

GENERATIVITY AND PROFITABILITY ON B2B INNOVATION PLATFORMS: A SIMULATION-BASED THEORY DEVELOPMENT¹

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Firms generate innovations to profit from market opportunities, which are newly identified customer needs not yet being met in the market. The rising complexity of market opportunities requires collaboration among multiple partner firms. However, this multipartner collaboration increases transaction and production costs when generating innovations. To address these challenges, incumbents build B2B innovation platforms with mechanisms to reduce partners' transaction and production costs. We do not yet know if and when partners would choose to use the incumbent's traditional service innovation model or the B2B innovation platform and how this choice would affect the generativity and profitability of innovations for the incumbent and the partners. We used agent-based modeling and simulation to develop a theory to address these questions. We found that the complexity of market opportunities interacts with the B2B innovation platform's transaction and production mechanisms to jointly affect whether partners use the platform and when the incumbent and partners achieve generativity and profitability. When the complexity of market opportunities is low, partners use the traditional service innovation model. As complexity increases to medium or high levels, partners begin to use the B2B innovation platform mechanisms to address the transaction and production challenges presented by the complexity of market opportunities. However, there are limits to how much the platform mechanisms can address these challenges. The complexity of market opportunities inhibits the emergence of network effects on B2B innovation platforms and limits the generativity and profitability of platform partners. There are diminishing benefits of investing in the platform's transaction and production mechanisms, and complexity affects whether the platform owner or the partners profit from innovations generated on the platform.

Keywords: B2B innovation platform, transaction mechanisms, production mechanisms, generativity, profitability, service innovation, agent-based modeling and simulation

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Introduction

Incumbent firms with an established business and customer base in a market have traditionally relied on collaborations in their partner ecosystem to generate innovations and profitably take advantage of market opportunities. However, the rising *complexity of market opportunities* (CMO) requires more partners to collaborate. It also increases the transaction and production challenges associated with the traditional service innovation model. Some incumbents build B2B innovation platforms as a potential solution to these challenges (Haki et al., 2024; Schreieck et al., 2022; Stonig et al., 2022). For instance, SAP built a B2B innovation platform in the early 2010s and made it available to its partners along with SAP's traditional service innovation model. Nevertheless, it is still unclear under which circumstances partners in an incumbent's partner ecosystem would choose the B2B innovation platform over the incumbent's traditional service innovation model. Equally unclear is the impact of this choice on the generativity and profitability of innovations for the incumbent firm and its partners. In this study, we address these questions.

Market opportunities are lucrative market imperfections that firms seek to exploit through service innovation, either alone or in collaboration with one another (Alvarez et al., 2013; Berglund et al., 2020; Davis et al., 2009; Shane, 2000; Shepherd et al., 2017). Market opportunities become complex when their requirements entail the integration of a large number and a wide variety of resources (Davis et al., 2009; Haki et al., 2020; Lusch & Nambisan, 2015). Consider a car manufacturer that uses a SAP system and requires a new software module for after-sales support. The complexity of this market opportunity is relatively low, as the car manufacturer can utilize the standard service of Salesforce and integrate it into its core SAP system. Consider the same car manufacturer needing to extend its enterprise IT to establish connections with all sold vehicles equipped with autonomous driving features. This market opportunity would involve collecting real-time sensor data from vehicles, analyzing it to interpret poorly marked road conditions, and subsequently updating self-driving algorithms. It is a complex market opportunity with no off-the-shelf solution. Various firms need to collaborate to integrate their resources, including sensor technologies, telematics, real-time data analytics, and machine learning applications, to generate the required innovation (Tarafdar & Tanriverdi, 2018).

In a B2B context, even resourceful firms may not possess the number or variety of resources required to develop innovations that meet CMO. Therefore, firms seek to collaborate with other firms (partners) to integrate each other's specialized and complementary resources (Lusch & Nambisan, 2015; Ozcan & Eisenhardt, 2009; Teece, 1986; Uzzi, 1997). Collaborating with multiple partners increases the transaction and production

costs of innovations due to the challenges involved in finding collaborators with complementary resources, managing the extent to which partners protect or share intellectual property, or ensuring the compatibility and interoperability of resources contributed by various partners (Krishnan et al., 2006; Madhok & Tallman, 1998; Wolter & Veloso, 2008). These challenges and costs can reduce partners' generativity and the profitability of innovations.

A B2B innovation platform is a digital technology foundation on which partner firms can co-create innovations in response to complex market opportunities (Cusumano et al., 2019; Haki et al., 2024). These platforms offer *transaction mechanisms* (TM) and *production mechanisms* (PM) that aim to reduce partners' transaction and production costs when generating innovations (e.g., Ceccagnoli et al., 2012; Malgonde et al., 2020; Staub et al., 2022; Tiwana, 2015b).

Incumbent firms build B2B innovation platforms and invest in platforms' TM and PM (Haki et al., 2024; Sandberg et al., 2020; Stonig et al., 2022; Svahn et al., 2017) with the hope of addressing CMO challenges. They offer their B2B innovation platforms to their existing partners as an additional venue of service innovation alongside their traditional service innovation models (Haki et al., 2024; Matzner et al., 2021; Yoo et al., 2010). Due to the scarcity of both theoretical and practical insights in B2B contexts, incumbent firms draw inspiration from B2C contexts (e.g., Cennamo & Santaló, 2019; Eaton et al., 2015; Huang et al., 2017; Oh et al., 2015) on how B2B innovation platforms would help them address CMO challenges. However, it is not clear if the underlying assumptions of B2C platforms would also be valid and applicable in B2B platforms. We have reasons to expect that B2B platforms' dynamics are different than those of B2C platforms.

First, supply-side and demand-side network effects are assumed to be critical success factors for a B2C platform's performance (Cennamo & Santaló, 2019; Cusumano, 2010; Thomas et al., 2014). However, a recent study failed to find evidence of supply-side network effects on many B2B platforms (Anderson et al., 2022). We build on this study and seek to generate new insights by examining how CMO, TM, and PM interact to enable or constrain the emergence of network effects on B2B innovation platforms. Specifically, we investigate whether and when existing partners of an incumbent firm are attracted to and use a B2B innovation platform. A related assumption is that digital platforms foster unbounded growth through the generativity of innovations (Tilson et al., 2010). In practice, however, many platforms fail to demonstrate the unbounded generativity of innovations (Fürstenau et al., 2023). We seek to explain when CMO, TM, and PM might enable or place limits on the generativity of a B2B innovation platform.

Second, existing literature has only investigated the independent effects of either TM or PM in isolation from the other (e.g., Ceccagnoli et al., 2012; Tae et al., 2020). An implicit assumption is that investing more in either or both mechanisms should lead to better generativity and profitability outcomes (Thomas et al., 2014). However, this assumption has yet to be tested and validated empirically. In addition to the independent effects of TM and PM, we examine whether the two mechanisms interact with one another to either dampen or amplify each other's effects on the generativity and profitability outcomes on B2B innovation platforms.

Third, existing literature assumes that both the platform owner and its partners must achieve generativity and profitability outcomes for the sustainability of the digital platform (e.g., Parker et al., 2017; Tiwana, 2015a). The primary consideration for each partner when deciding whether or not to use a platform is their individual generativity and profitability outcomes (Cennamo & Santaló, 2019). Meanwhile, the platform owner is interested in the overall generativity and profitability outcomes of the ecosystem to ensure the platform's survival and prosperity (Tiwana, 2014). Our study goes beyond an either-or approach, which is common in existing platform literature (e.g., Boudreau, 2010; de Reuver et al., 2018; Staub et al., 2021), and instead considers the distinct interests of both the platform owner and partners. We seek to understand if and when both platform owner and partners will achieve generativity and profitability on a B2B innovation platform, and the conditions under which either platform owner or partners might reap more generativity and profitability outcomes.

We used a simulation-based theory development and refinement approach (Beese et al., 2019; Davis et al., 2007; Dong, 2022) to explain how CMO, TM, and PM affect generativity and profitability outcomes on a B2B innovation platform. Specifically, we chose agent-based modeling to experimentally manipulate CMO, TM, and PM and examined their independent and joint effects.

We found that CMO interacts with the platform's TM and PM to jointly affect when partners use the B2B innovation platform, as well as when the platform owner and individual partners achieve generativity and profitability. If CMO is low, partners are self-sufficient in innovating off-platform and do not have compelling reasons to use the platform. It is only when CMO is medium or high that partners use platform mechanisms to address the transaction and production challenges of responding to complex market opportunities. However, there are limits to how much platform mechanisms can address these challenges. On B2B innovation platforms, CMO constrains the emergence of network effects. It also

places limits on the generativity and profitability of partners on the platform. There are also diminishing benefits of investing in the platform's TM and PM. Further, CMO affects whether the platform owner or the individual partners profit from the innovations generated on the platform.

Research Background

Exploiting Market Opportunities

Firms generate service² innovations in response to market opportunities (Davis et al., 2009; Lusch & Nambisan, 2015), which “involves applying resources for the benefit of others [i.e., other firms] or oneself” (Lusch & Nambisan, 2015, p. 158). In this context, resources are “anything an actor [i.e., a firm] can draw on for support [which] can be internal to actors and under their control, or external to actors but capable of being drawn on for support” (Lusch & Nambisan, 2015, p. 159). Service innovation “can then be considered the rebundling of diverse resources that create novel resources that are beneficial ... to some actors in a given context” (Lusch & Nambisan, 2015, p. 161).

From a process standpoint, service innovation is a process of “search” for novel combinations of resources (Ganco et al., 2020; Parker & van Alstyne, 2018). It is a co-creational process, where each firm offers a resource (e.g., a physical resource, production knowledge, customer knowledge) or a set of resources that can be combined with the resources of other firms. This serves to generate innovations in response to market opportunities (Lusch & Nambisan, 2015). From an outcome standpoint, service innovation aims at “value creation” through services in response to market opportunities and “value appropriation” to gain profit from the generated services (Ahuja et al., 2008; Jacobides et al., 2006). Thus, the outcomes of service innovation can be measured by the collaborating partner firms' *generativity* of service innovation and their *profitability* from service innovation (Bowman & Ambrosini, 2000; Ceccagnoli et al., 2012; Lepak et al., 2007). Generativity denotes the variety of unique services generated by heterogeneous partners (Cennamo & Santaló, 2019), representing value creation in a co-creational process of service innovation (Ceccagnoli et al., 2012; Thomas et al., 2014). In turn, profitability denotes the difference between the revenue generated from a service offering and the costs incurred in producing the service (Oh et al., 2015), representing value appropriation in a co-creational process of service innovation (Ceccagnoli et al., 2012; Oh et al., 2015).

² Following existing conceptualizations, the notion of “service” covers both tangible (products) and intangible (service) outputs in economic exchanges (see Lusch & Nambisan, 2015).

The changing nature of market opportunities requires efficient but swift service innovations that meet the requirements of the emergent market opportunities (Davis et al., 2009; Haki et al., 2020). When market opportunities are relatively simple, partners may rely on their own internal resources for service innovation. With increasing CMO, partners may no longer be able to meet the requirements with their internal resources and are hence likely to conduct local and distant “searches” in the ecosystem (Levinthal, 1997) to find other partners who can contribute complementary resources (Lusch & Nambisan, 2015). The higher the CMO, the more co-specialization is required (Teece, 1986), which in turn might necessitate resource contributions from various partners (Lusch & Nambisan, 2015).

Platform Mechanisms to Address the Challenges of Exploiting Complex Market Opportunities

Due to CMO, partners collaborating in service innovation may encounter many transaction-related and production-related challenges that incur costs and may affect their generativity and profitability. Partners may struggle to search for and find collaborators who can contribute complementary resources to the innovation process. Assessing the quality of the resources and gaining trust in the collaborators also present challenges (Krishnan et al., 2006). During the collaboration process, partners face dilemmas relating to the extent to which their intellectual property should be shared with—or protected from—other collaborators (Jarvenpaa & Majchrzak, 2016). When collaborators behave opportunistically, partners also struggle to resolve the ensuing disputes and conflicts (Madhok & Tallman, 1998). These and further challenges increase partners’ *transaction costs*. Service innovation also creates production-related challenges for partners, increasing their *production costs*. A complex market opportunity is not easy to decompose into well-defined resources that can be sourced from various partners. A lack of resource compatibility and interoperability, well-defined interfaces, and common development kits across multiple partners presents challenges, increases production costs, and inhibits the innovation process (Wolter & Veloso, 2008).

One of the main premises of digital platforms is to offer *mechanisms* that ease partners’ challenges in service innovation and reduce their transaction and production costs (e.g., Ceccagnoli et al., 2012; Malgonde et al., 2020; Tiwana, 2015b).

Generally speaking, digital platforms are “a set of digital resources—including services and content—that enable value-creating interactions between external producers and consumers” (Constantinides et al., 2018, p. 381). Digital platforms can be of two types, depending on their basis for value creation (Bonina et al., 2021; Cusumano et al., 2020).

Innovation platforms “facilitate the development of new, complementary products and services, such as PC or smartphone apps, that are built mostly by third-party companies without traditional supplier contracts” (Cusumano et al., 2020, p. 28). Common examples of innovation platforms are Microsoft Windows, Google Android, Apple iOS, and SAP Business Technology Platform. Transaction platforms “are intermediaries or online marketplaces that make it possible for participants to exchange goods and services or information” (Cusumano et al., 2020, p. 28). Common examples of transaction platforms are Amazon Marketplace, Uber, and Airbnb. On innovation platforms, value is created out of the myriad of services generated by the partners using the platform, whereas on transaction platforms value is created through facilitating the exchange of services between actors (Bonina et al., 2021).

Although the discussion of platform mechanisms in the IS literature has generated a considerable body of knowledge, it remains somewhat fragmented. Therefore, we organize platform mechanisms, with regard to their role in reducing transaction and production costs in service innovation, into two overarching categories: transaction and production mechanisms (TM and PM, respectively).

Digital platforms can reduce transaction costs through TM. Platform owners can invest in various mechanisms, such as search-matching and multisided recommender systems, to enable effective search and matching processes (Dinerstein et al., 2018; Malgonde et al., 2020). Feedback, ratings, and reputation measurement systems are other mechanisms that enable partners to assess the credibility of potential collaborators (Tae et al., 2020) and their trustworthiness (Rietveld et al., 2019; Rietveld et al., 2018). Platform owners can also invest in procedures to help resolve any conflicts among partners (Wareham et al., 2014) and implement certifications and reward systems as quality signals for partners’ resources (Ceccagnoli et al., 2012; Rietveld et al., 2019; Rietveld et al., 2018). Additionally, platform owners can establish knowledge sharing and seeding channels to build trust in the platform and among partners (Huang et al., 2018; Perrons, 2009; Sampler, 2018; Zhang et al., 2022).

Digital platforms can also reduce production costs through PM. Platform owners can invest in various mechanisms to reduce the cost of co-creating innovations. This includes standardization of the platform’s core and interfaces as well as ensuring the compatibility and interoperability of partners’ resources with the platform’s core (Ceccagnoli et al., 2012; Mantovani & Ruiz-Aliseda, 2016; Tiwana, 2015b; Wareham et al., 2014). Boundary resources (e.g., SDKs, APIs) are other common mechanisms used to cultivate the development of innovations by partners and overcome compatibility challenges among partners’ resources (Boudreau, 2017;

Ghazawneh & Henfridsson, 2013). Platform owners can also invest in mechanisms to modularize resources contributed to the platform by partners to enhance their reusability (Brunswick et al., 2019; Cennamo et al., 2018).

Incumbent Firms' Investments in Platform Mechanisms

One of the emerging trends in the platform economy is the sheer interest of incumbent firms in building their own digital platforms (e.g., Haki et al., 2024; Sandberg et al., 2020; Schrieck et al., 2022; Stonig et al., 2022; Svahn et al., 2017). Here, incumbent firms follow two main objectives. First, they seek to address the production- and transaction-related challenges of CMO through investing in a platform's TM and PM (e.g., Ceccagnoli et al., 2012; Malgonde et al., 2020; Tiwana, 2015b). The second objective relates to the phenomenal success of digital platform-native startups, which has disrupted incumbent firms in various industries (de Reuver et al., 2018). Incumbent firms seek to fend off the threat of entry and disruption by platform-native startups (Ceccagnoli et al., 2012; Schrieck et al., 2022) and further establish themselves as ecosystem leaders by offering their own digital platforms (Stonig et al., 2022).

Despite significant investments in platforms' TM and PM, few incumbent firms succeed in attracting partners and gaining traction. Such incumbent firms thus enjoy enormous returns and competitive positions, while many others fail (Gawer & Cusumano, 2008; Hagi & Altman, 2017; Yoffie et al., 2019; Zhu & Furr, 2016). Previous research has predominantly concentrated on platform-native firms (e.g., Cennamo & Santaló, 2019; Eaton et al., 2015; Huang et al., 2017; Oh et al., 2015; Tan et al., 2015). These firms use a digital platform as a green field to establish their partner ecosystems. In contrast, incumbent firms come with established partner ecosystems. They offer their existing partners a B2B innovation platform as an alternative locus of service innovation in addition to their traditional models (Haki et al., 2024; Matzner et al., 2021; Yoo et al., 2010). Yet, the endeavors of incumbent firms to venture into platform businesses continue to constitute unexplored terrain within the platform economy (Haki et al., 2024).

The success or failure of incumbent firms in entering platform businesses depends heavily on attracting a critical mass of existing partners in the ecosystem that choose to transact on-platform (e.g., Gawer & Cusumano, 2008; Rochet & Tirole, 2003). This topic is covered in the existing research on the role of partners and owner-partner relationships, which is one of the major streams of research on platforms (Rietveld & Schilling, 2021). This literature stream has focused on explaining why using a platform might be beneficial for partners (e.g., Ceccagnoli et al., 2012; Wareham et al., 2014)

and how owners could incentivize partners to use the platform (e.g., Boudreau, 2017; Gawer & Henderson, 2007). It has also examined how partners' benefits from the platform can be optimized (e.g., Brunswick et al., 2019; Malgonde et al., 2020) and explored the collaboration and competition dynamics among partners on-platform (e.g., Boudreau, 2012; Rietveld et al., 2019).

However, there is a limited understanding of situations in which an incumbent firm offers a B2B innovation platform to existing partners. In such cases, incumbent firms should operate the innovation platform business (on-platform) and the traditional business (off-platform) side by side within the ecosystem (Haki et al., 2024; Matzner et al., 2021; Schrieck et al., 2021; Schrieck et al., 2022). However, there is still more to learn about when partners might use on-platform or off-platform alternatives. Specifically, when partners opt for the on-platform alternative, they are required to share a portion of their revenue with the platform owner (i.e., the incumbent firm) as compensation for using the platform's TM and PM (Karhu et al., 2018). The choice of partners for innovating on-platform or off-platform alternatives can be impacted by CMO, which determines whether partners need the platform's TM and PM to co-create innovation with other partners and address the associated challenges. We examine if and how the partners' choice to innovate on a B2B innovation platform is affected by the CMO level and the platform owner's investments in TM and PM.

Further, as shown by existing research, platform mechanisms can demonstrate both positive (Boudreau, 2012; Ceccagnoli et al., 2012; Cennamo & Santaló, 2019; Kapoor & Agarwal, 2017) and negative effects (Boudreau, 2012; Casadesus-Masanell & Halaburda, 2014; Cennamo & Santaló, 2019; Mantovani & Ruiz-Aliseda, 2016) on generativity or profitability. These seemingly conflicting findings suggest the potential presence of missing contingencies. We examine whether CMO might be one of these contingencies in the B2B context, influencing whether TM and PM yield positive or negative impacts on generativity and profitability. Additionally, existing research has investigated the independent effects of TM and PM in isolation from each other (e.g., Ceccagnoli et al., 2012; Tae et al., 2020). This isolated approach could contribute to the conflicting results. We go beyond the independent effects to consider whether TM and PM interact to amplify or dampen each other's effects on generativity and profitability.

In addition, as previously noted, the success of incumbent firms' platform initiatives largely depends on attracting a critical mass of existing partners to use the platform (e.g., Gawer & Cusumano, 2008; Rochet & Tirole, 2003). This boost in platform adoption by partners is reflected in the concept of supply-side network effects (Cusumano, 2010). This concept denotes the number of partners choosing to

transact on-platform, which increases the platform's value in service innovation and encourages more partners to innovate on-platform (Cennamo & Santaló, 2019; Thomas et al., 2014). Although network effects are crucial for platform success, existing research has explored the phenomenon of competitive crowding (e.g., Boudreau, 2012; Boudreau & Jeppesen, 2015; Casadesus-Masanell & Halaburda, 2014; Foerderer et al., 2018; Li & Netessine, 2020; Mantovani & Ruiz-Aliseda, 2016). It occurs when a large number of partners join the platform, potentially reducing partners' innovation incentives due to excess competition and leading to "business stealing" among partners (Boudreau, 2012). While more partners can increase innovation generativity, this may not necessarily result in greater profitability if the services generated do not surpass those of competitors (Mantovani & Ruiz-Aliseda, 2016). Given the tension between network effects and competitive crowding (Boudreau, 2012), we posit that this tension could be elucidated by CMO within the B2B context, which might require a certain number of partners to use the platform's TM and PM and to contribute their resources. We thus investigate whether the number of partners using a B2B innovation platform has positive or negative effects on generativity and profitability under different levels of CMO, TM, and PM.

Research Method

To empirically measure if and how CMO, TM, and PM interact with each other in affecting the emergence of generativity and profitability, active intervention is needed to observe natural variance in key variables. Controlling for confounding variables affecting the studied behavior is also crucial. In such settings, researchers employ modeling and simulations to create a controlled computational environment for experimental variable manipulation and outcome observation (e.g., Miranda et al., 2022; Nan & Tanriverdi, 2017). This approach offers flexibility in manipulating variables to identify causal influences on emergent outcomes (Kiesling et al., 2012). Running numerous experiments in this setting is feasible (e.g., Brunswicker et al., 2019), while real-world replication would be impractical, if at all feasible.

Therefore, we opt for a simulation-based approach, specifically agent-based modeling (ABM), which is commonly employed for theory development (Beese et al., 2019; Davis et al., 2007; Dong, 2022). ABM enables the modeling of diverse and adaptive elements within a system, including their interactions, and the capacity to nudge the system to observe resulting outcomes (Nan & Tanriverdi, 2017). ABM makes it feasible to experimentally manipulate our independent variables (CMO, TM, and PM) to conduct what-if analyses to an extent that would not be feasible in conventional empirical settings (Nan & Tanriverdi, 2017).

Following existing ABM-based studies (Haki et al., 2020) and common recommendations for simulation-based research (Davis et al., 2007; Sargent, 2005), we developed the simulation model through an iterative process shifting between conceptual model development, operational model development, and validation and experimentation.

Simulation's Conceptual Model

We constructed a model of an incumbent firm's ecosystem of partners, which is a venue of service innovation where a multitude of partner firms co-create services in response to market opportunities (Jacobides et al., 2018; Lusch & Nambisan, 2015). In this model, the incumbent firm invests in an innovation platform's TM and PM, and offers the innovation platform as an additional locus of service innovation next to its traditional (i.e., off-platform) service innovation model (Haki et al., 2024; Sandberg et al., 2020; Schrieck et al., 2022; Yoo et al., 2010). Partners have the option to engage in bundling each other's resources to design innovative services. This can either be done on-platform, employing the platform's TM and PM and sharing parts of their revenue with the platform owner in return, or off-platform on their own. In both cases, the services generated must match market opportunities (Davis et al., 2009; Haki et al., 2020). Given the level of CMO, partners may adapt their choice of innovating on- or off-platform. Partners' choice of innovating on- or off-platform may also be impacted by the platform's TM and PM, which can help partners address challenges entailed in service innovation by reducing their transaction and production costs.

Therefore, the simulation model's *experimentally manipulated variables* are CMO and the platform owner's (i.e., incumbent firm's) investments in TM and PM. The model captures the effects of these variables on partners' generativity and profitability outcomes, which serve as *dependent variables*. Figure 1a depicts the conceptual model and the relations among the variables of interest.

Simulation's Operational Model

Service innovation involves the bundling of partners' resources to generate a service that matches a market opportunity's requirements (Davis et al., 2009; Lusch & Nambisan, 2015). Figure 1b and 1c show how we operationalized resources, services, market opportunities, and the matching of services with market opportunities.

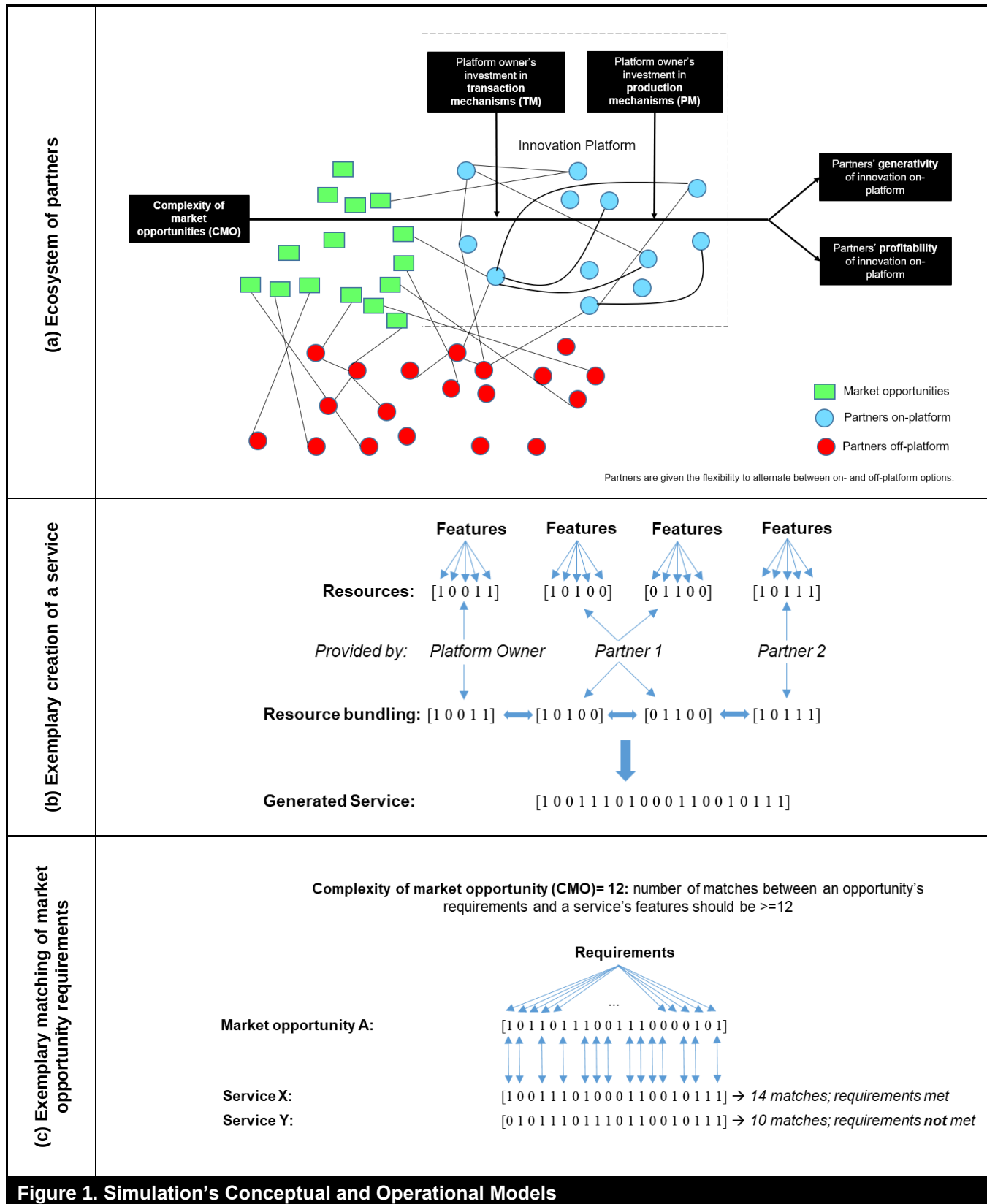


Figure 1. Simulation's Conceptual and Operational Models

Our ABM operationalizes each resource as a five-bit vector, each bit representing a feature (Davis et al., 2009; Haki et al., 2020). Resources are bundled by partners to generate a service. In our ABM, each service consists of four resources to represent a service as a bundle of several resources. This makes each service a 20-bit vector, i.e., each service contains 20 features contributed by the constituent resources. Our ABM also operationalizes each market opportunity as a 20-bit vector, each bit representing a requirement (Davis et al., 2009; Haki et al., 2020).

Experimentally manipulated variables: Building on existing simulation models (Davis et al., 2009; Haki et al., 2020), our model captures *CMO* as the number of a market opportunity's requirements that "must" be addressed successfully in service innovation. The *CMO* level is thereby determined by the number of a service's features (from the 20-bit vector of a service) that should exactly match the market opportunity's requirements (from the 20-bit vector of a market opportunity) (Davis et al., 2009; Haki et al., 2020). A service matches a market opportunity when the number of matches between a market opportunity and a service is greater than or equal to *CMO*. For example, if *CMO* = 12, there should be at least 12 features of a service that exactly match a market opportunity's requirements (Figure 1c). Given that each market opportunity is operationalized as a 20-bit vector, *CMO* varies from 1 to 20.

Building on platforms' premises to address *CMO* challenges in service innovation, the platform owner's *investments in TM and PM* are supposed to reduce partners' transaction and production costs (e.g., Ceccagnoli et al., 2012; Malgonde et al., 2020; Tiwana, 2015b). The latter is the reason why partners choose to transact on-platform instead of choosing the off-platform alternative. In the simulation model, both transaction costs and production costs can be reduced by a factor of 0.00-1.00 on-platform, with increments of 0.05, depending on the platform owner's level of investment in *TM* and *PM*.

Dependent variables: When changing the level of the platform owner's investments in *TM* and *PM*, the simulation model captures the impact of *CMO*'s various levels on partners' *generativity* and *profitability* outcomes both on- and off-platform.

This study considers the perspectives of both the platform owner and partners. The simulation model considers both the *average* and *total* outcomes of partners' generativity and profitability to account for these two perspectives. Partners' average generativity and profitability represent their key metrics of interest for innovating on-platform to achieve their individual outcomes (Cennamo & Santaló, 2019). Meanwhile, the platform owner's key metrics of interest for investing in

platform mechanisms are partners' total generativity and profitability on-platform to achieve ecosystem-level outcomes (Tiwana, 2014).

Additionally, the simulation model captures another variable that helps us understand the varying effects of experimentally manipulated variables (*CMO*, *TM*, *PM*) on dependent variables (partners' generativity and profitability). These effects can be attributed to the *number of partners on-platform* (those who decided to use the platform), which can result in network versus crowding effects (e.g., Boudreau & Jeppesen, 2015; Foerderer et al., 2018).

Model's operational components: We built our ABM in line with existing agent-based models capturing *agents*, the *interactions* among agents, and the surrounding *environment* in which interactions occur (Haki et al., 2020; Nan, 2011) using NetLogo.

The simulation model captures two types of *agents* (Haki et al., 2020; Jennings, 2000): Learning- or utility-based agents (i.e., partners) are capable of undertaking autonomous actions. They choose actions to maximize their outcomes from service innovation following specific attributes and behavioral rules. Reflex agents (i.e., resources and services) are artifacts that are drawn on (resources) or built (services) by learning agents. The simulation model also captures the *interaction* among agents through connections between and resource flows among agents (Haki et al., 2020; Nan, 2011).

Building on existing models, we modeled the *environment* as a flow of market opportunities, with each opportunity containing a random payoff value (Davis et al., 2009; Haki et al., 2020). Table 1 describes the simulation model's components.

Model operations: In the simulation model, partners are exposed to market opportunities from the environment. In response to market opportunities, partners either use their existing services (generated in the previous service innovation occasions) or generate new ones (Haki et al., 2020). Partners first match a market opportunity's requirements with their own existing services. If there is no matching service, partners engage in service innovation. In their quest to search for and find complementary resources that match a market opportunity's requirements, partners initially bundle their own resources (Lusch & Nambisan, 2015). If the internal resources are insufficient to meet the market opportunity's requirements, partners can draw on the resources of other partners (Lusch & Nambisan, 2015). Partners first conduct a local search for complementary resources in their local network (Levinthal, 1997). If still unsuccessful, partners conduct a distant search for complementary resources in the entire ecosystem (Levinthal, 1997).

Table 1. Simulation Model Components

Component		Description	Literature
Agents	Partners (learning-agents)	Attributes: Partners are endowed with four random resources that they bundle to generate services on- or off-platform. Behavioral rules: Partners conduct search (both local and distant) to bundle resources and generate services that match market opportunities. Partners gain a payoff when services to which they contribute are used. Partners also incur transaction costs for searching for other partners' resources and production costs for building/maintaining their resources.	Blaschke et al., 2018; Brunswicker et al., 2019; Ganco et al., 2020; Gavetti et al., 2017; Haki et al., 2020; Levinthal, 1997; Malgonde et al., 2020
	Resources (reflex agents)	Each resource has a set of features (randomized). Resources have an associated randomized production cost.	Ganco et al., 2020; Gavetti et al., 2017; Haki et al., 2020; Karhu et al., 2018
	Services (reflex agents)	Each service is generated in response to market opportunities and contains a set of features from the constituent resources.	Ceccagnoli et al., 2012; Haki et al., 2020
	Owner	The owner contributes some resources to all services generated on-platform. The owner gains payoff from services generated or used on its platform, depending on the defined revenue share.	Karhu et al., 2018; Wareham et al., 2014
Interactions	Partner-partner	Connection: Each partner has an initial local network (subject to a local search). New links are established, leading to change in the local network, after a partner's distant search that yields the generation of services. Flow: Partners share resources with and send signals to other partners in their local network. The signals contain information about partners' successful exploitation of market opportunities on- or off-platform, encouraging other partners to use/not-use the platform.	Ganco et al., 2020; Gavetti et al., 2017; Malgonde et al., 2020; Wareham et al., 2014; Yoo et al., 2010
	Partner-resource	Connection: Partners draw on their own or other partners' resources. Flow: Partners own resources and share features of their resources with other partners for service innovation.	
	Resource-service	Connection: Combinations of resources yield services. Flow: Combined resources delineate a service's features.	
	Partner-service	Connection: One partner (the lead partner who initiates the service innovation process) owns each service. Flow: The partner who owns a service provides the initial resources for service innovation.	
	Partner-owner	Connection: The platform owner provides base resources to partners for service innovation on-platform. Flow: Partners on-platform draw on the owner's resources to create services with or without other partners on-platform.	
Environment		Partners are exposed to market opportunities (randomized) in the ecosystem. Each opportunity contains a set of requirements and an associated randomized payoff. Partners, and the platform owner if the service is generated on-platform, obtain payoffs for exploiting market opportunities depending on the number of resources they contribute.	Davis et al., 2009; Haki et al., 2020

Partners generate services off- or on-platform. Off-platform, partners use their own resources or draw on those of other partners within their local network (local search) or the entire ecosystem (distant search). On-platform, one resource contributed by the platform owner along with the resources of partners are bundled to generate a service (Karhu et al., 2018). After checking if the provisioned service (not yet generated) matches a market opportunity, partners consider the transaction costs of finding resources from other partners together with the production costs of employed resources. Here, two conditions are operationalized. First, when generating services off-platform, the transaction costs for a distant search (in the entire ecosystem) are higher than those for a local search (in the local network) (Levinthal, 1997). Second, the transaction and production costs of generating a service are lower on-platform compared to the off-platform alternative (e.g., Ceccagnoli et al., 2012; Malgonde et al., 2020; Tiwana, 2015b), depending on the platform owner's level of investments in TM and PM, respectively. When the investment in one type of platform mechanism is maximized, the associated costs of transaction or production can be reduced by up to 100%, compared to the off-platform alternative.

A market opportunity is exploited, i.e., a service is generated, if the payoff of the corresponding market opportunity exceeds the sum of the transaction and production costs of generating the given service. After a market opportunity is exploited, the payoff from the corresponding market opportunity is distributed among the collaborating partners based on the number of resources they each contributed. If a service is generated on-platform, the platform owner receives a share of the payoff as the owner's revenue (Karhu et al., 2018) and the remaining amount is distributed among the partners based on their respective contributions. Accordingly, the partners' profit is calculated as follows:

$$\begin{aligned} \text{Partners' profit off-platform:} & P_{\text{off-platform}} \\ &= OP - PC_{\text{off-platform}} \\ &\quad - TC_{\text{off-platform}} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Partners' profit on-platform:} & P_{\text{on-platform}} \\ &= OP - OP * RSO \\ &\quad - PC_{\text{on-platform}} - TC_{\text{on-platform}} \end{aligned} \quad (2)$$

P = profit; OP = opportunity payoff (the partner's share, depending on the number of contributed resources); PC = production cost; TC = transaction cost; RSO = revenue share of the platform owner (%). PC and TC are lower on-platform compared to the off-platform alternative, depending on the platform owner's level of investment in TM and PM.

The simulation model also calculates generativity in the form of the number of generated services. While generativity is a quantitative measure of service innovation, the quality of innovations is ensured by successfully meeting the market opportunity's requirements. The simulation model calculates both the average and total generativity and profitability outcomes as, respectively, key metrics of interest for individual partners and the platform owner.

The simulation model also considers partners' movement between on- and off-platform options (Haki et al., 2024). Partners decide to use or not use the platform based on positive or negative signals received from their local network (Haki et al., 2020). A partner receives a positive signal if a local network partner successfully exploits a market opportunity on-platform. Partners on-platform can also choose to transact off-platform (Haki et al., 2024). A partner receives a negative signal if a local network partner successfully exploits a market opportunity off-platform.

Validation and Experimentation

Before conducting simulation experiments, we engaged in various activities to ensure the simulation model's external and internal validity. To ensure external validity, we based our ABM's components and its baseline scenario on existing models. Specifically, we were inspired by existing ABMs for the operationalization of agents, interactions, and the environment (Haki et al., 2020; Nan, 2011). Furthermore, we closely followed existing models for the operationalization of resources, services, opportunities, CMO, the matching process with opportunities, interactions among agents, as well as the operationalization of the environment as a flow of market opportunities (Davis et al., 2009; Haki et al., 2020).

Regarding internal validity, we followed recommended procedures for model validation and verification (Davis et al., 2007; Sargent, 2005). Although some of our model's parameter initialization values were informed by existing models, we calibrated parameters' ranges (boundaries) and determined each parameter's baseline value accordingly. Additionally, we conducted robustness and sensitivity analysis tests to evaluate the effects of variations in the simulation model's parameters on the relationship between the model's variables. Appendix A provides details on the results of the sensitivity analysis, including the parameters' tested ranges and the employed baseline values.

For experimentation, we varied all the manipulated variables (CMO, TM, PM) across the entire possible ranges (Table 2), creating all possible combinations of variable values to track their impact on dependent variables (partners' generativity and profitability).

Each unique parameter setting of manipulated variables was tested 30 times, yielding $21 \times 21 \times 20 \times 30 = 264,600$ total simulation runs. We then analyzed the generated data to track the three-way interactions of the three manipulated variables. To achieve this, we used three levels of CMO: low (mean $- \sigma$ = level 5), medium (mean = level 11), and high (mean $+ \sigma$ = level 16). Within each of these levels of CMO, we examined the individual and two-way interaction effects of TM and PM.

Findings and The Proposed Research Framework

Figure 2 summarizes the research framework and testable propositions derived from the ABM results. This section presents the step-by-step process of deriving a comprehensive set of propositions that collectively constitute our generated theory.

When Do B2B Innovation Platforms Attract and Retain Partners?

We found that CMO affects when a B2B innovation platform is able to attract and retain partners in an incumbent's existing ecosystem of partners. At low CMO levels (1-5), the platform is not able to attract partners, as Figure 3a shows. At low CMO, the number of partner-partner links in the ecosystem is flat, as Figure 3b shows. These findings suggest that partners might be self-sufficient in service innovation at low CMO. The search patterns in Figure 4 confirm that partners are able to meet the requirements of low CMO on their own by reusing their existing services or reconfiguring their internal resources. Therefore, partners do not have a compelling need to use the platform at low CMO.

At medium CMO levels (6-11), partners start joining and using the platform. Their search and link-formation behaviors change. Partners conduct local and distant searches to form new partner-partner links to tap into the complementary resources of other partners. These changes suggest that, at medium CMO levels, partners are no longer self-sufficient in meeting the demanded requirements of service innovations.

At high CMO levels (12-16), partners reduce internal service reuse, internal resource configuration, and local search. They increase the number of distant searches. These changes suggest that partners' own resources or the complementary resources of local collaborators are not sufficient to meet the high variety of requirements entailed in high CMO. Partners perform distant searches to find collaborators who might bring in the missing variety of resources. At high levels of CMO, the platform attracts partners from off-platform to on-platform. It is also able to maximize the number of partners and partner-partner links

on-platform, as Figure 3a and 3b show, respectively. At high CMO, most of the innovation activity takes place on-platform.

At very high levels of CMO (above 16), service innovation entails a much wider variety of resources. Although the platform already maximized the number of partners and partner-partner linkages on-platform, partners are not able to provide the requisite variety of resources demanded by very high CMO. This forces partners to engage in distant searches to find complementary resources that are different than their own. However, partners are unable to assemble the variety of resources to match the needs of very high CMO. Thus, partners stop using the platform, as it no longer enables them to generate the demanded service innovations. Both the number of partners and partner-partner linkages on-platform decline sharply at very high CMO. These results also suggest that very high CMO inhibits the platform's ability to create network effects to lock in and retain partners on-platform.

Proposition 1: *The complexity of market opportunities at various levels affects the attraction and retention of partners on B2B innovation platforms differently.*

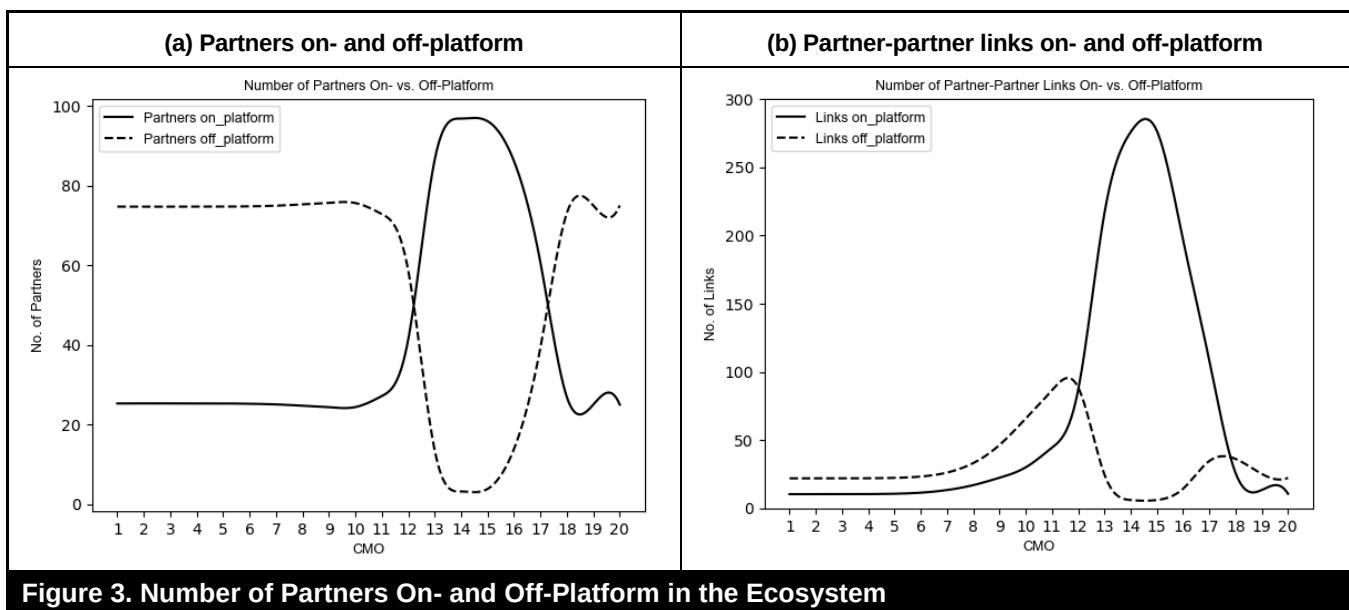
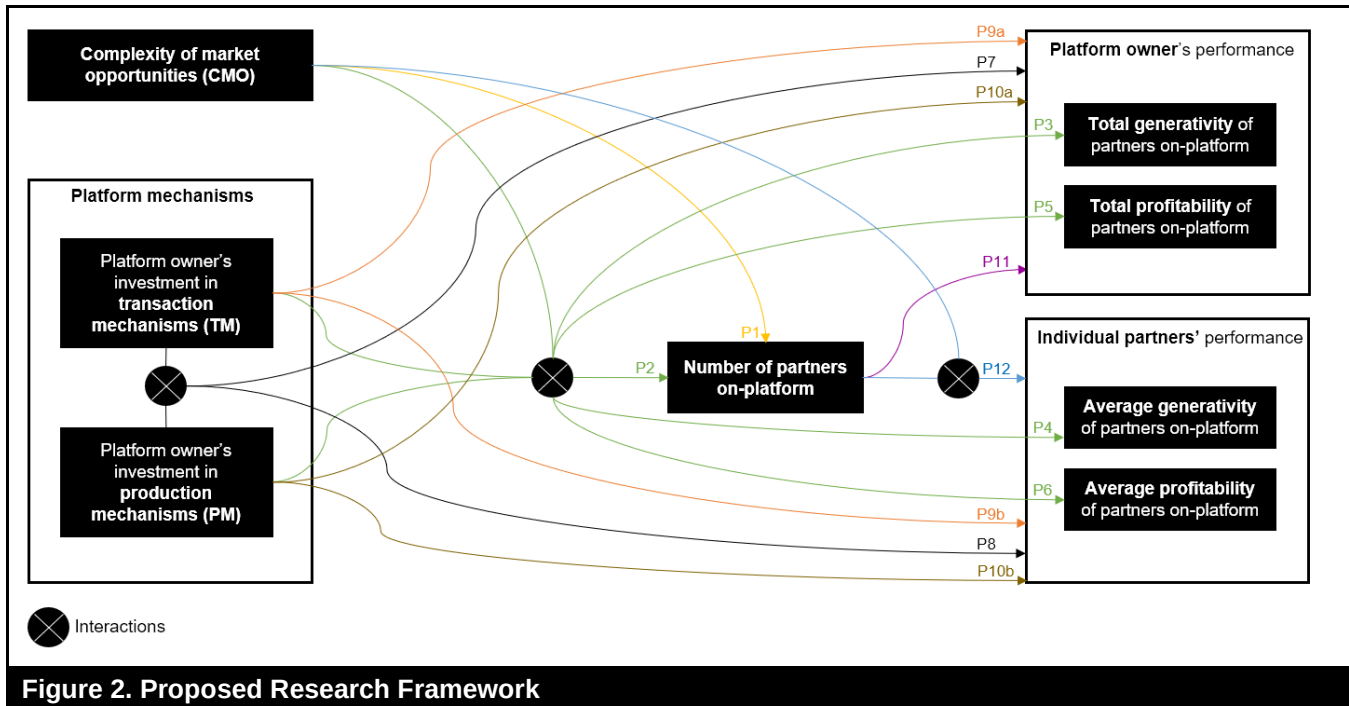
CMO also interacts with TM and PM to jointly affect the number of partners on-platform. The 3D surface plots and regression results in Table 3 show these relationships.

At low CMO, the linear and quadratic terms of both TM and PM do not have any significant effects on the number of partners on-platform, but they do have significant effects at medium and high CMO levels. As previously noted, at low CMO, partners do not have a compelling reason to use the platform mechanisms because they are self-sufficient in service innovation. The platform owner's investments in TM and PM at low CMO do not increase the platform's ability to attract partners. At medium and high CMO levels, PM attracts partners to the platform by making it easier and less costly for partners to integrate each other's resources. Similarly, partners find TM attractive to ease and reduce the costs of conducting local and distant searches. However, the negative signs on the quadratic terms of both TM and PM indicate that these platform mechanisms' benefits in attracting partners slow down and taper off as the platform owner makes further investments in these mechanisms. These findings suggest that even though the platform attracts many partners and PM makes their resources more modular and reusable, the limited variety of resources on-platform inhibits TM in finding complementary resources that match the requirements of medium-high levels of CMO.

Proposition 2: *The relationships between the platform owner's investments in the transaction and production mechanisms of a B2B innovation platform and the platform's ability to attract and retain partners are moderated by the complexity of market opportunities.*

Table 2. Simulation Experiments

Variable	Range	Tested values	Variations
Investments in transaction mechanisms (TM)	0.00-1.00	0.00-1.00 in increments of 0.05	21
Investments in production mechanisms (PM)	0.00-1.00	0.00-1.00 in increments of 0.05	21
Complexity of market opportunities (CMO)	1-20	1-20 in increments of 1	20



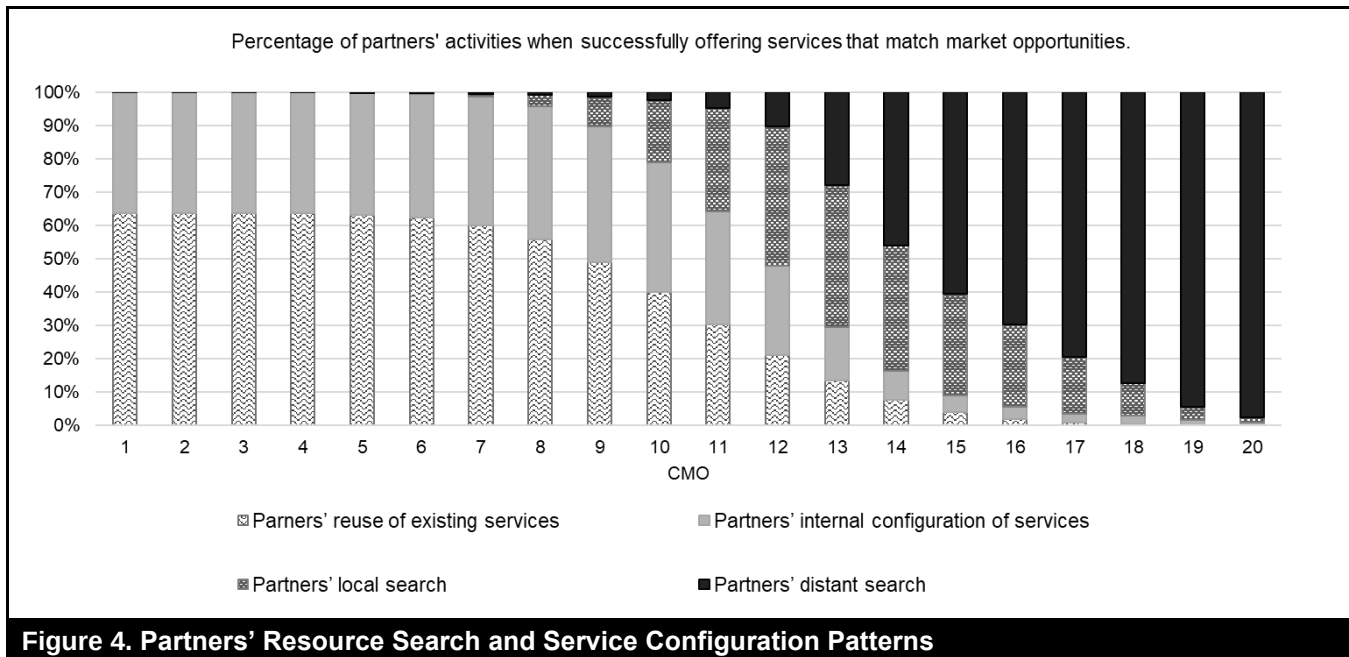
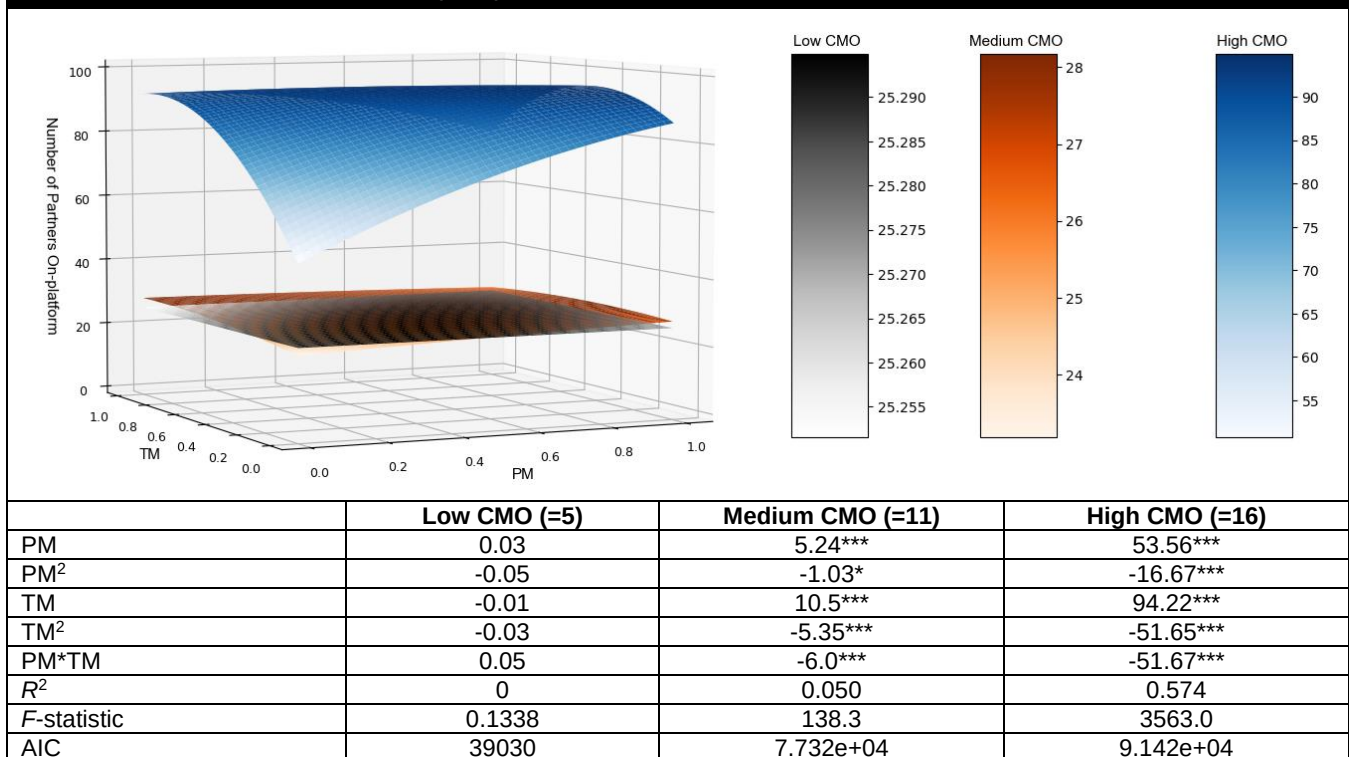


Table 3. Interaction Effects of TM, PM, and CMO on the Number of Partners On-Platform



How Do B2B Innovation Platforms' Mechanisms Affect Partners' Generativity and Profitability On-Platform at Different Complexity Levels of Market Opportunities?

The Effects of Platform Mechanisms on Partners' Total Generativity On-Platform

From the platform owner's perspective, partners' total generativity on-platform is a key performance metric. The interactions among CMO, TM, and PM significantly affect this metric. The platform owner benefits from increasing levels of CMO. As shown in the 3D surface plots and the regression results in Table 4, partners' total generativity on-platform is the lowest at low CMO, medium at medium CMO, and the highest at high CMO.

There are diminishing total generativity benefits of the platform owner's investments in TM and PM. CMO moderates these relationships, but it moderates the TM-total generativity relation differently than the PM-total generativity relation. Specifically, TM's effects on total generativity on-platform taper off at increasing levels of TM at all three levels of CMO. TM's linear terms have positive and significant effects, while TM's quadratic terms have negative and significant effects on total generativity at all three levels of CMO. In comparison, PM's effects on total generativity on-platform taper off at medium levels of CMO only. PM has positive linear effects on partners' total generativity at low and high levels of CMO. PM's quadratic term is negative and significant at medium levels of CMO only.

Proposition 3: *The platform owner's investments in the transaction and production mechanisms of a B2B innovation platform have diminishing effects on the total generativity of partners on-platform (a key metric for the platform owner), and these relationships are moderated differently by the complexity of market opportunities.*

The Effects of Platform Mechanisms on Partners' Average Generativity On-Platform

From the perspective of individual partners, the average generativity of partners on-platform is a key performance metric. Partners' average generativity on-platform increases when CMO increases from low to medium levels only, as the 3D surface plots and the regression results in Table 5 show. As CMO increases further from medium to high levels, partners' average generativity starts declining. Together, the findings in Tables 4 and 5 indicate that increasing CMO affects the platform owner and partners on-platform

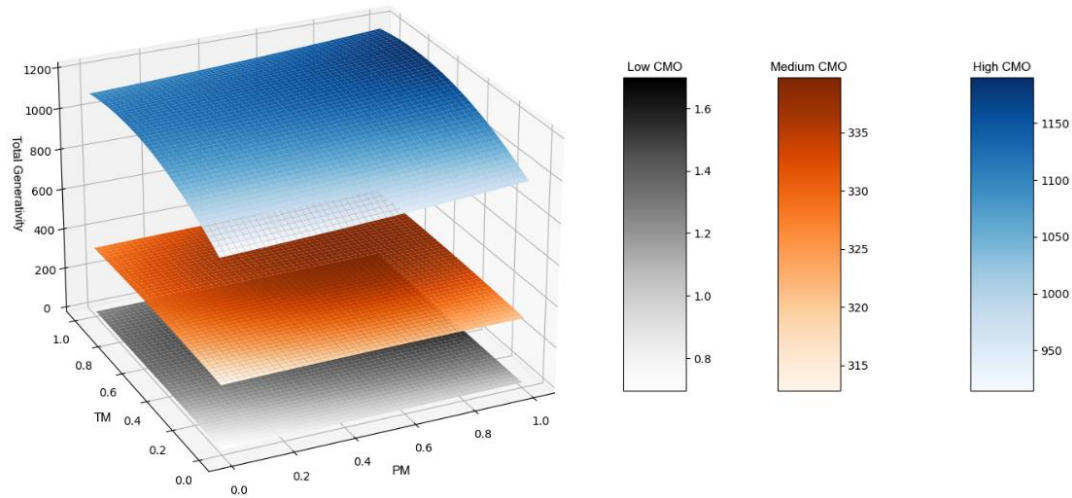
differently. While the platform owner continues to benefit from higher total generativity with increasing levels of CMO, individual partners only become more generative at medium CMO levels and start experiencing declining generativity at high CMO levels.

The platform owner's investments in TM and PM have diminishing generativity benefits for individual partners on-platform. CMO moderates these relationships, but the moderation effects are different for the TM-average generativity and PM-average generativity relations. TM's linear terms have positive and significant effects on partners' average generativity, whereas TM's quadratic terms have negative and significant effects at all three levels of CMO. These results imply that TM has diminishing benefits for individual partners' generativity at all levels of CMO. In comparison, increasing PM investments has positive and significant effects on partners' average generativity on-platform at low CMO. These benefits do not taper off, as the quadratic term of PM is not significant. At low CMO, there are a few partners on-platform (Figure 3a), and PM seems to improve their individual generativity by modularizing their resources. At medium and high levels of CMO, the linear term of PM is positive and significant, whereas PM's quadratic term is negative and significant. These results suggest that PM investments have diminishing generativity benefits for individual partners at medium and high levels of CMO.

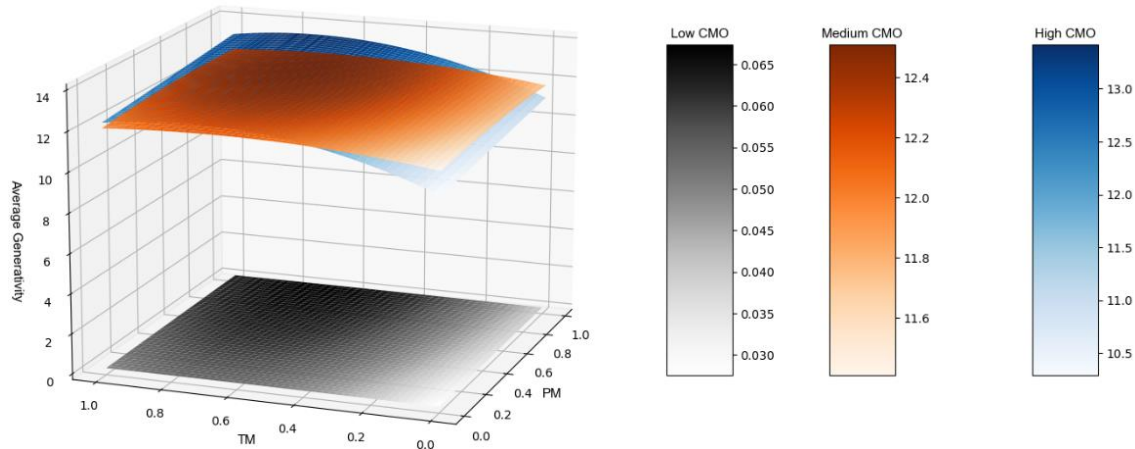
Proposition 4: *The platform owner's investments in the transaction and production mechanisms of a B2B innovation platform have diminishing effects on the average generativity of partners on-platform (a key metric for individual partners), and these relationships are moderated differently by the complexity of market opportunities.*

The Effects of Platform Mechanisms on Partners' Total Profitability On-Platform

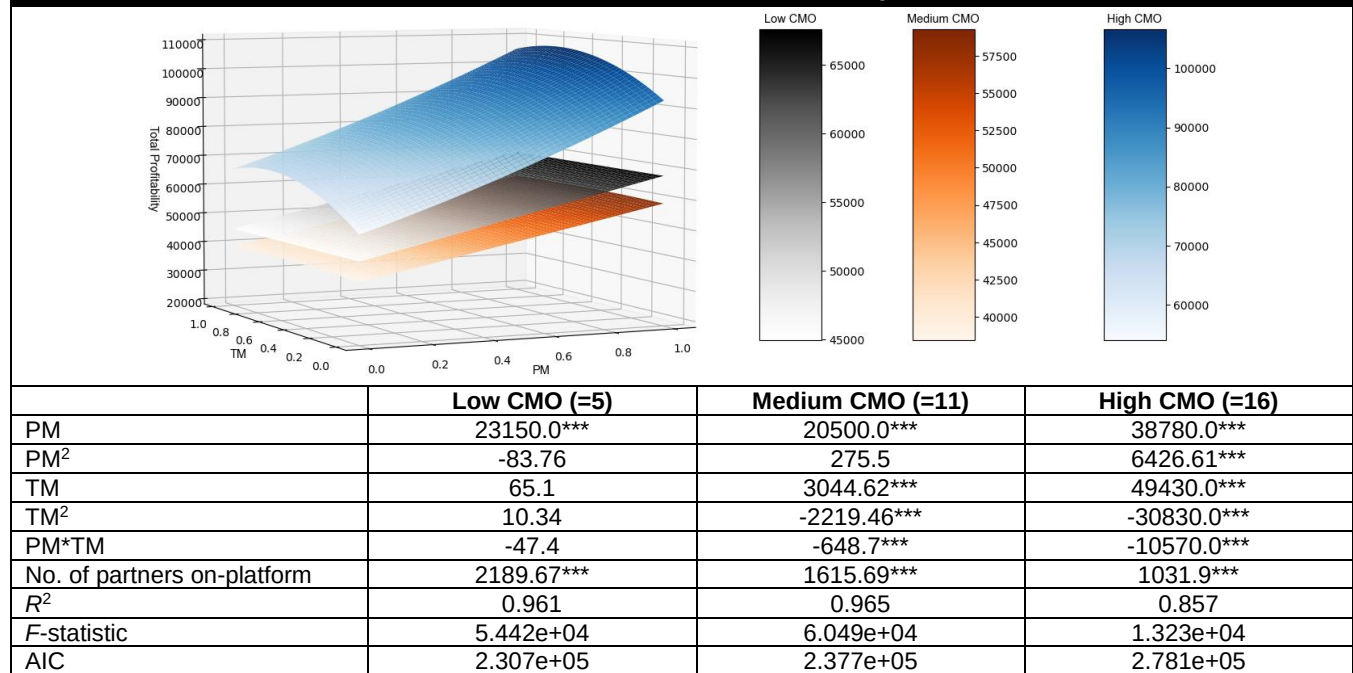
For the platform owner, the total profitability of partners on-platform is another key performance metric. We found that CMO, TM, and PM interact with each other to jointly affect this metric, as shown by the 3D surface plots and the regressions in Table 6. Total profitability is the highest at high CMO and the lowest at medium CMO. Recall from Table 4 that increasing levels of CMO lead to increasing levels of total generativity. We found that increasing total generativity does not always translate to total profitability. As Table 6 shows, when CMO increases from low to medium levels, total profitability declines even though total generativity increases.

Table 4. Interaction Effects of TM, PM, and CMO on Total Generativity of Partners On-Platform

	Low CMO (=5)	Medium CMO (=11)	High CMO (=16)
PM	1.09***	40.46***	246.41***
PM ²	-0.23	-15.54***	0.4
TM	2.49***	71.19***	835.92***
TM ²	-1.39***	-39.54***	-465.81***
PM*TM	-1.05***	-33.18***	-312.19***
No. of partners on-platform	0.04**	12.17***	15.04***
R ²	0.034	0.765	0.823
F-statistic	77.31	7157.0	1.024e+04
AIC	4.571e+04	1.294e+05	1.628e+05

Table 5. Interaction Effects of TM, PM, and CMO on Average Generativity of Partners On-Platform

	Low CMO (=5)	Medium CMO (=11)	High CMO (=16)
PM	0.04***	1.67***	3.42***
PM ²	-0.01	-0.63***	-0.33**
TM	0.1***	2.93***	9.85***
TM ²	-0.05***	-1.64***	-5.48***
PM*TM	-0.04***	-1.37***	-3.97***
No. of partners on-platform	-0.0	-0.01*	0.09***
R ²	0.033	0.051	0.713
F-statistic	76.12	118.4	5467.0
AIC	-3.975e+04	4.253e+04	4.191e+04

Table 6. Interaction Effects of TM, PM, and CMO on Total Profitability of Partners On-Platform

These results point to crowding effects in profitability. At medium CMO, the platform attracts more partners (Figure 3a). More partners make more resources available for innovation and increase total generativity. However, more partners also lead to price competition and reduce the profitability of winning innovations. At low CMO, there are few partners on-platform (Figure 3a) and the competitive intensity is low. If partners are able to generate services, they do not face much price competition, and total profitability is hence higher at low CMO than at medium CMO. At high CMO, the platform attracts more partners (Figure 3a), but generating an innovation also becomes very challenging due to the wide variety of resources needed to meet the requirements of high CMO. If partners succeed in generating matching innovations, they are able to charge higher prices due to the rareness of innovations meeting the requirements. Thus, the total profitability of the platform is highest at the high level of CMO.

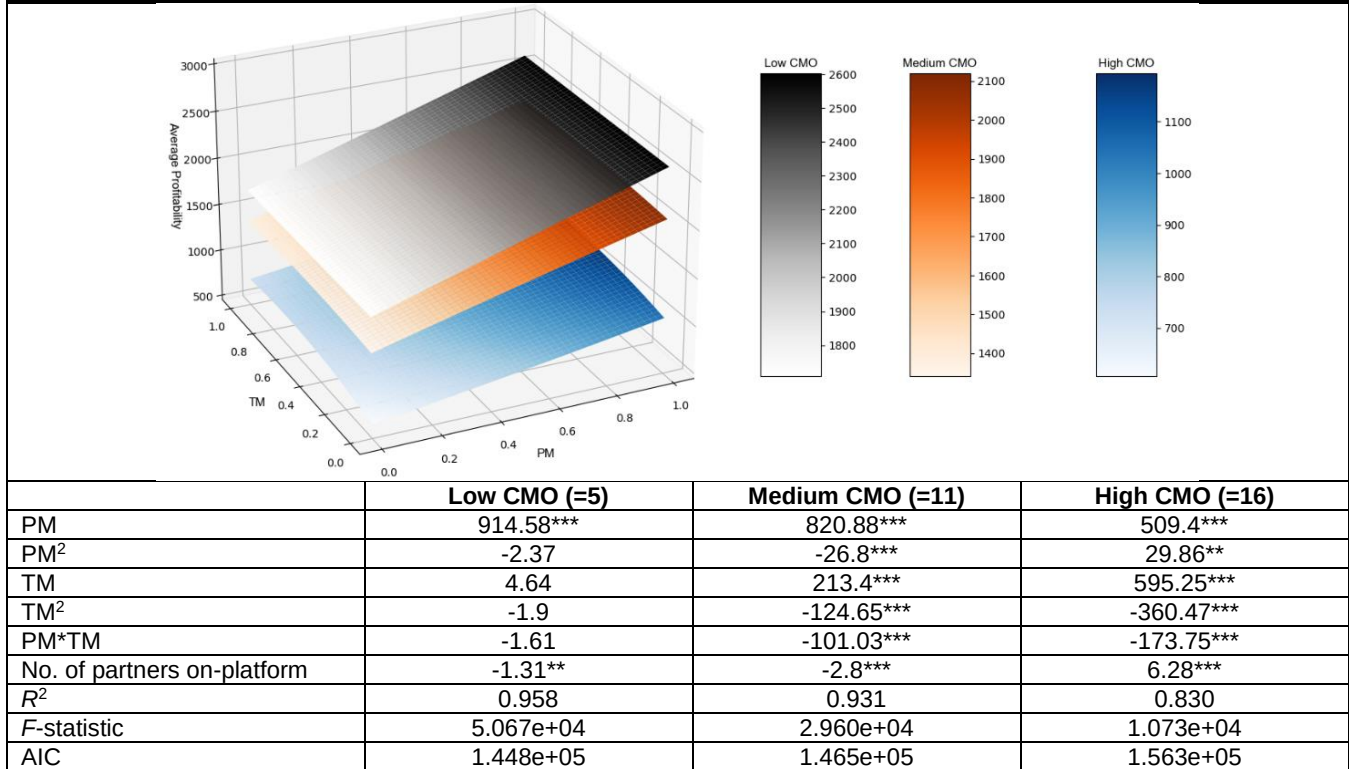
The platform owner's TM and PM investments affect partners' total profitability differently at different levels of CMO, as the regression results in Table 6 indicate. PM has positive linear effects on total profitability at low and medium levels of CMO. PM also has positive quadratic effects on total profitability at high CMO. Thus, there are increasing total profitability benefits of increasing PM investments. In comparison, TM investments have no significant effects on total profitability at low CMO. TM's effects on total profitability emerge at medium and high levels of CMO, but they taper off at increasing levels of TM.

Thus, there are diminishing total profitability benefits of increasing TM investments.

Proposition 5: *The platform owner's investments in the transaction and production mechanisms of a B2B innovation platform affect the total profitability of partners on-platform differently (a key metric for the platform owner), and these relationships are moderated by the complexity of market opportunities.*

The Effects of Platform Mechanisms on Partners' Average Profitability On-Platform

The interactions among CMO, TM, and PM also significantly affect the average profitability of partners on-platform, a key performance metric for individual partners. As shown in Table 7, partners' average profitability is maximized at low CMO and minimized at high CMO. At low CMO, the challenges and costs of transaction and production are low. Thus, partners are able to innovate and maximize their individual profitability. At high CMO, the challenges and costs of transactions and production increase significantly; hence, the average profitability of partners drops to the lowest levels. These findings also reveal a conflict of interest between the profitability levels of the platform owner and partners. At high CMO levels, the platform owner achieves the highest total profitability (Table 6), whereas the individual partners gain the minimum average profitability (Table 7). High complexity benefits the platform owner but hurts the partners.

Table 7. Interaction Effects of TM, PM, and CMO on Average Profitability of Partners On-Platform

The effects of TM and PM investments on partners' average profitability are contingent on the CMO level. At low CMO, TM has no significant effects on the average profitability of partners (neither the linear nor the quadratic terms are significant). TM's effects emerge at medium and high levels of CMO but taper off at increasing levels of TM (positive and significant linear terms, negative and significant quadratic terms). Thus, increasing TM investments have diminishing profitability benefits for partners. As for PM's effects, changing CMO levels significantly modify the nature of the relationship between PM and partners' average profitability. At low CMO, PM has linearly increasing effects on partners' average profitability. At medium CMO, PM's effects taper off at increasing levels of PM (negative and significant quadratic terms), suggesting diminishing profitability benefits for partners. At high CMO, both the linear and the quadratic terms of PM have positive and significant effects on the average profitability of partners, suggesting increasing returns from PM investments.

Proposition 6: *The platform owner's investments in the transaction and production mechanisms of a B2B innovation platform affect the average profitability of partners on-platform differently (a key metric for individual partners), and these relationships are moderated by the complexity of market opportunities.*

The Interaction Effects of Platform Mechanisms

Contrary to conventional wisdom, we found that increasing both TM and PM investments simultaneously does not increase generativity or profitability on B2B innovation platforms. On the contrary, the regression results in Tables 4-7 (see PM*TM line in regression tables) show that TM and PM negatively interact to dampen each other's effects on total generativity, total profitability, average generativity, and average profitability of partners on-platform.

PM increases generativity and profitability by facilitating modularity and the reusability of resources on-platform and making it easier and less costly for partners to reuse and reconfigure each other's resources in service innovation. TM, on the other hand, is responsible for finding and bringing new resources to the platform. TM faces two major hurdles. First, if the requisite variety of resources demanded by the innovating partners does not exist in the incumbent's ecosystem of partners (on-platform or off-platform), TM would not be able to find and bring in the nonexistent resources. This is irrespective of how cost-effectively TM searches. Second, when TM succeeds in bringing in new resources, they are not yet compatible or interoperable with the existing resources on-platform. Thus, TM's success in bringing in new resources reduces PM's

effectiveness in fostering generativity and profitability on-platform due to the compatibility, interoperability, integration, and reconfiguration problems created by the new resources.

Proposition 7: *The platform owner's investments in the transaction and production mechanisms of a B2B innovation platform negatively interact to dampen each other's effects on the total generativity and total profitability of partners on-platform (key metrics for the platform owner).*

Proposition 8: *The platform owner's investments in the transaction and production mechanisms of a B2B innovation platform negatively interact to dampen each other's effects on the average generativity and average profitability of partners on-platform (key metrics for individual partners).*

The Independent Effects of Platform Mechanisms

We also found major differences in the independent effects of TM and PM on the generativity and profitability of partners on B2B innovation platforms. In 2D diagrams in the first column of Table 8, we fix PM at 0 to examine how TM interacts with CMO to affect partners' generativity and profitability. In the second column, we fix TM at 0 to examine how PM interacts with CMO to affect partners' generativity and profitability.³ While there are diminishing returns to TM's generativity and profitability benefits, PM does not have such limitations. Increasing TM investments from low to medium levels increases partners' generativity and profitability. However, further increasing TM investments to high levels only marginally improves partners' generativity and profitability, if at all.

TM enables partners to do long jumps in the ecosystem to find resources that are highly different from theirs. There are diminishing generativity and profitability benefits of TM investments because TM's success is constrained by the availability of partners in the ecosystem who possess different and complementary resources. If the ecosystem lacks partners who possess the requisite variety of resources for matching the complexity of market opportunities, it is not possible for the TM to improve partners' generativity and profitability on-platform by enabling better and less costly searches. PM does not have such a limitation. Increasing PM investments from low through medium to high levels always yields higher generativity and profitability benefits. PM standardizes and modularizes resources on-platform to increase their reusability and reconfigurability. Partners keep benefiting from the

increasingly higher levels of resource reusability and reconfigurability in profitably generating service innovations.

Proposition 9: *The platform owner's investments in the transaction mechanisms of a B2B innovation platform have diminishing benefits in terms of both the (a) total generativity and total profitability (key metrics for the platform owner), and (b) average generativity and average profitability (key metrics for individual partners) of partners on-platform.*

Proposition 10: *The platform owner's investments in the production mechanisms of a B2B innovation platform have increasing benefits in terms of both the (a) total generativity and total profitability (key metrics for the platform owner), and (b) average generativity and average profitability (key metrics for individual partners) of partners on-platform.*

How Does the Number of Partners on B2B Innovation Platforms Affect Partners' Generativity and Profitability?

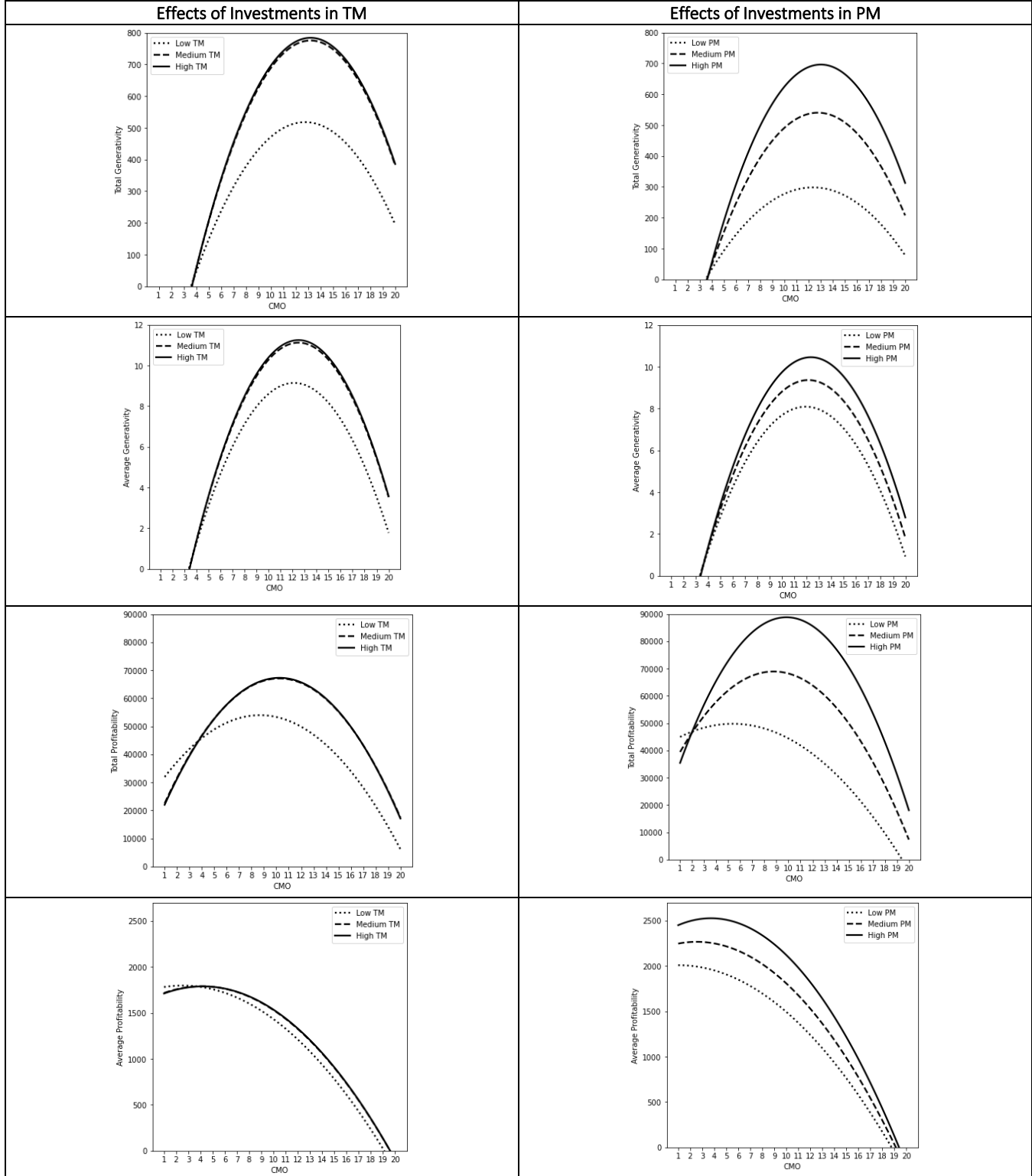
Finally, we found that the number of partners on-platform affects the performance metrics of the platform owner and the individual partners differently.

The performance metrics of the platform owner always improve with more partners on-platform. Regression results in Tables 4 and 6 show that the number of partners on-platform has positive and significant effects on total generativity and total profitability at all levels of CMO.

In comparison, more partners on-platform affect the performance metrics of individual partners very differently at different levels of CMO, as shown by the regression results in Tables 5 and 7. At low CMO, the number of partners on-platform does not have significant effects on partners' average generativity (Table 5), but it has negative and significant effects on partners' average profitability (Table 7). At low CMO, there are few partners on the platform. They are able to generate innovations due to the low complexity of market opportunities. The partners engage in price competition, which reduces their average profitability.

At medium CMO, the number of partners on-platform has a negative and significant effect on both partners' average generativity (Table 5) and average profitability (Table 7). These declines in the individual partners' performance metrics could be due to competitive crowding effects.

³ We varied the mechanisms of interest between low (mean - σ = 0.2), medium (mean = 0.5), and high (mean + σ = 0.8).

Table 8. Independent Effects of TM and PM on Generativity and Profitability of Partners On-Platform


Specifically, with more partners on-platform, there is more competition among partners who strive to generate a service at the lowest possible price to emerge as the winning match for a given market opportunity. While many partners compete to generate a matching innovation, only one partner succeeds in successfully matching a market opportunity while the others lose. Thus, the partners' average generativity declines. Likewise, the price competition among the partners who develop service innovations reduces prices and hence the average profitability of partners. The platform owner is the beneficiary of this crowding effect: as more partners compete to generate a matching service, the platform becomes more likely to successfully meet a given market opportunity.

At high CMO, having more partners on-platform has positive and significant effects on both partners' average generativity (Table 5) and average profitability (Table 7). Due to the high complexity of market opportunities, partners constantly look for complementary resources to meet the variety of resources demanded by the high CMO. More partners on-platform increases the variety of resources available on-platform. Thus, it becomes feasible to develop matching service innovations for high CMO. Yet, the complexity of requirements reduces the number of matching service innovations. The rareness of matching service innovations enables partners to charge higher prices. Thus, both the individual partners and the platform owner enjoy generativity and profitability benefits from having more partners on-platform at a high level of CMO.

Proposition 11: *Increasing the number of partners on a B2B innovation platform increases the total generativity and total profitability of partners on-platform (key metrics for the platform owner) at all complexity levels of market opportunities.*

Proposition 12: *The complexity level of market opportunities moderates the relationships between the number of partners on a B2B innovation platform and the average generativity and average profitability of partners on-platform (key metrics for individual partners).*

Discussion

Contributions to Research

Number of partners on B2B innovation platforms: Prior studies have observed that B2B innovation platforms may not attract as many third-party developers (partners) as B2C platforms (Haki et al., 2024; Hein et al., 2019). However, there is limited knowledge on mechanisms that might constrain the number of partners on a B2B innovation platform. Our study

contributes to this literature stream by explaining how CMO interacts with TM and PM to jointly determine when a B2B innovation platform attracts partners. When CMO is low, partners do not use the B2B innovation platform because they are self-sufficient in meeting the relatively simple market opportunities. When CMO is medium or high, the partners' own resources do not suffice to meet the requirements of market opportunities. Partners have to collaborate with others to gain access to complementary resources. The TM and PM of a B2B innovation platform attract partners by promising to address the transaction and production challenges entailed in the service innovation. However, there are limits to how much TM and PM can address these challenges. Thus, investing more in TM and PM does not necessarily increase the number of partners on a B2B innovation platform.

Network effects on B2B innovation platforms: Prior studies have assumed that network effects within and across the supply and demand sides are critical for attracting partners to a platform (Cennamo & Santaló, 2019; Cusumano, 2010; Thomas et al., 2014). A recent study (Anderson et al., 2022) began to challenge this assumption by reporting that many B2B platforms do not create network effects. However, it did not explain why. Our study contributes to this literature stream by identifying CMO as a key mechanism that constrains the emergence of network effects on B2B innovation platforms. In our study, the B2B innovation platform was able to attract partners and maximize the number of partners on the platform at high levels of CMO. As CMO increased to very high levels, the B2B innovation platform was not able to create network effects to lock in and retain partners. Network effects will emerge and have positive spillover benefits for existing partners to the extent that the variety of resources on the platform is sufficient to develop resource combinations that meet the requirements of complex market opportunities. When CMO is very high, however, the variety of resources needed to meet the requirements is also very high. The pool of complementary resources on the platform does not have the requisite variety to match the variety of the requirements. No matter how well the TM and PM of the B2B innovation platform assist partners in finding and reconfiguring the resources, partners cannot produce innovations that match the requirements. Thus, very high CMO serves as a barrier to the emergence and growth of network effects on the B2B innovation platform.

Generativity on B2B innovation platforms: A recent study challenged a general assumption in the digital platform literature that digital platforms foster unbounded growth through the generativity of innovations (Fürstenau et al., 2023). Our study's findings support this challenge to existing assumptions and provide a more nuanced explanation as to why generativity might be bounded in B2B innovation platforms. On the one hand, the findings support the

assumption by showing that TM, PM, and CMO generally increase the total generativity of partners on B2B innovation platforms. On the other hand, the findings also show that TM, PM, and CMO interact with each other to place limits on each other's generativity effects.

B2B innovation platforms achieve higher total generativity at increasing levels of CMO. Interestingly, the platform does so by increasing the number of partners on the platform rather than increasing the individual partners' average generativity. The individual partners' average generativity levels are very close to each other at the medium and high levels of CMO. Thus, high CMO places limits on individual partners' average generativity. The platform owner can choose to foster further generativity by increasing investments in TM so that partners can have better capabilities to search for collaborators, thereby bringing in more partners and resources to the platform. Although TM enables such searches cost-effectively, there is no guarantee that potential collaborators would possess the complementary resources needed to meet the requirements of high CMO. Thus, CMO interacts with TM negatively to reduce TM's generativity effects. The platform owner can also choose to increase investments in PM to foster further generativity by modularizing resources and making it less costly for partners to recombine existing resources in the quest to generate innovations that match high CMO. However, CMO also interacts negatively with PM to place limits on how much PM can foster generativity. Moreover, TM also negatively interacts with PM to limit PM's generativity effects further. The success of TM in finding and bringing in new resources to the platform negatively affects PM's ability to foster generativity because the new resources create compatibility, interoperability, and integration challenges.

Profitability on B2B innovation platforms: There is a shortage of empirical research against which we can compare our results on the effects of TM and PM at different levels of CMO on the profitability of partners on a B2B innovation platform. A somewhat relevant study in the B2C innovation platform context examined the link between app complexity and sustained superior performance of developers on Apple's iOS and Google's Android (Kapoor & Agarwal, 2017). The study found that developers who offered more complex apps were able to achieve and sustain superior performance. In contrast, we found that increasing levels of CMO reduced individual partners' average profitability on B2B innovation platforms. Individual partners achieved the highest average profitability at low CMO, the average profitability declined to a moderate level at medium CMO and dropped to the lowest level at high CMO. TM enabled partners to address some of the transaction challenges and improve their average profitability at medium and high levels of CMO. However, the improvements slowed down and tapered off at high levels of TM. These results

suggest that there are limits to TM's ability to address challenges of service innovation at high levels of CMO. In contrast, PM was able to address production challenges and improve individual partners' average profitability at all levels of CMO. Overall, these findings suggest that the link between CMO and individual partners' average profitability could be fundamentally different in B2B and B2C innovation platforms.

Our findings on total profitability of B2B innovation platforms uncover two interesting dynamics. First, whether there are crowding effects that reduce the total profitability of a B2B platform is contingent on the level of CMO. At medium CMO, the B2B innovation platform started attracting partners, but they achieved only medium level of total generativity, and their total profitability level was the lowest. These results point to crowding effects. The competition among partners reduced total generativity and total profitability of partners. There was no evidence of such crowding effects at the low or high levels of CMO. While previous studies discuss crowding effects on digital platforms (e.g., Boudreau, 2012; Boudreau & Jeppesen, 2015; Foerderer et al., 2018; Li & Netessine, 2020; Mantovani & Ruiz-Aliseda, 2016), our study provides a more nuanced explanation of when crowding effects might emerge on a B2B innovation platform.

Second, identifying who creates and captures value on a digital platform is a key research question. There is often conflict between whether platform owner or individual partners would capture the value from the generativity of innovations (Boudreau, 2012; Ceccagnoli et al., 2012; Cennamo & Santaló, 2019; Kapoor & Agarwal, 2017; Mantovani & Ruiz-Aliseda, 2016). Our findings suggest that the CMO level affects who captures profits from the generativity of innovations on B2B innovation platforms. Specifically, the platform owner captures the value from the generativity of innovations at high CMO, whereas individual partners capture the value at low CMO.

At high CMO, partners' total profitability reached the highest level while individual partners' average profitability dropped to the lowest level. Only a handful of partners on the platform meet the requirements of high CMO, receive high payoffs in return, and increase the total profitability of the platform. Meanwhile, the majority of partners on the platform fail to generate innovations and revenues, thus bringing down individual partners' average profitability. At low CMO, individual partners' average profitability reaches the maximum level whereas the total profitability of partners drops to medium levels. At medium CMO, individual partners' average profitability declines to medium levels whereas the total profitability of partners drops to the lowest levels.

The independent and interaction effects of B2B innovation platforms' mechanisms: The extant literature discussed only the independent effects of TM and PM in isolation of each other (e.g., Ceccagnoli et al., 2012; Tae et al., 2020). The implicit assumption is that the more investments in these mechanisms the better, and that the two platform mechanisms might have additive effects (Thomas et al., 2014) on generativity and profitability. Our study finds that TM and PM interact negatively to dampen each other's effects on the generativity and profitability of B2B innovation platforms. We also show that there are diminishing generativity and profitability benefits of TM investments, whereas PM investments do not have such a limitation.

Implications for Research

A key implication of our study for digital platform research is to not generalize the assumptions of B2C platforms to B2B platforms. Factors that attract partners to the platform and foster network effects, generativity, and profitability are fundamentally different on B2B innovation platforms. In a B2B context, market opportunities that trigger service innovation may be much more complex than opportunities in a B2C context (Anderson et al., 2022; Haki et al., 2024; Schrieck et al., 2021). Thus, research needs to account for the critical role that the complexity of market opportunities plays in generativity and profitability on B2B innovation platforms.

Both TM and PM are essential to take advantage of digital platform technology (e.g., Ghazawneh & Henfridsson, 2013; Thomas et al., 2014). However, our study calls on scholars to recognize the negative interaction effects of TM and PM mechanisms of B2B innovation platforms that impose limits on each other's generativity and profitability outcomes. When studying incumbent firms' efforts to offer digital platforms in their ecosystem of partners, another implication of our study is to view on-platform and off-platform modes of innovation as supplements rather than substitutes. This is due to the circumstances under which either on-platform or off-platform modes are more effective. Further, scholars need to clarify whether generativity and profitability outcomes are being studied from the perspective of platform owners or partners. This study indicates that B2B innovation platforms affect these performance outcomes differently for platform owners and partners.

Implications for Practice

A major implication of our findings for incumbent firms is that the B2B innovation platform coexists with its traditional off-platform service innovation model instead of replacing it.

Partners in the incumbent's ecosystem switch from an off-platform to an on-platform mode of service innovation or vice versa depending on the complexity of market opportunities. Our results suggest that both models are valuable to partners but at different CMO levels. Thus, instead of undertaking transformation projects to migrate existing partners from traditional off-platform service innovation models to B2B innovation platforms, incumbents may want to operate the two service innovation models side by side.

The study also has implications for partners considering using an incumbent's B2B innovation platform. Partners achieve the highest average profitability when the service innovation is low in complexity and there are few partners on the platform. As the complexity of the required services increases, partners still benefit from the B2B innovation platform's mechanisms in generating innovations, but their average profitability declines to its lowest levels.

Limitations, Boundary Conditions, and Future Research

The proposed theory has a few limitations and boundary conditions that require further research. The theory focuses on one B2B innovation platform targeting an incumbent firm's existing ecosystem of partners to understand the conditions under which partners are likely to use the platform and generate innovations profitably. To keep the scope of our model manageable, we have not modeled additional real-life complexities such as the availability of rival B2B innovation platforms that seek to switch over the incumbent's existing partners. How the presence of multiple competing B2B innovation platforms might change partner behavior and affect the generativity and profitability dynamics on the incumbent's B2B innovation platform are future research topics.

Our theory focuses on B2B innovation platforms without customization to any particular application domain. B2B innovation platforms have a wide variety of application domains (Anderson et al., 2022), such as IoT platforms focusing on process optimization, preventive maintenance, or big data-related service innovations. Further research will be required to customize the proposed theory to the specific application context of a given B2B innovation platform.

Our theory does not address the various challenges that partners might face when innovating on a B2B innovation platform. For instance, when using a B2B innovation platform, partners need to adapt their business models to fit the platform's requirements and address the risk of their resources being replicated by other partners on-platform or even by the platform owner (Ceccagnoli et al., 2012; Foerderer et al., 2019; Haki et al., 2024). Further research is

needed to understand how partners can address these challenges to generate innovations profitably on B2B innovation platforms. Finally, the proposed theory generated a set of empirically testable propositions. Empirical studies will be required to test and validate the propositions.

Conclusion

This study uses a simulation-based theory development approach to explain the conditions under which B2B innovation platforms attract partners and add value to platform owner and partners. When an incumbent firm builds a B2B innovation platform, whether existing partners in its partner ecosystem would use the platform and generate innovations profitably depends on the platform owner's investments in the platform's transaction mechanisms and production mechanisms, as well as the complexity of market opportunities. These three factors affect the platform owner's and the individual partners' generativity and profitability on-platform both independently and jointly.

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Appendix A

Sensitivity Analysis and Robustness Check

We calibrated the boundaries of each parameter and determined their baseline values using NetLogo. By considering the values of each parameter with respect to the others, we identified the baseline values that cover all the important value ranges for understanding the overall model behavior without causing the model to degenerate. After selecting the baseline value for each parameter, we conducted a sensitivity analysis to test whether the model's input variables (CMO, TM, PM) had an effect on the output variables (partners' generativity and profitability) that were sensitive to our choice of baseline values. To achieve this, we ran several hundred thousand experiments, using all possible values for each parameter within the defined boundaries. Based on the results of these tests, we calculated the correlation between parameter values and output variables. If a significant correlation was found, we conducted additional tests by varying the parameter values to see if this changed the direction or shape of the effects of input variables on output variables, compared to the baseline values of the parameters. The table below shows all values that were tested (the boundaries) and the selected baseline value for each parameter and provides justification for our selection of each parameter's baseline value with respect to the sensitivity analysis results. In addition to justifying the baseline values, we ensured that we could logically explain the changes observed in the model behavior when a parameter value was altered. The sensitivity analysis showed consistent behavior, which further supports our confidence in the validity and robustness of the model.

Table A1. Sensitivity Analysis of Model Parameters

Model Parameter	Description	Model's baseline value	All tested Values	Justification (based on sensitivity analysis)
Agents				
No. of partners	The number of partners is fixed in the entire ecosystem and throughout the simulation runs.	100	25, 50, 100, 200, 500	Based on sensitivity analysis, we observed that outcomes only emerge when there are about 100 partners in the ecosystem. Increasing the number of partners had little effect on the average generativity and profitability. While we did observe an effect on the total generativity and profitability by increasing the number of partners, the results generally followed the same pattern, but with higher values because there were more contributing partners. Additionally, we selected the baseline value considering model efficiency considerations, as a higher number of partners resulted in higher computational penalties for the simulation.
No. of resources per partner	Each partner is endowed with a certain number of resources with random features.	4	4, 5, 6, 7, 8	Sensitivity analysis showed that increasing the number of resources for each partner did not have any meaningful effect on the output variables. In our model, at least four resources are needed to generate one service. Therefore, we endowed each partner with four resources.
No. of platform owner resources	The platform owner offers a defined number of core resources. All services generated on-platform must integrate one core resource.	30	20, 25, 30, 35, 40	The platform owner offers core resources, such as APIs and SDKs, with which partners can integrate their own resources and generate services (e.g., Haki et al., 2024; Schreieck et al., 2021). Sensitivity analysis showed that although a minimum number of platform owner resources is necessary to make the platform attractive, further increasing the number of platform owner resources does not have any effect on the output variables.
Platform owner's revenue share	When a service is generated on-platform, the platform owner receives a defined percentage of the obtained payoff (see "opportunity payoff").	20%	5%, 10%, 20%, 30%, 40%, 50%	Revenue sharing is a means for the platform owner to appropriate value from partners' service innovations on-platform. Based on sensitivity analysis, increasing the platform owner's revenue share has a negative impact on the profitability outcomes of partners. The baseline value for this parameter was selected based on empirical data from other innovation platforms, where the owner's revenue share varies across platforms, such as Apple's 30% on iOS in the B2C context and Salesforce's 15% on AppExchange in the B2B context (Karhu et al., 2018; Staub et al., 2021). Since varying the revenue share only varied partners' profitability, we chose a fixed value within the range of values from empirical data.

Life of services (time steps)	A generated service will disappear if it is not reused after the defined number of time steps.	$\mu = 30$ $\sigma^2 = 10$ (normal distribution)	$\mu = 10, 20, 30, 40, 60$	The approach for removing unused services after a certain number of time steps were adopted from an existing ABM (Haki et al., 2020). According to sensitivity analysis, at the lower boundary, there is hardly any chance for reusing generated services, while at the higher boundary, a significant portion of profit is gained by reusing existing services (leading to less motivation to generate new services). Therefore, we opted for a random value from a normal distribution with a mean value of 30.
Interactions				
Initial no. of partner-partner links	Each partner is “initially” linked with a defined number of other partners (to shape a local network).	2	1, 2, 3, 4	As in other ABMs (e.g., Haki et al., 2020; Malgonde et al., 2020), agents are connected to other agents through links. The “initial” links between agents may change over time depending on the business transactions conducted in collaboration with new partners. Also, there should be a limit on the number of created links to enable a distant search and avoid situations where all partners have each other in their local network (Haki et al., 2020). Sensitivity analysis showed no effects of these parameters on output variables. We selected the baseline value based on the fact that, at the lower and upper boundaries, the number of links stabilized after the first unused links were removed (see below).
Limit for no. of partner-partner links	Each partner can make links with a certain number of other partners.	4	3, 4, 5, 6	
Life of partner-partner links (time steps)	A partner-partner link will disappear if no transaction happens among the respective partners after the defined number of time steps.	$\mu = 150$ $\sigma^2 = 5$ (normal distribution)	$\mu = 50, 100, 150, 200, 400$	Building on an existing ABM (Haki et al., 2020), unused ties between agents decrease in strength over time. Our ABM captures this as the number of time steps after which a link disappears entirely without any transaction between the given partners. The life of links is renewed every time the connected partners interact. According to sensitivity analysis, the lower boundary is in favor of partners’ individual outcomes (average generativity and profitability), while the higher boundary is in favor of the ecosystem as a whole (total generativity and profitability). Thus, we opted for a random value from a normal distribution with a mean value of 150.
Signals among partners	Each partner decides to use or not use the platform after receiving a certain number of signals from other partners in the local network.	5	2, 5, 10, 15	Adopted from an existing ABM (Haki et al., 2020), linked partners communicate and exchange knowledge. Here, communication is about partners’ successful business transactions on- or off-platform encouraging other partners to use or not use the platform. Building on the results of sensitivity analysis, the lower boundary lets partners quickly join/leave, whereas the upper boundary negatively affects partners’ generativity and profitability outcomes. Thus, we chose a value that reflects both the efforts of partners to onboard and offboard from a platform and also provides flexibility for partners to choose the best option.
Environment				
Initial no. of opportunities	A certain number of opportunities are “initially” distributed in the environment to initiate partners’ service innovation process.	20	5, 10, 20, 30, 50, 100, 500	Adopted from existing models (Davis et al., 2009; Haki et al., 2020), our model starts with an initial number of opportunities. The number of opportunities changes over time according to the “inter-arrival time of new opportunities” (see below). A minimum initial number of opportunities is required to commence the service innovation process. Yet sensitivity analysis showed no effects on output variables through further increasing the initial number of opportunities. Therefore, we selected the baseline value to not only initiate the service innovation process but also optimize model efficiency.
Opportunity payoff	Each opportunity is associated with a random payoff. Payoff is distributed among collaborating partners	$\mu = 110$, $\sigma^2 = 10$ (normal distribution)	$\mu = 50, 70, 110, 140, 160$	Based on existing models (Davis et al., 2009; Haki et al., 2020), we used random values from a normal distribution to model the payoff for each opportunity. Sensitivity analysis showed that while high payoffs can increase profitability, they can also impede service innovation by making it more likely for existing services to

	depending on how many resources each partner contributes.			be reused. Additionally, the baseline mean value was selected through calibration efforts with regard to cost levels (see “production and transaction costs”).
Opportunity duration (time steps)	Opportunities disappear if not realized after the defined number of time steps.	$\mu = 20$ $\sigma^2 = 5$ (normal distribution)	$\mu = 5, 10, 20, 30, 40$	Opportunities remain in the environment for a random number of time steps, as suggested by existing models (Davis et al., 2009; Haki et al., 2020). We adopted the baseline value from these models, which aligns with our sensitivity analysis. Specifically, when the duration is short or long, partners have little or ample time to find other partners and generate a service.
Inter-arrival time of new opportunities (time steps)	A certain number of “new” opportunities are distributed in the environment to continuously let the service innovation process occur.	$\lambda = 5$ (Poisson distribution)	$\lambda = 2, 5, 7, 10$	This parameter, which determines the inter-arrival time of opportunities in time steps, was adopted from existing models (Davis et al., 2009; Haki et al., 2020). Consistent with these models, we operationalized the parameter as a Poisson distribution with a rate parameter of $\lambda = 5$. We selected a baseline value based on sensitivity analysis to ensure that there were neither too few nor too many opportunities available (see “opportunity duration”) (Haki et al., 2020).
Platform’s initial market share in the ecosystem	A given share of existing partners are already on-platform at the initialization.	25%	5%, 15%, 25%, 45%, 65%	When launching their platforms, incumbent firms already manage to incentivize some partners to transact on-platform (Haki et al., 2024; Schreieck et al., 2021). Our model thus accounts for an initial market share of the platform in its respective ecosystem. However, more partners may join the platform over time (see “signals among partners”). Sensitivity analysis on the lower boundary showed that a critical mass of initial partners is needed for the model dynamics to unfold and that a higher initial market share would increase outcome variables. We thus selected the baseline value accordingly and with reference to empirical data from incumbent firms in their early stages of launching an innovation platform (Haki et al., 2024).
Production costs	Each resource is associated with a random production cost within the predefined range.	5-15 (uniform distribution)	1-10, 3-13, 5-15, 7-17, 10-20	The model assumes that creating and maintaining resources is associated with a cost (Alexy et al., 2018). Similarly, transactions are assumed to be costly (Wolter & Veloso, 2008). A distant search is more risky (Levinthal, 1997) and thus more costly. Production costs are always incurred by partners and the platform owner. Transaction costs are incurred by the partner who searches. Sensitivity analysis indicated that varying min/max values of production and transaction costs have minimal effects on the outcome variables. The values and ranges of costs used in the model were based on calibration efforts to ensure consistency among production cost levels, transaction cost levels, and opportunity payoff levels.
Transaction costs (local search)	Each local search is associated with a random transaction cost within the predefined range.	20-40 (uniform distribution)	10-30, 15-35, 20-40, 25-45, 30-50	
Transaction costs (distant search)	Each distant search is associated with a random transaction cost within the predefined range.	40-60 (uniform distribution)	30-50, 40-60, 50-70, 60-80	
Simulation runs				
Time steps	Each simulation run has a defined number of time steps.	1000	500, 750, 1000, 2500, 5000	The baseline value used in our model was adopted from an existing ABM (Haki et al., 2020). Sensitivity analysis indicated that when the value is set too low, the model dynamics do not fully unfold in the simulation. While increasing the number of time steps had an effect on the outcome variables, the results generally followed the same pattern but the values were higher because there were more time ticks to generate services and gain profit. We selected the baseline value for efficiency reasons, as a higher number of time steps would result in higher computational penalties for the simulation.

