops with more than one customer to have a somewhat moderate marketing effect, and potentially create innovation that can be disruptive on the markets. (Project manager, partner company)* *We are starting with a kind of package so we name it Three-Three-Three, three days, three weeks, three months. It's a small value for when we start with some Design Thinking approach with a very specific project, we develop something quick and dirty on [the cloud platform] and we're putting on the pilot to test it, it works great, if not, okay, so be it, we lost a couple of days. (Head of SAP Portfolio, partner company)*
Scaling of apps developed for individual customers through the ecosystem	*Once they have done some initial projects they realize there is an opportunity to build some accelerator or build some templates based on the expertise they have gained. Once they have implemented that with a few customers, they realize the opportunity to productize. Often, they do not have the right business set up in terms of dedicated development resources or support. Thus, sometimes there is a shift in terms of how they use their resources, their commitment to building and managing a portfolio of apps and IP-related issues. And over time, they implement an innovation or a portfolio [of innovations]. This will be hopefully a virtuous cycle. We are starting to see some partners benefiting from that in many ways. (Senior vice president partner innovation, SAP)* *From our own Software-as-a-Service solutions we could of course reuse building blocks in the form of libraries. That's what we do. That's how we implement the idea of reuse. (Project manager, partner company)*
Increasing number of partners in the free trial program	*In December, SAP announced 12-month free access to the SAP Cloud Platform. To date, more than 850 partners have subscribed.* *(SAP SE, 2019)*
Legitimacy gain: Role change of customers towards innovators	
Engaging in innovation activities on the cloud platform	*I know an SAP customer here in Darmstadt, who has built 20 applications on the cloud platform. In principle, the customer is organized in two layers: They typically have an IT department. They just get project applications from the business departments. And they then use the cloud platforms to deliver exactly these projects. (Senior vice president platform ecosystem, SAP)* *We took this as an opportunity for the entire company to build on SAP's cloud platform as a strategic platform for our future developments, also for the on-premise landscapes. And that we then develop prototypes on the cloud platform. (Chief information officer, customer company)*
First app as a starting point for further projects on the cloud platform	*The other use cases were then created because the platform was already there. With the customer use case, we have now established API management and identity management on the platform and the other use cases have then benefited from this preparatory work. This means that once this innovation platform is there and you have gained the first experience with it, then it can be multiplied very quickly. It's like 'appetite comes with food': The food is now served and we can choose from different services and get new use cases off the ground just like in a modular Lego system. And that was actually what happened. The application for employees and the application for suppliers were then self-runners, there was never an entry barrier since we could already reap what we have sown with the preparatory work in the customer case. (Head of IT innovations, customer company)* *We plan to build an e-commerce platform with SAP's cloud platform. That sounds like a webshop, and that's exactly what it is. We have specialized processes here in the forestry sector, also with regard to the end customer. For example, we now want to start marketing firewood via the Internet. We also want to start with the marketing of venison via the Internet and this is a pure reservation process for the time being. But we are also thinking about auction platforms. So, for example, if we produce high-quality wood, we then auction it off via the Internet. So far, this has been a purely regional, if not local, process. (Chief information officer, customer company)* *We implemented SAP's cloud platform because of the integration capabilities and also because of future projects. With this solution, we have now created the basis for other use cases, which could also be related to various kinds of machinery and equipment. We can then simply connect them directly to the cloud platform. (Senior vice president, customer company)*

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