

Value co-creation in B2B industrial digital platforms: A platform-native perspective under service-dominant logic

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Abstract

Background: Emerging B2B industrial digital platforms (IDPs) are vital enablers of digital transformation in traditional manufacturing. However, existing research has predominantly focused on IDPs led by industrial incumbents, leaving a gap in understanding IDPs led by platform-native firms. For such non-industrial network technology firms built around a platform business model from the start, value co-creation with industrial users possessing domain knowledge is essential to develop IDPs.

Method: Through the theoretical lens of service-dominant logic, we conducted a longitudinal, exploratory case study of Alibaba's Taofactory Platform. The study explores the dynamic process through which platform natives, as cross-boundary entrants in the B2B industrial market, develop IDPs via value co-creation.

Findings: Our analysis reveals that, driven by evolving service foci across stages, the platform owner orchestrates three core value co-creation strategies: resource integration, service exchange, and institutional arrangements. This orchestration fosters the evolution of value co-creation modes from connection-based to interaction-based and finally to collaboration-based, which in turn shapes the evolution of platform types from an industrial transaction platform to an industrial solution platform, and ultimately to an industrial platform ecosystem.

Contributions: This study offers a theoretical framework that advances research on digital platform development, value co-creation, and service-dominant logic. It also provides practical insights for platform natives aiming to enter the B2B industrial market.

Keywords: Industrial digital platform (IDP), platform ecosystem, value co-creation (VCC), service-dominant (S-D) logic, platform-native firms (platform natives)

1. Introduction

Industrial digital platforms (IDPs) are emerging as critical infrastructures that empower the digital transformation of manufacturing, attracting growing academic and practical interest (Li et al., 2023; Yi et al., 2024). By leveraging modular digital architectures, IDPs enable extensive interconnectivity among humans, machines, physical objects, and systems, thereby facilitating the integration and sharing of heterogeneous resources (Jovanovic et al., 2022; Liu et al., 2022). This technological foundation allows IDPs to coordinate diverse actors (e.g., complementary service providers, third-party developers, end-user firms) across organizational boundaries, supporting the joint delivery and scaling of advanced manufacturing and service solutions (Den Hartigh et al., 2023; Madanaguli et al., 2023). Despite their recognized potential in enabling manufacturing digitalization (Pauli et al., 2025), the development of IDPs in business-to-business (B2B) industrial contexts remains nascent and progresses slower than digital platforms in consumer markets (Veile et al., 2022).

Prior research attributes this lag partly to the inherent features of B2B industrial contexts (Anderson et al., 2022). Heterogeneous equipment connection, highly customized and reliability-sensitive demands, long-term and asset-intensive operation impose elevated technological and organizational complexity of IDPs (Pauli et al., 2021). Weak business model design further undermines sustained value creation and capture of IDPs (Madanaguli et al., 2023). Underlying these issues is a fundamental shift in the value creation paradigm (Veile et al., 2022). IDPs are transforming the traditional linear value chain into networked value co-creation (VCC) among multiple actors (Benitez et al., 2020; Hendricks et al., 2025).

Thus, **the successful development of IDPs critically hinges on how platform owners orchestrate value co-creation among diverse actors** (Struwe & Slepnirov, 2023).

Existing literature on IDPs exhibits a pronounced actor-centric bias: it has largely assumed that industrial incumbents are the natural leaders of industrial digital platforms (Madanaguli et al., 2023). This research stream, which focuses on IDPs led by industrial incumbents (e.g., Siemens MindSphere, SANY IROOTECH, Haier COSMOPlat), elucidates how these firms leverage their profound domain-specific knowledge, physical industrial assets, and established B2B customer relationships to develop industry-specific technological capabilities and subsequently build industrial platforms (Ji et al., 2025; Sjödin et al., 2022; Wang et al., 2024). The theoretical lineage of these studies is rooted in the B2B industry platform literature.

However, an emerging and equally significant practical phenomenon remains theoretically unexamined: the entry and development of IDPs led by platform natives (e.g., AWS, Microsoft Azure, Alibaba) as cross-boundary entrants into the B2B industrial market. Informed by platform strategy literature, these firms are digital-native, deriving their core capabilities and value creation logic from platform strategy and two-sided market theories, and excel at rapid scaling through platform governance, pricing strategies, and network effects (Haki et al., 2024; McIntyre & Srinivasan, 2017). Lacking industrial incumbents' embedded industrial resources, platform natives cannot simply transplant their success from B2C markets into the B2B industrial context and thus face formidable challenges (Pauli et al., 2021). Yet, little is known about how platform natives orchestrate value co-creation under these distinctive constraints.

These two types of platform leaders differ fundamentally in their resource endowments and value creation logics (Mosch et al., 2023). While industrial incumbents possess deep sector embeddedness, research indicates they are often constrained by a goods-dominant (G-D) logic inertia when building industrial ecosystems, manifesting as digital value myopia, dependence on traditional value chains, and firm-centric thinking (Sjödin et al., 2022). In contrast, platform natives have internalized a service-dominant (S-D) logic in their core B2C operations, fostering user-centric, use-value-focused co-creation modes. This inherent logical contrast suggests they likely follow divergent development paths and orchestration approaches when developing IDPs.

Nevertheless, extant theory insufficiently explains: How do the value co-creation orchestration mechanisms and platform development paths systematically differ when IDP leadership shifts from "industrial sector experts" to "B2C platform experts"? This theoretical gap, stemming from the role difference, limits our holistic understanding of the diverse development logics of IDPs (Su et al., 2023). Exploring this question can not only address the perspectival void in current IDP research but also bridge the dialogue between B2C platform strategy literature and B2B industrial platform ecosystem literature. Specifically, platform strategy theory, largely focused on B2C contexts, has not deeply explored how platform natives' core value co-creation modes must be adapted upon entering B2B industrial markets (Ceccagnoli et al., 2012). Concurrently, B2B industrial platform literature has not systematically incorporated platform natives as a new type of platform leader to analyze the unique logic of their IDP development (Shen et al., 2024).

To address this gap, this study adopts S-D logic which posits that value is co-created by multiple actors through resource integration and service exchange within specific use contexts, coordinated by institutional arrangements (Vargo & Lusch, 2016). S-D logic's systemic explication of value co-creation aligns strongly with the multilateral coordination inherent in IDPs (Hein et al., 2019) and resonates with the intrinsic nature of platform natives. It captures their endogenous co-creation logic while providing a dynamic, process-oriented framework for analyzing how they overcome the industry embeddedness deficit. Therefore, applying S-D logic offers a robust theoretical foundation for unpacking the value co-creation process in IDPs, while also extending understanding of platform governance, actor engagement, and service innovation (Lusch & Nambisan, 2015). Crucially, although recent studies on S-D logic emphasize the key role of institutional arrangements (Vargo et al., 2023), existing research on platform value co-creation predominantly focuses on resource integration and service exchange (Ji et al., 2025; Tian et al., 2021), lacking in-depth examination of how institutional arrangements are dynamically designed to drive IDPs development. Building on these gaps, this study proposes the core research question: **How do platform-native firms, as cross-boundary entrants, orchestrate value co-creation**

strategies—resource integration, service exchange and institutional arrangements—to develop B2B industrial digital platforms?

To investigate this question, we conduct a longitudinal inductive case study of Alibaba's Taofactory Platform. Our findings reveal that IDPs led by platform natives evolve through three distinct platform archetypes: an industrial transaction platform, an industrial solution platform, and finally an industrial platform ecosystem. This evolution corresponds to a shift in the value co-creation mode from connection-based to interaction-based and ultimately to collaboration-based. This shift is driven by the platform owner's orchestration of three VCC strategies: resource integration, service exchange, and institutional arrangements. We further contrast this development path with that of IDPs led by industrial incumbents.

This study advances research on digital platform development, value co-creation, and S-D logic in several ways. First, it addresses an important gap in digital platform development literature. By examining platform natives as cross-boundary entrants in B2B industrial market, we uncover the novel developmental pathway and underlying value creation modes for IDPs, thereby significantly deepening the understanding of IDP distinctiveness logic (Pauli et al., 2021; Su et al., 2023) and bridging the chasm between B2C platform theory and B2B industrial ecosystem literature (Gawer, 2014; Mosch et al., 2023). Second, our study contributes to platform-based VCC literature. By deconstructing the process through which platform natives dynamically orchestrate multi-actor value co-creation, we identify three distinctive value co-creation modes and their mechanisms in shaping IDP development, responding to calls for exploring the complex dynamics of value co-creation in industrial ecosystems (Hein et al., 2019; Li et al., 2022). Third, our study extends the applicability of S-D logic to B2B industrial contexts and advances S-D logic from a static, descriptive meta-theory to a dynamic, explanatory process theory in this context (Vargo & Lusch, 2017). We elucidate the pivotal role of dynamically evolving institutional arrangements in shaping the development of IDPs, directly responding to the call for exploring the role of institutions in ecosystem coordination (Vargo et al., 2023). Finally, the study offers managerial implications for platform natives seeking to enter the B2B industrial market, as well as for manufacturing firms leveraging IDPs for digital transformation.

2. Literature review and research framework

2.1. Industrial digital platform and platform development

Advances in cloud computing, edge computing, big data, AI, and Internet of Things (IoT) have enabled IDPs to digitally connect and coordinate activities across physical and virtual worlds (Rantala et al., 2023). Through large-scale data collection and analysis from heterogeneous industrial assets (Su et al., 2023), IDPs facilitate multi-actor VCC by enabling third-party complementors to collaboratively develop service solutions with firm users (Madanaguli et al., 2023).

IDPs are typically initiated by two categories of platform sponsors. Most existing IDPs originate from industrial incumbents, such as Siemens MindSphere, SANY IROOTECH, and Haier COSMOplat (Li et al., 2023). Recently, platform natives such as Amazon Web Services, Microsoft Azure, and Alibaba have begun entering the B2B industrial market to develop IDPs. Yet scholarly attention remains heavily skewed toward IDPs led by industrial incumbents, leaving a limited understanding of IDPs led by platform natives.

Industrial incumbents are physically born and traditionally operate pipeline business models, creating linear value through the procurement, manufacturing, sales, and maintenance of physical products (Porter, 1985). In contrast, platform natives are digital-native, typically originating in B2C markets, and build their business models around digital platforms from inception (Haki et al., 2024; McIntyre & Srinivasan, 2017). Their characteristics include modular technology architectures, platform governance, asset-light operations, and dependence on network effects (Cennamo, 2021; De Reuver et al., 2018). Their platform development strategies typically rely on standardized interfaces and VCC modes centered on shared customer experiences (De Oliveira & Cortimiglia, 2017). They subsequently employ discriminatory pricing strategies to trigger network effects (Caillaud & Jullien, 2003).

However, B2B industrial contexts differ sharply from B2C markets. IDPs carry the dual nature of technological infrastructures and market intermediaries, resulting in high technological and organizational complexity (Madanaguli et al., 2023; Pauli et al., 2021). Technologically, IDP architectures must coordinate edge layers with IaaS, PaaS, and SaaS (X. Zhang & Ming, 2021), integrate heterogeneous

industrial data, and maintain loosely coupled modules that support complementor-driven solution development (X. Zhang et al., 2022). Organizationally, differing from commonly studied product platforms or supply chain platforms (Gawer, 2014), B2B IDPs involve non-hierarchical interactions among platform owners, hardware manufacturers, system integrators, software developers, firm users, and other complementary service providers (Lerch & Heimberger, 2022; Pauli et al., 2021). Unlike platform natives' previous focus on individual consumers, participants are all specific organizations in the B2B industrial context, which leads to more complex sales processes and inter-organizational relationships, requiring elaborate orchestration by the platform owner (Markfort et al., 2022; Shen et al., 2024).

For platform natives, the technological complexity of IDPs leads to significant investment costs and the need to supply reliable solutions across fragmented application scenarios (Mosch et al., 2023). The organizational complexity requires them to establish robust trust-based relationships with firm users and address high demands for data security and customization (Lan et al., 2019).

Studies on IDPs development largely analyze platforms led by industrial incumbents from a technology capability or business model. Madanaguli et al. (2023) propose a typology encompassing four platform types distinguished by data integration extent and ecosystem integration extent. Su et al. (2023) outline three digital business model innovations that facilitate IDP development by peripheral industrial actors. Jovanovic et al. (2022) describe a staged path for industrial incumbents' IDPs, shifting from product platform to supply chain platform and eventually to platform ecosystems, driven by the co-evolution of platform architecture, platform service, and platform governance.

However, platform natives face a fundamentally different starting position. Their advantages lie in digital technologies and platform governance experience (Mosch et al., 2023). Their limitations stem from the absence of industrial assets, embedded domain-specific knowledge, and entrenched B2B customer relationships (Pauli et al., 2021). Consequently, they cannot independently provide complex service solutions. Instead, they must rely on firm users and other complementors to contribute their tacit, experience-based domain knowledge and participate in the VCC process (Schrieck et al., 2021). These distinctions motivate the need for research on the VCC process and development pathways of IDPs led by platform natives under these challenges.

Given the high complexity of IDPs, platform natives must continually overcome bottlenecks that constrain platform development. Drawing on prior research and the context of this study, we define bottlenecks in a platform ecosystem as a necessary, non-substitutable element that most constrains the overall evolution of the ecosystem due to weak performance, poor quality, high costs, scarcity, or restricted access (Hannah & Eisenhardt, 2018; Jacobides et al., 2006). For example, iTunes Store resolved the bottleneck of digital music payment, triggering large-scale user growth in the iPod ecosystem. Bottlenecks can be classified as technological, strategic, or hybrid (Draschbacher et al., 2025). Moreover, bottlenecks are always defined relative to other elements. Thus, when a particular bottleneck is resolved, the platform may evolve; yet, as the context shifts, other elements may emerge as new bottlenecks (Daim et al., 2014; Jacobides et al., 2006).

Following Springer et al. (2025), we analyze IDP evolution archetypes along two dimensions: the **platform market** and the **platform architecture**. The platform market dimension refers to the bilateral or multilateral market structure where participants interact, characterized by network structure and network size. Network structure describes the nature and architecture of interactions among platform participants, often more complex in industrial contexts than in consumer settings due to its structure and relational dynamics (Suuronen et al., 2024). For network size, network effects common in consumer platforms for scaling network size, such as "more-is-more" and "winner-takes-all," are less pronounced in IDPs. B2B IDPs typically serve industry niches with specific needs, prioritizing quality-oriented services over scale-driven growth (Arnold et al., 2022). The platform architecture dimension encompasses platform scope and platform interoperability. Platform scope denotes the breadth of platform activities, including the range of functionalities, services, and supported stakeholders. Platform interoperability emphasizes the structural and functional consistency between the platform owner, complementors, and users, as well as across platforms. These dimensions together shape how IDPs evolve from platforms to ecosystems.

2.2. Value co-creation on platform and service-dominant logic

Research on value co-creation has advanced over two decades, with evolving perspectives aligned with changing practical environments. The concept of VCC originated from co-production (Ramírez, 1999), formally emerged from the customer experience perspective (Prahalad & Ramaswamy, 2004), and subsequently developed significantly through S-D logic (Vargo & Lusch, 2004), gradually expanding to encompass perspectives such as service ecosystems (Vargo & Lusch, 2008).

Scholars have recognized the importance of VCC for platform development (Ceccagnoli et al., 2012; Chandna & Salimath, 2024). However, research has primarily concentrated on B2C platforms. Currently, VCC in platform ecosystems not only disrupts the traditional unidirectional, static, linear value chain but also transcends the dyadic interaction between businesses and customers. Instead, it transforms into a diversified, dynamic, loosely coupled complex network system (Ranjan & Read, 2021; Struwe & Slepnirov, 2023).

Research addressing this more complex VCC within B2B industrial platforms remains scarce. Hein et al. (2019) identified three standardized practices in the VCC process in B2B platform ecosystems, specifically encouraging the supply side through complementary asset integration, incentivizing the demand side by ensuring platform readiness, and connecting these processes via servitization enabled by application deployment. Tian et al. (2021) uncovered micro-foundational VCC activities with suppliers and customers during the platformization of a traditional textile manufacturer, including co-diagnosis, co-sharing, co-experience, and co-innovation. Struwe and Slepnirov (2023) induced four key VCC capabilities for B2B digital service platforms, including digital literacy, aligning, reflecting, and coping. While these studies offer valuable insights, they remain largely phenomenological descriptions or static analyses, lacking deep investigation into the dynamic processes and underlying mechanisms of multi-actor VCC within IDPs.

S-D logic offers a theoretical perspective contrasting the G-D logic (Vargo & Lusch, 2004). It posits that service is the fundamental basis of exchange, where service is defined as the application of specialized competences (knowledge and skills) by one entity for the benefit of another entity or the entity itself through interaction (Vargo et al., 2008). Initially focused on dyadic firm-customer interactions, S-D logic has evolved into a theory encompassing multi-actor VCC within service ecosystems (Vargo et al., 2023).

S-D logic offers a systemic view of VCC, positing that value is co-created through resource integration, service exchange, and institutional arrangements. First, resource integration refers to the process in which actors combine, configure, and deploy various resources to engage in VCC (Singaraju et al., 2016). Resources encompass both operand resources (tangible, static resources acted upon, e.g., raw materials, equipment) and operant resources (dynamic, intangible resources acting upon others, e.g., knowledge, skills, relationships) (Lusch & Nambisan, 2015). All economic and social actors are resource integrators (Herutomo et al., 2022). Second, service exchange is the interactive process among actors based on “services” as the fundamental unit. Its essence is the dynamic process where actors apply specialized operant resources (e.g., knowledge, skills) to benefit other actors and oneself, rather than a static outcome (Vargo & Lusch, 2008). Service exchange emphasizes reciprocity, forming networks of interactive collaboration through mutual service provision (e.g., firms providing product support, users offering improvement suggestions). Exchange processes where goods serve as vehicles for service delivery are termed indirect service exchange (Cova & Salle, 2008). Third, institutional arrangements. Institutions are humanly devised sets of endogenous, shared rules, norms, beliefs, symbols, and practices among actors, which allow the limited-cognition rationality (Lusch & Vargo, 2014). Institutional arrangements are constellations of interrelated institutions, a set of normative systems and coordinating mechanisms that enable and constrain actors’ behaviors, serving as the core mechanism for ecosystem self-regulation (Vargo & Lusch, 2016). In loosely coupled ecosystems, institutional arrangements bridge cognitive distances between diverse actors (Nim et al., 2024), fostering a shared worldview (a set of business and cultural assumptions, evaluation methods, and/or mental frameworks) (Lusch & Nambisan, 2015). This facilitates faster mutual understanding and alignment among actors regarding resource integration and service exchange (Hein et al., 2019).

These three strategies are interdependent, collectively constituting multi-actor, multi-level VCC within an ecosystem (Vargo et al., 2023). Resource integration creates complementary resource pools through resource liquefaction (enhancing accessibility) and increasing resource density (enabling more efficient optimal resource configuration), providing a necessary condition for effective service exchange

(Liu et al., 2024; Lusch & Nambisan, 2015). Service exchange is the core activity of VCC, embodying the outcomes of resource integration while also shaping the scope, type, and manner of future resource integration. The processes of resource integration and service exchange determine the institutional arrangements that emerge within the ecosystem. Conversely, institutional arrangements safeguard the sustainability of resource integration and service exchange, providing a stable organizing logic for multi-actor VCC (Nim et al., 2024). These three strategies mutually influence each other and collectively shape actor roles, ecosystem structure, and evolutionary pathways (Vargo & Lusch, 2011). However, the proponents of S-D logic acknowledge that much research has focused on developing the meta-theoretical narrative, stating that “it needs more evidence-based research” (Ng & Vargo, 2018; Vargo & Lusch, 2017).

The multi-actor collaborative nature of VCC on IDPs provides a highly relevant empirical context, while the three strategies of S-D logic offer a robust theoretical foundation for dissecting the VCC process within this setting. First, through resource liquefaction (decoupling information from its physical devices) (Liu et al., 2024), IDPs enable the real-time interconnection and sharing of dispersed physical manufacturing resources, data resources, and knowledge resources among multiple actors. This facilitates efficient cyber-physical integration, establishing the foundation for subsequent collaborative development of smart manufacturing service solutions (Wang et al., 2024). Second, the development of IDPs inherently reflects the trend of manufacturing servitization, aligning strongly with the service-centric perspective of S-D logic. Leveraging cyber-physical integration, IDPs enable collaboration with complementors to offer innovative service solutions (e.g., remote equipment operation and maintenance services, SaaS industrial software) (Pang et al., 2023), acting as intermediaries between developers and users for industrial value-added services (Shen et al., 2024). Third, IDP owners design institutional arrangements including strategic vision publicity, incentive mechanisms, and specifications, which can enable and constrain actor behaviors, guide the flow of resources and services, and build open ecosystem collaboration (Mancuso et al., 2024; Springer et al., 2025). While prior studies have emphasized resource integration and service (Hein et al., 2019; Tian et al., 2021), the role of institutional arrangements is central to enabling multi-actor collaboration and extending S-D logic from dyadic to ecosystem levels (Stofberg et al., 2025; Vargo et al., 2023).

In summary, S-D logic provides a macro narrative framework: Actors act as both service providers and beneficiaries within networks through resource integration and service exchange activities, engaging in VCC. This process is coordinated by institutional arrangements generated by the actors themselves. Together, they give rise to nested, multi-level service ecosystems where value and innovation are continuously generated (Vargo et al., 2023). The systemic and dynamic perspective of S-D logic aligns strongly with the context of IDPs coordinating resources from diverse participants to provide service solutions.

S-D logic posits that a firm’s value propositions are commitments that trigger VCC and evolve with changing contexts (Skálén et al., 2015). External industrial environment fluctuations determine shifting bottlenecks at different stages, which will influence IDPs’ development. Based on this, we argue that the IDP value propositions stem from development bottlenecks in practice. These external bottlenecks are internalized by the platform owner as the service foci, which drive the dynamic orchestration of resource integration, service exchange, and institutional arrangements.

Building on this literature review, we adopt S-D logic as the theoretical lens for our study. Following a “development bottleneck - development process - development outcome” logic, we construct a research framework centered on service focus, value co-creation, and platform archetype, as depicted in Fig. 1. Using this framework, this study will further unpack how platform natives, driven by shifting service foci, dynamically orchestrate the VCC strategies (resource integration, service exchange, and institutional arrangements), thereby shaping the evolution of IDP archetypes.

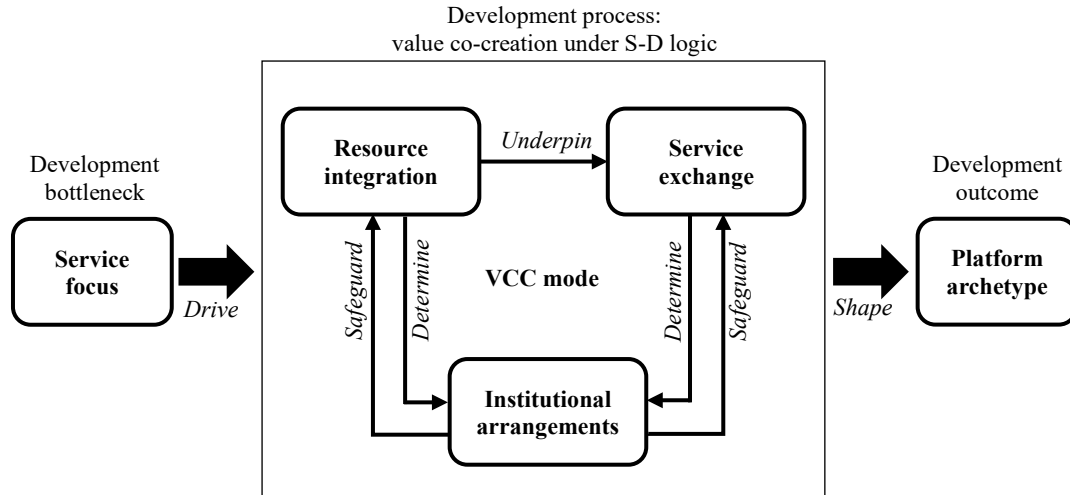


Fig. 1. The research framework.

3. Methodology

We adopt a longitudinal single-case study design for three reasons. First, IDPs are an emerging phenomenon in industrial practice. The specific research question of how platform natives develop IDPs through VCC remains largely unexplored. Compared to quantitative methods, which seek generalizable conclusions from large datasets and focus on causal relationships, the case study method is better suited to capturing complex, dynamic multi-actor interactions (Yin, 2017). Therefore, the case study method provides richer contextual detail and enables deeper dissection of nascent and complex phenomena, making it more appropriate for exploratory theory building (Eisenhardt, 1989). Second, IDPs led by platform natives are important yet rare in practice. Compared to multiple-case studies, a single-case design allows for a more nuanced analysis of the longitudinal evolution of an IDP. It is particularly suitable for extracting underlying patterns and inducing theoretical insights from rich empirical detail (Siggelkow, 2007). Third, our research question focuses on the developmental process and value co-creation logic of IDPs. The process perspective inherent in longitudinal case studies is essential for identifying how VCC modes emerge, evolve, and interact with platform revolution across stages (Langley, 1999).

Overall, the longitudinal single-case study approach is well-suited to dissect the evolutionary process of IDPs led by platform natives and the interaction dynamics of multi-actor VCC within the ecosystem.

3.1. Case selection

Guided by the principles of representativeness, theoretical relevance, and data accessibility, we select Alibaba's Taofactory Platform as a focal case.

(1) Representativeness. A single-case study benefits from uniqueness and revelatory potential (Eisenhardt & Graebner, 2007). Unlike widely studied IDPs led by industrial incumbents (e.g., Siemens MindSphere, SANY IROOTECH, Haier COSMOPlat), Taofactory represents the first major attempt by the platform-native Alibaba to expand from its B2C market (e.g., Taobao Mall) into the B2B manufacturing sector. This initiative also marks one of the earliest efforts by a Chinese platform native to develop an IDP. When Taofactory was established, Alibaba did not possess large-scale industrial assets, deep industry knowledge, or a manufacturing user base. These contextual conditions render the case both theoretically typical and empirically distinctive among existing IDPs. Therefore, we chose Taofactory as a "revelatory case" (Eisenhardt & Graebner, 2007). Its evolution provides a compelling setting for understanding how platform natives approach IDP development under resource constraints. Studying its developmental trajectory and value co-creation orchestration will provide managerial insights and practical references for other platform natives.

(2) Theoretical relevance. First, existing research has yet to develop a sufficient understanding of the emerging IDPs led by platform natives. The evolution of Taofactory from a two-sided matching platform to an industrial platform ecosystem offers a highly aligned context for examining the differentiated development paths of IDPs. Second, for platform natives lacking industrial resources and manufacturing capabilities, a key challenge lies in how to leverage their digital technological advantages to co-create value with firm users that possess domain-specific knowledge. The Taofactory Platform has addressed various development bottlenecks across stages by efficiently integrating resources and orchestrating multi-actor VCC coordinated by institutional arrangements. This dynamic process aligns precisely with our research question, offering rich potential to enrich and extend research on VCC in IDPs.

(3) Data accessibility. Access to extensive and objective primary interview data is a critical consideration in case selection. Our research team has established a long-term, stable cooperation relationship with Alibaba. Through field visits and in-depth interviews, we have accumulated substantial primary data. Furthermore, Alibaba provides a wealth of archival documents and publicly available materials accessible to the research team, enabling robust triangulation through multiple data sources.

3.2. Case background

Taofactory was established in 2013 to enable intelligent factory transformation, intelligent factory-supply chain connectivity, and integration between the manufacturing and consumption sides. Initially relying on Alibaba's 1688 Division and Alibaba Cloud, Taofactory leveraged big data and AI technologies for precision trade matching between manufacturers and the vast pool of Taobao sellers. By analyzing retail big data from Taobao/Tmall apparel sellers, it aggregated fragmented, stochastic production demands. Its intelligent demand-supply matching algorithms then connected these demands to high-quality factories with idle capacity on the platform. This facilitated highly efficient matching, currently connecting over 25,000 apparel factories with more than 1.2 million buyers. In 2016, Taofactory began offering digital transformation services tailored for small and medium-sized enterprises (SMEs), significantly lowering the barriers to digitization. In 2018, building on this foundation, Taofactory focused on developing a common technological infrastructure to empower diverse ecosystem participants to collaboratively provide service solutions for specific scenarios. Its service scope expanded to encompass warehousing, logistics, and finance, marking its transition into an industrial digital platform ecosystem. The development stages and main characteristics of the case firm are shown in Table 1. Taofactory's mode has been featured by prominent media like CCTV (China Central Television), and its practices offer significant implications for platform natives developing industrial digital platforms and for the digital transformation of participating SMEs.

Table 1

The development stages and main characteristics of the case firm

	Initial stage (Dec, 2013 - Dec, 2015)	Growth stage (Jan, 2016 - Sept, 2018)	Expansion stage (Oct, 2018 - present)
Key event	Tap into the upstream of the clothing industry chain, gather demand and retail data from e-commerce sellers and basic information from small and medium-sized factories	Began to provide digital manufacturing solutions for small and medium-sized factories, such as clothing factory A	Introduce third-party developers of specific scenario solutions, and integrate service providers such as fabric procurement, finance, warehousing, and logistics
Actors	Platform firms, buyers, and sellers	Platform firms, buyers, sellers, and hardware manufacturers	Platform firms, buyers, sellers, hardware manufacturers, upstream fabric manufacturers, third-party software developers, financial institutions, and warehousing and logistics service providers
Service type	Matching the demands of e-commerce sellers with the production capacity of small and medium-sized factories	Industrial transaction matching and digital transformation of production	Industrial transaction matching, digital transformation of manufacturing, fabric procurement, warehousing logistics, and finance
Platform role	Provider of the trading environment and the connector for industrial transaction matching	Provider of digital transformation solutions for production	Organizer of the industrial ecosystem

3.3. Data collection

Data collection proceeded in three primary stages, as illustrated in Table 2. The data collected primarily focuses on primary data obtained through interviews and field observations, supplemented by secondary data including archival documents and publicly available literature, as detailed in Table 3. We ensured data triangulation through diverse information sources to enhance the reliability and validity of the case study (Yin, 2017). Specifically, secondary data (e.g., archival records) proved particularly valuable for establishing objective facts, such as delineating stages of platform development, confirming key events and decisions mentioned by interviewees, and quantifying specific outcomes (e.g., financial benefits) of strategic decisions. Interview data, conversely, provided rich contextual details and nuanced insights not captured in archival sources.

In stage 1, the research team identified the emerging phenomenon of IDPs and comprehensively reviewed secondary materials, including news articles, public speeches, literature, and white papers. Based on the case selection criteria, Alibaba's Taofactory Platform was chosen as the focal case. Leveraging the established cooperation relationship, team members joined DingTalk groups of the Alibaba Research Institute, which granted access to internal research reports and case files of partner factories. Based on this preliminary understanding, the team drafted a semi-structured interview protocol to guide subsequent primary data collection.

In stage 2, the research team focused on obtaining first-hand data, mainly including in-depth interviews with case firms and field visits.

Semi-structured interviews. As many middle and senior management personnel in Alibaba Group are alumni of our college, the research team has established a long-term cooperative relationship with Alibaba. We conducted multiple formal interviews and informal discussions with executives from Alibaba Group and the Taofactory Platform leadership team between December 2018 and June 2023. Firstly, to understand the background and strategic positioning of the platform, we interviewed the Executive Vice President of Alibaba Group and the CEO of Alibaba 1688 Division. Secondly, to gain a detailed understanding of the platform's development history and key events, we interviewed the platform's General Manager, Chief Technology Officer, Director of the Operations Department, Director of the Customer Department, and the Regional Director. An illustrative interview protocol for the General Manager is provided in the Appendix.

Field observations. Our team conducted on-site observations at Alibaba's headquarters and Taofactory business units. With permission from the General Manager, team members observed operations at the Alibaba headquarters and key business sites associated with Taofactory to generate direct experiential data. Without disrupting normal operations, the team attended a monthly corporate review meeting and accompanied Taofactory business personnel on field visits to representative partner factories (clothing factory A and wool products factory B). These observations provided valuable experiential insights into platform-factory interactions.

In stage 3, during the data analysis process, additional interviews were conducted to deepen understanding and enhance triangulation. The interviewees of additional interviews include internal operational teams (business personnel from different regions, known as "factory assistant"), managers of Taofactory's key partner factories, the IoT technology collaboration team (e.g., Vice President of Alibaba Cloud Strategic Expansion Department), and third-party service providers.

Table 2

Data collection process.

	Main work	Objectives
Stage 1	Collect secondary data from various sources such as literature, news reports, and books	Gain a preliminary understanding of the platform's development process and analyze its fit with the research, draft an interview outline to lay the foundation for subsequent interviews
Stage 2	Semi-structured in-depth interviews with senior management personnel	Gain a detailed understanding of the platform's development history and key events, obtain authentic, detailed, and rich first-hand data
	On-site observation of case firms and key cooperative users	Gain more intuitive empirical data to understand how platform users interact with the platform
Stage 3	Conduct supplementary interviews through online channels	Address issues that need clarification or confirmation during the early stages of data collection to enhance data reliability

Table 3

Data collection summary.

Data type	Source of information and method of acquisition	Quantity	Content	Code
First-hand data	Interview with the Executive Vice President of Alibaba Group	90 min	Strategic positioning and future development vision of the Taofactory Platform within Alibaba Group	A1
	Interview with the CEO of Alibaba's 1688 Division	84 min	Development background and overall strategic planning of Taofactory Platform	A2
	Interview with the General Manager of Taofactory	110 min	Development history and key decisions of the platform	A3
		98 min	Challenges in platform development, solutions, and future goals	
		115 min	Sharing the latest developments of the platform and user cases	
	Interview with the Chief Technology Officer of Taofactory	120 min	Platform development stage and R&D process	A4
		92 min	Data analysis capabilities and service solution development of the platform	
	Interview with the Director of the Operations Department of Taofactory	128 min	business model, profit models, service process of the platform	A5
	Interview with the Director of the Customer Department of Taofactory	96 min	Platform user case sharing, customer relationship, and governance of ecosystem participants	A6
	Interview with the Regional Director of Taofactory	79 min	The specific service process, support measures, and governance mechanism for factories in the source industry cluster	A7
	Interview with the manager of Factory A	85 min	The cooperation process of Factory A with the platform	A8
	Interview with the manager of Factory B	102 min	The cooperation process of Factory B with the platform	A9
	Participant observation of the firm headquarters	3 times	Participate in the monthly summary meeting of the firm and the business discussion meeting	A10
Second-hand data (internal)	Participant observation of Factory A	Once	Digital transformation of the production workshop of Factory A	A11
	Participant observation of Factory B	Once	Digital transformation of the production workshop of Factory B	A12
	Online channel communication with business personnel, platform users, and third-party complementors	35 times	Obtain supplementary information and verification data related to the above interview content through WeChat, email, video conferences, and other means	A13
Second-hand data (external)	Internal materials provided by internal personnel, including research reports, presentation PPTs, meeting minutes, etc.	15 copies	Platform development history, platform architecture, business processes, and cases of cooperative users	B1
	Articles published on the official website, Weibo, and WeChat public account of the platform	230 articles	Platform services, cooperative user cases, and incentive measures for factories	B2
	Reports from mainstream media such as China News Service and other new media reports	30 copies	Online media materials, including records of external interviews and public speeches, etc.	B3
	Journal literature on China National Knowledge Infrastructure (CNKI), industry reports, and white papers released by the research institute	10 copies	Platform architecture, platform development history, platform resource integration situation, and platform-driven development of regional industrial clusters	B4

3.4. Data analysis

Our data analysis followed an iterative, multi-step process consistent with established qualitative and process research guidelines.

Step 1: developing chronologies of events and identifying temporal stages in platform development. Following recommended strategies for process research, we conducted an initial analysis of the case using the narrative strategy and temporal bracketing strategy (Langley, 1999). Based on interviews with senior executives and archival records, we meticulously reconstructed the key events in the platform's history since its inception. Aligning these key events with the "development bottleneck - development process - development outcome" logic of our research framework, we segmented Taofactory's development into distinct stages: initial stage, growth stage, and expansion stage. We then discussed these stage boundaries with the General Manager to obtain feedback and increase research credibility (Skålén et al., 2015). This process research strategy allowed us to establish temporal anchors, facilitating a deeper exploration of platform development across stages (Kouame & Langley, 2018).

Step 2: coding data to identify key mechanisms. To ensure qualitative rigor, we adopted a structured data analysis approach following the Gioia methodology (Gioia et al., 2013). First, the research team was divided into two subgroups. Each subgroup independently performed open coding while preserving the informants' verbatim expressions. This step generated over 200 first-order concepts (e.g., "identifying and targeting potential complementors"). Second, we compared and reconciled the two sets of first-order codes and engaged them in iterative dialogue with existing literature. Conceptually relevant codes were clustered into theoretically meaningful second-order themes. For instance, following the framework proposed by Madanaguli et al. (2023), data integration and ecosystem actors integration are identified as two crucial parameters determining IDP development. In our case data, concepts such as "identify and position potential complementors", "empower target complementors", and "coordinate complementors relationships" were grouped under the second-order theme "multiple complementors integration", which reflects a key activity during Taofactory's expansion stage to integrate resources.

Step 3: determining aggregated dimensions and building a process model. Leveraging insights from the literature, we formed theoretically grounded aggregated dimensions. Specifically, based on logical connections, the research team grouped the second-order themes into three aggregated dimensions. For example, the first aggregated dimension, "resource integration", encompassed the second-order themes: transaction information integration, industrial data integration, and multiple complementors integration. Finally, to construct the research model, we linked the second-order themes (step 2) and aggregated dimensions (step 3) with the temporal stages identified in step 1. We synthesized the logical relationships among first-order concepts, second-order themes, and aggregated dimensions both within and across stages. This led us to characterize three distinct VCC modes across platform development stages as: connection-based VCC, interaction-based VCC, and collaboration-based VCC. Correspondingly, we classified the evolving platform archetypes as: industrial transaction platform, industrial solution platform, and industrial platform ecosystem.

Throughout the data collection and analysis process, we conducted multiple rounds of longitudinal data collection to ensure data saturation and to obtain authentic and traceable evidence. Key informants were interviewed several times to capture their evolving perspectives. When ambiguities or inconsistencies arose during data analysis, we conducted additional online follow-up interviews for clarification. Following Yin's (2017) methods, we used NVivo software to build a comprehensive case study database. All data sources were repeatedly examined and discussed among the research team until no new information relevant to the research question could be identified, which indicates that data saturation had been achieved.

To further ensure theoretical saturation and enhance the reliability and validity of our findings, we adopted several rigorous procedures, including team-based workshops, back-to-back coding, and multiple rounds of discussion. The research team continuously iterated between data, coding, literature, and the emerging theoretical framework until no new theoretical concepts emerged. Finally, we shared the coding results with key informants and experienced qualitative researchers specializing in case study methods for joint review and refinement, ensuring the development of a robust and saturated theoretical framework. The resulting data structure is shown in Fig. 2. Consistent with the research framework

presented in Fig. 1, bottlenecks encountered in platform development are interpreted by the platform owner as service foci. These foci serve as the logical starting point for VCC, driving the orchestration of three VCC strategies: resource integration, service exchange, and institutional arrangements. This VCC orchestration ultimately shapes the evolution of the platform types.

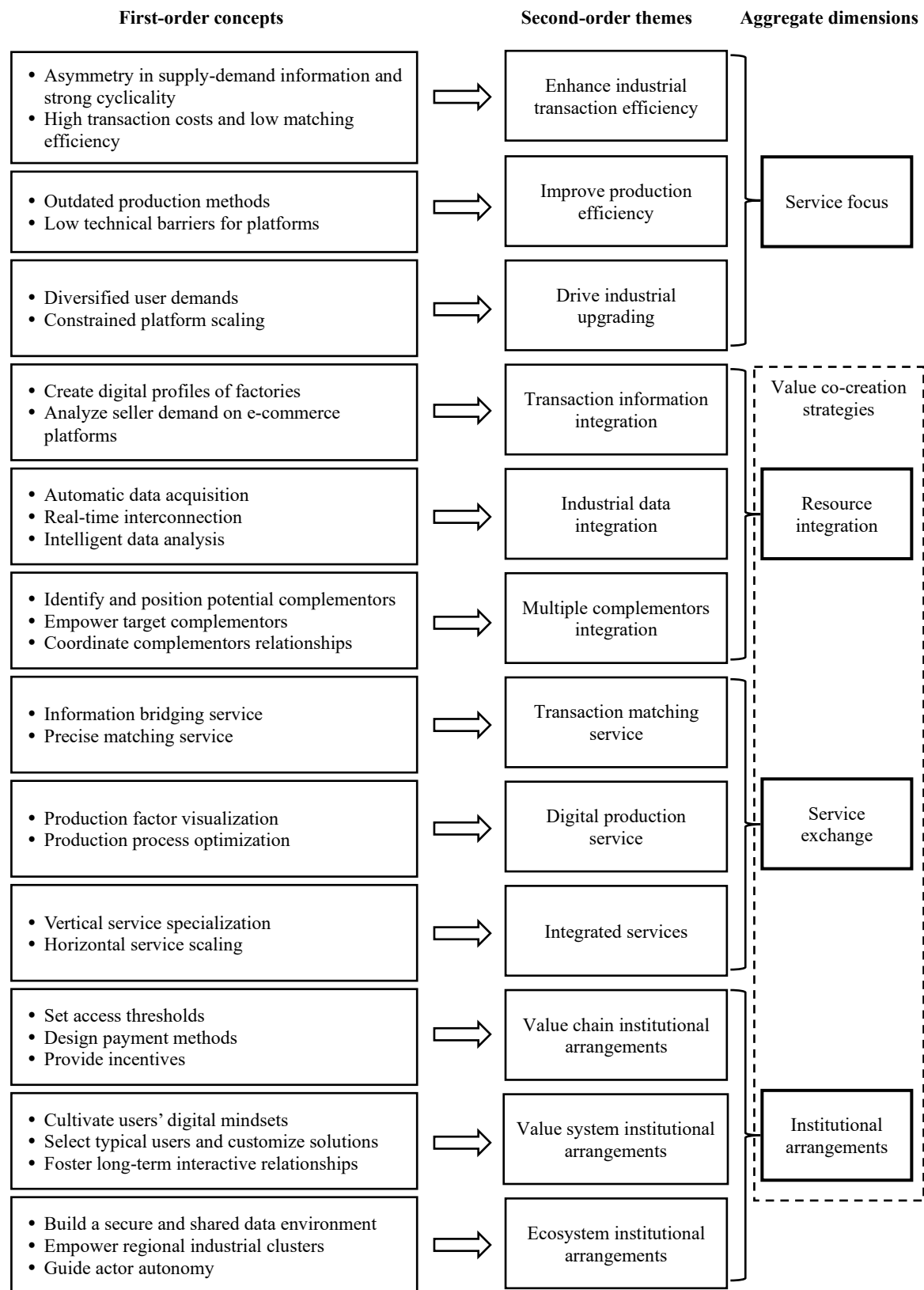


Fig. 2. Data structure.

4. Case analysis and findings

4.1 Initial stage: industrial transaction platform

(1) Service focus

Drawing on case evidence, Taofactory's primary service focus during its initial stage was **enhancing transaction efficiency**. This focus emerged in response to the development bottleneck of inefficient and difficult demand-supply matching within the apparel industry, mainly manifested in the following two aspects. An obvious bottleneck lies in *asymmetry in supply-demand information and strong cyclicity*. Limited by their production capacity, small and medium-sized factories often specialize in specific clothing categories with pronounced seasonal characteristics. This resulted in significant fluctuations between peak and off-peak seasons, causing substantial idle capacity and resource waste during off-peak periods. Meanwhile, traditional apparel OEM sector in China, characterized by low technological capacities and intense competition, suffered from fragmented information flows, leading to high information asymmetry between buyers and suppliers and consequently low overall industrial transaction efficiency. Another bottleneck is manifested in *high transaction costs and low matching efficiency*. Under traditional industry practices, small and medium-sized factories faced complex procurement and material management challenges, demand uncertainty, inventory pressures, and difficulty finding suitable fabric suppliers promptly. The standard payment cycle in the apparel OEM industry often exceeded two months (B2). The spatial and temporal separation between clients and suppliers incurred substantial time, labor, and money costs for search, communication, and relationship maintenance. The coding results are detailed in Table 4.

Table 4

The coding results and typical examples of service focus in the initial stage of IDPs.

Aggregate dimensions	Second-order themes	First-order concepts	Typical evidence citation
Service focus	Enhance transaction efficiency	Asymmetry in supply-demand information and strong cyclicity	“Sometimes we’re racing around the clock, still can’t keep up with orders. But the moment the busy season ends, both machines and staff sit around with nothing to do.” (A8) “The needs of Taobao sellers vary wildly. Small and mid-sized factories typically have narrow expertise, so there’s a serious mismatch between supply and demand.” (A2)
		High transaction costs and low matching efficiency	“We found that, faced with rapidly shifting fashion trends and inventory pressures, small factories simply can’t stockpile large quantities of raw materials.” (A6) “Some days our factory would receive over a hundred online inquiries from Taobao sellers, yet very few of those leads ever turned into orders.” (A9)

(2) VCC strategies: resource integration, service exchange, and institutional arrangements

Driven by a service focus on enhancing industrial transaction efficiency and leveraging its inherent strengths (advanced digital technology and B2C platform experience) as a platform native, Taofactory entered the B2B industrial market through the transaction link. It deployed corresponding activities across the three VCC strategies (resource integration, service exchange, and institutional arrangements), forming a connection-based VCC. The coding results are detailed in Table 5.

Transaction information integration includes Taofactory's actions in collecting, digitizing, and integrating supply-demand information resources from both sides on the platform. This aimed to increase the transparency and completeness of industrial transaction information, which addressed information asymmetry. First, Taofactory *created digital profiles of factories*. To solve difficulties for e-commerce sellers in finding factories, high transaction costs and low operational efficiency for factories, Taofactory started with the familiar apparel industry. To break information barriers, the platform collected extensive basic information from capable small and medium-sized factories (e.g., factory size, business registration, specialized categories, craftsmanship expertise, workforce size), tagged and digitized this data, and made it accessible online. Crucially, factories were required to commoditize their idle capacity online, updating their available production slots for the next 30 days in real-time. The integration of dispersed idle capacity resources help factories to reduce waste and lower overall production costs. Second, the platform owner *analyzed seller demand on e-commerce platforms*. By initially attracting suppliers (factories), the platform drew in Taobao apparel sellers. The platform owner structurally

analyzed the order demands of Taobao sellers and displayed them on the platform, eliminating the spatio-temporal barriers to information flow. As the CTO noted: *“In the initial stage, we accumulated vast data, including factory profiles, e-commerce seller order data, etc. By analyzing data fields, we identified each factory’s core competencies and predicted the popular styles and fabrics through data modeling. This enabled us to achieve increasingly precise buyer-seller matching (A4).”*

Transaction matching service incorporated information bridging service and precision transaction matching service provided by Taofactory to facilitate industrial trade between bilateral users, which improved industrial transaction efficiency and effectiveness. First, the platform provided basic *information bridging service* for both supply and demand side. The platform connected factories and e-commerce sellers by freely displaying supply and demand information to break information asymmetry and improve the efficiency of free exchange. Specifically, it bypassed traditional intermediaries (brands, agents, distributors) by inviting factories to join directly. E-commerce sellers could overcome physical and temporal constraints, querying factory availability in real-time, communicating, and placing orders online, accelerating the connection between manufacturing and sales. Second, the platform upgraded the basic service to *precise matching service*. After the initial operation, user feedback revealed a poor user experience and limited transaction improvement. The core issue was the high heterogeneity of seller demands, misaligned with the specialized capabilities of small and medium-sized factories, resulting in low matching accuracy. Leveraging its accumulated data and digital capabilities, Taofactory introduced a precision trade matching service. Using data analysis algorithms, it developed an intelligent order dispatching function for personalized recommendations, enabling precise matching between heterogeneous seller demands and factory expertise, thereby boosting transaction efficiency and effectiveness. The General Manager explained: *“The platform’s strength lies in big data-driven precision buyer-seller matching and precision order matching, filtering the most suitable factories from over 20,000 nationwide for Taobao sellers (A3).”*

Value chain institutional arrangements are a set of rules designed by the platform owner to enable and constrain bilateral user behavior, ensuring the smooth operation of transaction matching services. They included setting access thresholds, designing payment methods, and providing incentives. First, the platform owner *set access thresholds* to ensure the smooth implementation of transaction matching services. For factories, Taofactory implemented a third-party factory verification mechanism. Professional third-party agencies assessed a factory’s actual production capacity using data audits, random interviews, and on-site inspections, presenting results in an online report. For Taobao sellers, the platform reviewed shop credentials and historical transaction data. This unified access control ensured participant quality. Second, the platform *designed payment methods* to ensure a safe and simultaneous transaction of goods and payment, mainly included three methods tailored for SMEs: full Alipay escrow, credit voucher transactions, and installment payments. Just as the manager of Factory B said, *“I really didn’t expect it. Using the Taofactory platform for transactions really helped me solve the most troublesome cash flow problem (A9).”* For post-transaction, a bidirectional rating system and dispute resolution mechanism were established to reduce friction. Third, to build initial trust in the B2B industrial context, Taofactory *provide incentives* to high-quality factories, such as fee waivers and access to premium customer orders. By subsidizing the supply side to attract demand side, the platform achieved a successful launch. These institutional arrangements define which user exchange behaviors are encouraged or prohibited, aiding the IDP in establishing user base and platform trust during the initial stage.

Table 5

The coding results and typical examples of value co-creation in the initial stage of IDPs.

Aggregate dimensions	Second-order themes	First-order concepts	Typical evidence citation
Resource integration	Transaction information integration	Create digital profiles of factories	<p>“Our platform’s first step was to do what Taobao did for retailers: bring garment manufacturers online just like Taobao sellers. We collected each factory’s basic information and consolidated it into our system.” (A3)</p> <p>“The platform allows factories to turn their idle capacity into real-time online listings, publicly displaying their available slots over the past 30 days.” (A5)</p>
		Analyze seller demand on e-commerce platforms	<p>“We dynamically show the live order requirements of Taobao sellers from all across the country right on our homepage.” (A5)</p> <p>“In the process, we’ve amassed a wealth of order data from e-commerce sellers, enabling us to analyze similar merchants and aggregate their product offerings.” (A4)</p>
Service exchange	Transaction matching service	Information bridging service	<p>“The platform has built a solid bridge between Taobao sellers who understand e-commerce but not supply chains and SMEs who know supply chains but not e-commerce.” (A3)</p> <p>“In the past, our sales reps had to go region by region or attend trade fairs to drum up orders. Now we can receive orders directly online.” (A13)</p> <p>“Online communication has greatly reduced the cost of coordination and product development for both factories and Taobao sellers.” (A3)</p>
		Precise matching service	<p>“We introduced an intelligent order-dispatch feature on the platform. The system filters and recommends the best-fit factories for each buyer, based on region, category, quality, and factory capabilities.” (A4)</p> <p>“From 2014, I noticed daily visits from Taobao sellers plunged, from dozens or even hundreds a day down to single digits. Yet the conversion rate is very high, even surpassing 50%.” (A9)</p> <p>“A constant influx of orders has balanced our factory’s capacity utilization, shifting us from feast-or-famine cycles to steady work throughout the year.” (A8)</p>
Institutional arrangements	Value chain institutional arrangements	Set access thresholds	<p>“We introduced a third-party professional factory-audit agency that conducts on-site inspections of source factories and produces in-depth audit reports. Factories are randomly re-inspected, and only those that pass can accept orders. Taobao sellers can verify these audit reports online.” (A7)</p> <p>“For Taobao sellers, we use data such as a store’s history of violations and its transaction ratings as part of our screening criteria.” (A5)</p>
		Design payment methods	<p>“We offer three tailored transaction mechanisms: the first suits low-value trades with no cash-flow pressure on either side; the second is for high-value orders where the Taobao seller faces funding constraints; and the third fits large transactions where the factory itself has cash-flow pressure.” (A5)</p> <p>“Now, by transacting online through the platform, we receive full payment upon delivery, with a payment cycle of at most one week, plus platform oversight. This has truly solved our biggest pain point.” (A9)</p> <p>“After each transaction, we implement a bidirectional rating system. If a product-quality dispute arises, the platform mediates and arbitrates, and the entire resolution process takes no more than two weeks.” (A5)</p>
		Provide incentives	<p>“In the early days, we hand-picked a few reputable factories and matched them with premium orders. Once others saw the successful outcomes, more and more factories proactively approached us to join.” (A7)</p> <p>“For top-quality factories, we initially waived all intermediary fees, and later offered significant discounts. That helped us attract a large number of factories.” (A5)</p>

(3) Value co-creation mode and platform archetype

In summary, during the initial stage, addressing the service focus on enhancing industrial transaction efficiency, the platform owner orchestrated the three VCC strategies: transaction information integration, transaction matching services, and value chain institutional arrangements. This orchestration fostered a **connection-based VCC** among the platform, factories, and sellers, shaping the platform prototype of this stage as an industrial transaction platform.

The internal mechanism of connection-based VCC is as follows. The platform owner integrated supply-demand information resources by creating digital profiles of factories and analyzing seller demand, alleviating high information asymmetry. Integrating bilateral transaction information significantly increased resource density on the platform, laying the foundation for transaction matching services. Progressing from information bridging to precision matching services reduced users' search and transaction costs, enhancing industrial transaction efficiency and effectiveness (Arnold et al., 2022). The nature of resource integration and service exchange around transactions dictated the focus of institutional arrangements. The platform-led design of access controls, payment methods, and incentives provided the institutional safeguards necessary for establishing platform trust and optimizing resource integration and transaction matching in the initial stage. Crucially, this helped overcome the identity legitimacy restrictions inherent to IDPs led by platform natives when entering the B2B industrial sector (Su et al., 2023). Finally, the key activities underpinning the three strategies worked synergistically, enabling bilateral users to co-create and capture exchange value based on connection.

This dynamic orchestration not only formed a connection-based VCC but also shaped the platform archetype. In the **platform market** dimension, transaction information integration and matching services established a bilateral information connection *network structure*, which reduced search and transaction costs, ignited *cross-side network effects based on user scale* within the industry. *Network size* expanded rapidly, attracting over 10,000 factories and achieving a daily transaction volume of 5 million RMB by 2015 (B1). In the **platform architecture** dimension, value chain institutional arrangements defined the *platform scope*, focused solely on matching within the transaction link. Actors included the platform, factories, and e-commerce sellers. The platform owner acted as a transaction matchmaker, facilitating connections without direct participation in transactions. Relationships were characterized by bilateral information flow. *Platform interoperability* was limited, utilizing standardized, simplified digital processes to connect actors on the platform.

In conclusion, during the initial stage, driven by **enhancing industrial transaction efficiency**, Taofactory forms a **connection-based VCC** by orchestrating **transaction information integration**, **transaction matching services**, and **value chain institutional arrangements**. This stimulates cross-side network effects based on user scale within the industry, successfully launching the **industrial transaction platform**. While Taofactory builds nascent ecosystem advantages during this stage, its VCC strategies were easily imitable, failing to create strong competitive barriers. Given the multi-homing tendency of bilateral clients, the platform lacked sufficient lock-in effects, making its ecosystem advantage potentially fragile.

4.2 Growth stage: industrial solution platform

(1) Service focus

Upon entering the growth stage, the platform's service focus shifted to **improving production efficiency**. This focus addressed two critical development bottlenecks: outdated factory production methods and low technical barriers for platforms. The first issue is *outdated production methods*. Rapid changes in the apparel sales market led to increasingly diverse demands from e-commerce sellers, characterized by smaller batch sizes, greater product variety, and faster delivery requirements. The challenge for sellers evolved from simply finding factories to difficulties with small trial orders, managing material preparation for repeat orders, and developing new products. These new demands for fast-changing and complex order strained SMEs, resulting in low fulfillment rates and user satisfaction. This situation imposed high demands for flexibility and digital intelligence on small and medium-sized factories, forcing them towards digital transformation. Another bottleneck is *low technical barriers for platforms*. The transaction matching services of the initial stage were relatively simple, with low technical barriers and high imitability of the VCC mode. Consequently, customer stickiness remained

low, and the platform's competitive advantage was vulnerable. These combined factors hindered Taofactory's further expansion. The coding results are detailed in Table 6.

Table 6

The coding results and typical examples of service focus in the growth stage of IDPs.

Aggregate dimensions	Second-order themes	First-order concepts	Typical evidence citation
Service focus	Improve production efficiency	Outdated production methods	<p>"A crop of small but stylish independent brands has sprung up on Taobao. These merchants usually place small-batch orders, but their designs are fresh and distinctive, and they demand rapid delivery to seize market opportunities. Traditional production methods of SMEs simply can't keep pace, often resulting in missed deadlines or bad quality." (A5)</p> <p>"We've toured many small factories, most of which were converted from family workshops and severely lack modern management tools. Their warehouse logs are still handwritten." (A7)</p>
		Low technical barriers for platforms	<p>"In our platform's early days, we merely brokered connections between small factories and e-commerce sellers. There wasn't much technology involved, and our profit margins were thin." (A3)</p> <p>"Some users, after the first match on the platform, bypass us and go straight back to their previous partners. We call this phenomenon 'order flying', and it's a real drag on our platform's expansion." (A5)</p>

(2) VCC strategies: resource integration, service exchange, and institutional arrangements

Driven by a service focus on enhancing industrial production efficiency, Taofactory vertically deepened its engagement within the apparel industry's production link. It deployed corresponding activities across the three VCC strategies (resource integration, service exchange, and institutional arrangements), fostering an interaction-based VCC. This orchestration transformed the platform from an industrial transaction platform into an industrial solution platform. The coding results are detailed in Table 7.

Industrial data integration serves as the foundation for the platform to provide digital production solutions and services. It includes Taofactory's activities of capturing, connecting, and analyzing heterogeneous data across the supply, inventory, production, and sales operations of factories. This broke down data silos inherent in traditional factory operations, significantly improving resource allocation efficiency and laying the groundwork for providing production digital transformation services. First, *automated data acquisition* involves deploying low-cost, miniaturized IoT devices (e.g., smart cameras, embedded sensors, RFID systems, edge servers) on workshop production lines. These devices automatically sensed and captured diverse heterogeneous data from humans, machines, physical objects, and systems with minimal manual intervention. Second, aiming to *real-time interconnection* among humans, machines, physical objects, and systems, the platform owner transmitted the acquired heterogeneous data to the cloud through utilizing information and communication technologies. As the CTO stated: "*After deploying this equipment, we can integrate and display real-time production data from the factory floor directly to the factory manager's mobile phone (A4).*" Third, *intelligent data analysis is the process* that the platform owner converted massive industrial data into valuable insights and actionable directives through data cleaning, structuring, and the development of intelligent algorithms. The General Manager noted: "*Our 'Eagle Eye' supply chain diagnostic model offers replenishment forecasting. Based on real-time data on factory inventory and order progress, it helps factories make evidence-based, scientific production plans, reducing inventory pressure (A3).*" Industrial data integration established the resource foundation for small and medium-sized factories' digital production transformation and future collaborative manufacturing within the industrial ecosystem.

Digital production services encompass production factor visualization and production process optimization services provided by Taofactory to empower the digital transformation of small and medium-sized factories. First, the platform owner tried *production factor visualization*. Leveraging Alibaba's mature digital capability, Taofactory developed user-friendly SaaS tools. These enabled small and medium-sized factories to digitize static production factors such as manufacturing equipment, materials, personnel, orders, and inventory. Simultaneously, collaborating closely with lead users to deeply understand industry nuances, the platform decomposed factory production processes into key node operations. Using IoT devices and intelligent algorithms to achieved data tagging, real-time computation, and online integration, the platform provided factory managers with fully digitalized and visualized services for production factors. As the manager of Factory A remarked, "*I can now directly*

see on the big screen how much of an order is completed, how much of which fabric is left in the warehouse, and even the progress at each stage of the production line, like cutting, sewing, and finishing. It's incredibly convenient (A8).” Second, the platform owner provided *production process optimization* service. Based on digitized production factors, the platform employed digital twin technology to virtually reconstruct physical factories. Intelligent data algorithms optimize production workflows and decision-making mechanisms. For instance, to meet Taobao sellers’ demand for “small batches, fast response” personalized customization, Taofactory developed an intelligent production management system app. This optimized Factory A’s original fixed, multi-person assembly line into flexible production groups of 2-6 people, capable of various configurations, enhancing production flexibility (A11). Furthermore, the platform’s intelligent production optimization system enabled automatic production planning based on order demand, real-time production tracking, anomaly alerts for order status, and generated solutions for managerial decisions (A12). These services significantly reduced error rates, improved production efficiency, and combined personalized customization with mass production, substantially increasing the value content of the manufacturing process. The General Manager emphasized: *“We combine Factory A’s deep apparel production experience with Taofactory’s digital capabilities. This create a synergy where technologies and domain knowledge complement each other, which drives process optimization and service innovation. We think this is the true utilization of digital technology (A3).”*

Value system institutional arrangements refer to a set of norms and practices co-designed to facilitate the platform’s evolution from merely connecting supply-demand transactions within the value chain to coordinating production-sales synergy within the value system. It included cultivating users’ digital mindsets, selecting typical users and customizing solutions, and fostering long-term interactive relationships. First, the platform owner found it crucial to *cultivate users’ digital mindsets*. The platform implemented blended online-offline initiatives to enhance factory personnel’s understanding of digital transformation. Examples included on-site digital literacy training, visits to advanced factories, and showcasing success stories via official channels (e.g., WeChat public accounts, website). These practices bridged the cognitive gap among traditional factory managers regarding digital transformation, boosting participation. As the General Manager stated, *“For small and medium-sized factories, digital transformation is perhaps more about a transformation in mindset (A3).”* Second, to promote exemplary user cases, the platform *selected typical users and customized solutions* for them. Based on prior cooperation, Taofactory identified highly willing and capable small and medium-sized factories as lead users. It co-developed small-step service solutions featuring staged implementation and rapid validation/optimization. The initial stage focused on low-cost, minimally invasive digital upgrades. This ensured smoother adoption, increased user acceptance and stickiness, and solidified the platform’s competitive edge. The General Manager explained: *“We aimed to enable small and medium-sized factories to start on digital transformation with low implementation costs and minimal disruption, using methods like visual analysis for data integration (A3).”* Third, through regular factory visits and actively soliciting user feedback via multiple channels, the platform *fostered long-term interactive relationships* with some users. This enabled Taofactory to proactively learn domain-specific tacit knowledge and user experiences shared by factories, mitigating its inherent industry knowledge deficit as a platform native. The Regional Director noted: *“Relying solely on our digital tech or the factory’s industry knowledge won’t unlock data’s value. That’s why we assigned dedicated factory assistants to frequently visit factory production lines and understand real operational problems. Only then can we truly grasp and solve production managers’ pain points (A7).”* These institutional arrangements fostered a shared vision for digital transformation and a culture of trust between the platform owner and factories. This enabled the fusion of digital technology and domain knowledge through iterative interaction, driving upgrades of digital production services. Crucially, it helped Taofactory to overcome its inherent domain knowledge deficit and innovation legitimacy disadvantage as an IDP led by platform natives entering the B2B industrial sector.

Table 7

The coding results and typical examples of value co-creation in the growth stage of IDPs.

Aggregate dimensions	Second-order themes	First-order concepts	Typical evidence citation
Resource integration	Industrial data integration	Automatic data acquisition	“We built a lightweight, easy-to-copy capacity-monitoring system. Using smart cameras, RFID tags, and sensors, we turn over 100 million daily scans into data you can actually use, no manual data entry needed.” (A3) “Step one was just spending around RMB 50,000 to set up about 20 cameras and an edge server in a modest workshop, covering everything from cutting tables to sewing machines.” (A8)
		Real-time interconnection	“The cameras snap images that our back end analyzes, everyone can see when fabric arrives, when it goes to cutting, how many pieces are done, and so on.” (A4) “Now customers can open our app on their phone, stream video from our shop floor, and check their order’s progress anytime. It really puts their minds at ease about on-time delivery.” (A13)
		Intelligent data analysis	“We track each order’s real-time progress and whether it’s on schedule. With data analysis, we paint a multi-dimensional picture of each factory. Are they churning out budget, mid-range, or premium clothes? Which techniques do they nail, and what’s their defect rate?” (A4) “We’ve turned the entire production process into quantifiable data in the cloud, so we get live data sync and instant alerts whenever an order goes off track.” (A4)
Service exchange	Digital production service	Production factor visualization	“The platform uses visual recognition and SaaS tools to put the whole factory process on screen, so managers can see real-time data at every step.” (A4) “Smart cameras at the packing station plus some algorithms automatically update the completed-item count.” (A12)
		Production process optimization	“We ran an algorithm to improve our workflow, breaking the old 20-person fixed assembly line into flexible 2–6 person teams. After switching, Factory A saw a 6% bump in scheduling efficiency and cut delivery times by 10%.” (A7) “Now our production-line status shows up as data on my phone, and I get instant tips on how to fix any malfunctions. It even crunches the numbers to find the most cost-effective way to slot in different orders on my line.” (A9)
Institutional arrangements	Value system institutional arrangements	Cultivate users’ digital mindsets	“Some of our managers are stuck in their old ways. Taofactory often takes us to tour top factories and even brings digital experts to train us.” (A8) “We highlight model factories on our website and WeChat, and we’ve invited digital experts for on-site training so managers can see the value of digitalization firsthand.” (A7)
		Select typical users and customize solutions	“Whether the first wave of digital makeovers works is critical. After weighing manager enthusiasm, urgency, and tech feasibility, we chose two factories near Hangzhou, Factory A and Factory B.” (A3) “Super high-tech changes aren’t always a win for us small and medium-sized factories, they demand huge training efforts and high costs.” (A9) “We’re taking a ‘minimally invasive’ approach. Using each worker’s smartphone via a smart production-management app to digitize and visualize production without heavy training.” (A4)
		Foster long-term interactive relationships	“We’ve set up a hybrid online-offline support team across the country to quickly respond to factory needs. Local factory assistants regularly visit the shop floor to dig into and understand each factory’s pain points.” (A6) “In 2016, we kicked off our first stage of digital upgrades with the platform. Now we’re into the third stage, with a dedicated team hashing out the details of each upgrade plan right there at the factory.” (A8)

(3) Value co-creation mode and platform archetype

In summary, during the growth stage, addressing the service focus on improving industrial production efficiency, the platform owner orchestrated the three VCC strategies (industrial data integration, digital production service, and value system institutional arrangements). This orchestration fostered an **interaction-based VCC** among the platform, factories, and sellers, driving the evolution of the platform archetype from an industrial transaction platform to an industrial solution platform.

The internal mechanism for interaction-based VCC is as follows. Leveraging its advanced digital technology, the platform owner achieved resource liquefaction (decoupling industrial data from its physical form or equipment, enabling independent existence) through automatic data acquisition, real-time interconnection, and intelligent analysis (Lusch & Nambisan, 2015). These activities broke down data silos within factories, realizing industrial data integration and establishing the resource foundation for production digital transformation services. Based on this, through deep interaction with small and medium-sized factories, the platform provided digitized services encompassing production factor visualization and process optimization. This represented a service upgrade from passive single-link monitoring to proactive full-process optimization. The focus on resource integration and service exchange within the production link shaped the institutional arrangements. The platform owner and factory users co-designed institutional arrangements (cultivating mindsets, selecting typical users, fostering relationships), ensuring the feasibility of data integration and digital transformation services during the IDP's growth stage. Finally, the interplay of the three strategies expanded the platform's service scope and value network, enabling the platform and factory users to co-create and capture functional value based on interaction. This also enhanced the exchange value captured by all participants—platform, factories, and sellers.

This dynamic orchestration not only formed an interaction-based VCC but also shaped the evolving platform archetype. In the **platform market** dimension, industrial data integration and digital transformation services fostered a *bidirectional knowledge interactive network structure* between the platform and factories. However, the platform's focus remained on customizing solutions to enhance factory productivity and quality, stimulating *localized data network effects based on relationship stickiness*. Data network effects arise when increased data volume improves algorithm accuracy, creating a positive feedback loop (Gregory et al., 2021). In the **platform architecture** dimension, value system institutional arrangements defined the *platform scope*, now covering both transaction and production links within the industrial chain. The platform owner's role evolved into a production digitalization enabler. Relationships with factory users deepened into bidirectional knowledge exchange, increasing in both breadth and depth. *Platform interoperability* improved to a moderate level, enabling customized digital transformation solutions to connect machinery, production processes, and sales data within the platform.

In the growth stage, driven by **enhancing production efficiency**, platform natives form an **interaction-based VCC** by orchestrating **industrial data integration, digital production services, and value system institutional arrangements**. This stimulates localized data network effects based on relationship stickiness, shaping the evolution into the **industrial solution platform**. Taofactory vertically deepened its focus on production digitalization within the industrial chain, achieving a deep fusion of its digital technology with users' domain knowledge, forming a unique technological innovation barrier, and significantly increasing user stickiness. However, the time-intensive nature of customizing digital solutions and its concentration within a single industry constrained scale expansion. Further exploration of business growth points was necessary to strengthen the ecosystem advantage.

4.3 Expansion stage: industrial platform ecosystem

(1) Service focus

Upon entering the expansion stage, the platform's service focus shifted to **driving industrial upgrading**. This focus addressed two key development bottlenecks. A critical bottleneck lies in *diversified user demands*. As the user base grew and expanded to other industries, the platform faced increasingly complex and varied industrial scenarios and deeper digital demands. Furthermore, the platform identified that some firm users required not just transaction matching and production efficiency improvements, but also value-added services such as warehousing, logistics, and finance. *Constrained*

platform scaling is another bottleneck hindering the development of the IDP. While deeply rooted in the production link of the clothing industry during the growth stage, providing customized solutions has allowed Taofactory to accumulate domain-specific knowledge. However, this focus also confined the platform scope to a single industry, slowing network size expansion. Consequently, the platform needed to deepen its transaction matching and production digitalization services through common foundational services and personalized solutions to empower cross-industry users' comprehensive digital transformation. Simultaneously, it needed to expand its service portfolio, offering crossover services to meet diverse user needs, enhancing the one-stop service experience, and thereby strengthening the ecosystem advantage. The coding results are detailed in Table 8.

Table 8

The coding results and typical examples of service focus in the expansion stage of IDPs.

Aggregate dimensions	Second-order themes	First-order concepts	Typical evidence citation
Service focus	Driving industrial upgrading	Diversified user demands	“We’d love to run our own Taobao shops, but today’s e-commerce game means livestreaming, driving traffic, creating viral hits, and none of us at the factory have a clue how to do that.” (B2) “Our factory has to buy and manage over a hundred different materials: cotton, wool, wool blends, cashmere, ... You name it. Sometimes just sourcing one material takes weeks or even months.” (A8)
		Constrained platform scaling	“At first, we didn’t really get how factories actually operate. It took us three to four months to do the first digital upgrade at factory A. We need to turn those personalized solutions into something more standardized if we want to scale.” (A4) “Some factories have been asking for help with digital marketing and warehousing too. We’ve already got tons of data, so why not build a fully integrated online-to-offline B2B service ecosystem?” (A3)

(2) VCC strategies: resource integration, service exchange, and institutional arrangements

Driven by a service focus on driving industrial upgrading, Taofactory pursued vertical deepening within the industrial chain while simultaneously horizontally expanding. It deployed corresponding activities across the three VCC strategies (resource integration, service exchange, and institutional arrangements), fostering a collaboration-based VCC. This orchestration transformed the industrial solution platform into the industrial platform ecosystem. The coding results are detailed in Table 9.

First, **multiple complementors integration** is the foundation on which integrated services on IDPs rest. It includes activities such as identifying and positioning potential complementors, empowering target complementors, and coordinating complementors relationship, implemented by the platform owner to introduce external actors for collaborative innovation. Complementors such as hardware providers and software developers are vital components of an industrial platform ecosystem. Integrating their complementary resources and capabilities fosters spontaneous reciprocal service exchange among participants, forming the resource foundation for stimulating platform generativity and a collaboration-based VCC. Unlike the initial stage’s focus on integrating data (operand resources), complementors integration primarily involves integrating their operant resources (knowledge, capabilities, relationships).

A necessary prerequisite for multiple complementors integration is *identifying and positioning potential complementors*. Taofactory clarified the functional roles of complementors across different industrial chain links through analyzing factory users’ diversified demands, making complementors’ positions in the ecosystem explicit. For horizontal demands (e.g., logistics, finance), the platform selected leading firms like Cainiao (intelligent logistics enterprise) and Ant Technology (Internet financial service enterprise) to co-provide crossover services. *Empowering target complementors* is an important orchestration activity for integrating them. It refers to Taofactory’s assistance to identified complementors from both technical and market perspectives. On one hand, Taofactory invested in its platform architecture, building a data intelligence layer, opening boundary resources, and encapsulating generic functions into reusable modules to empower niche software developers, reducing their participation uncertainty. On the other hand, it created a unified marketplace for industrial applications and upstream/downstream services, providing complementors (raw material suppliers, software developers, third-party service providers) with vast customer access and market space. As the General Manager noted, “For key partners like Ant Technology, we opened dedicated data interfaces. They can analyze processed platform data (factory audit reports, sales data) to assess user operational status and

risk (A3).” *Coordinating complementors relationships* is the main initiative through which the platform orchestrated newly integrated complementors resources and relationships to stimulate interdependence among participants, enabling flexible collaboration and spontaneous co-innovation. Concurrently, it negotiated win-win agreements with complementors, clarifying transaction rules, roles, and responsibilities to minimize conflicts, ensuring ecosystem generativity while retaining complementors and maintaining ecosystem stability.

Second, **integrated services** are characterized by the synergistic evolution of vertical service specialization and horizontal service scaling. By integrating diverse ecosystem actors, Taofactory built a collaborative service network, offering manufacturing firm users integrated solutions spanning the ecosystem.

Vertical service specialization refers to that Taofactory deepened and strengthened core services (industrial transaction and production digitalization), which continuously driven industrial digitization and enabled large-scale production-sales coordination within regions. In terms of production digitalization services, the platform put forth effort on building fundamental capabilities to provide a low-code development environment and open-source tools. By refining common user needs, it modularized complex industrial knowledge and encapsulated it into reusable standardized components. This promoted co-innovation and industrial knowledge reuse across firms and industries. Based on this common capability layer, the platform can collaborate with diverse complementors to provide customized solutions. For instance, for clothing manufacturer S, the platform co-created an intelligent manufacturing solution with a third-party developer, integrating fabric ID tracking and AI scheduling to optimize production planning, capacity allocation, and material flow (B1). In terms of large-scale production collaboration, building on individual factory digitization, Taofactory pioneered the “virtual joint factory” concept, forming online cloud factories from geographically dispersed units, using algorithms for dynamic order and capacity allocation. For example, during the 2018 FIFA World Cup, Taofactory rapidly integrated idle capacity from over 30 factories across 10+ provinces to produce over 1 million mascots within 30 days (B2). In terms of marketing digitalization service, the platform upgraded basic transaction matching to full-link digital marketing services, offering e-commerce solutions for manufacturers (digital product selection, intelligent dynamic pricing, digital marketing managed services). As the Director of the Operations Department stated, “*The digital marketing managed service provided by our platform enables direct manufacturers-to-consumer (M2C) connections via ultra-short links, supported by localized, consultant-style factory assistants service, which deeply couples with consumption trends for rapid response and inventory relief (A5).*”

Through *horizontal service scaling*, the platform owner extended services scope beyond core functions into adjacent sectors (e.g., smart warehousing/logistics, industrial finance, raw material procurement), to achieve cross-industry, multi-category service scaling. In terms of warehousing and logistics service, the platform collaborated with Cainiao Logistics and Best Express to build regional origin warehouses, offering integrated “storage and distribution” solutions for manufacturing clusters. Factory A’s manager confirmed: “*The origin warehouse solved our peak-season fulfillment bottleneck. Nowadays, we only need to focus on production and deliver the finished products to the original warehouse. The platform can guarantee a service level of 72-hour delivery to the main consumption areas (A8).*” In terms of industrial finance service, Taofactory shared user operational data with Ant Technology and MyBank to co-provide fast-approval, flexible online loans, empowering factory cash flow.

The value creation logic of integrated services is as follows. Vertical specialization systematically elevates industrial chain digitization by deeply empowering core processes (production and transaction). Horizontal scaling significantly expands the service boundary and coverage through powerful resource integration and network coordination, ultimately driving the platform towards a sustainable ecosystem characterized by multi-actor participation, multi-level coordination, and multi-dimensional VCC.

Third, **ecosystem institutional arrangements** refer to a set of ecosystem-level institutions and practice co-generated by Taofactory and actors to activate diverse participants and balance platform generativity with stability. A key issue is *building a secure and shared data environment*. Taofactory leveraged its digital strengths to transform industrial data from isolated silos into interconnected flows, ultimately achieving manufacturing-consumption data synergy and sharing among actors. Meanwhile, it

spearheaded a comprehensive security framework, coordinating stakeholders to ensure secure data transmission and access throughout its life cycle via mechanisms like authentication, access control, data masking, and encryption, fostering an open, secure, reliable co-governed data environment. *Empowering regional industrial clusters* is another crucial institutional practice. Aligning with local government policies, Taofactory used e-commerce orders to guide and empower factories for digital transformation and supply chain optimization. It coordinated regional factories for complementary advantages and collaboration, establishing industrial belt standards and quality control, thereby supporting the source industrial belt transformation and high-quality sustainable development. The Regional Director explained: “In 2020, over 110 woolen factories from Guangdong’s D County joined. We launched the first ‘Sweater Festival’. Shop views reached 616,000 and visitors nearly 30,000 in 7 days (8x normal), significantly boosting D County’s brand (A7).” Guiding actor autonomy is an important institutional guarantee for the platform’s expansion into the ecosystem. The platform delegated some control and decision-making rights to key actors, encouraging their active involvement in layered platform governance. This fostered spontaneous resistance to opportunism (e.g., free-riding) and promoted healthy competition and collaboration, creating a self-sustaining, self-organizing ecosystem of mutual benefit. The General Manager stated: “We established developer community and ‘Super Factory’ forums, encouraging knowledge sharing and spontaneous community order maintenance (A3).”

Table 9

The coding results and typical examples of value co-creation in the expansion stage of IDPs.

Aggregate dimensions	Second-order themes	First-order concepts	Typical evidence citation
Resource integration	Multiple complementors integration	Identify and position potential complementors	<p>“We saw many users stressing over raw-material sourcing, so we tapped into 1688’s long-standing network of suppliers to give factories a ton of easy buying options.” (A13)</p> <p>“Taofactory wants to be a tech-powered foundation platform, then we select partners in specific fields based on customer needs to offer more professional service solutions.” (A3)</p>
		Empower target complementors	<p>“We’ve built a ‘data-intelligence layer’ that cleans up and structures all the data we collect, so third-party developers can grab and analyze production info in real time.” (A3)</p> <p>“We teamed up with a fabric-inspection machine maker to share machine-run data like fabric test results, so they can keep tuning their machines for faster, more accurate checks.” (A4)</p>
		Coordinate complementors relationships	<p>“We sign win-win deals with different partners. For example, we co-build origin warehouses with Cainiao Logistics. We funnel them big-volume clients, and they give our clients discounted rates.” (B1)</p> <p>“For major clients, we set up a dedicated project team to coordinate all the partners, keep communication flowing, and work together on a fully digital-upgraded plan.” (A6)</p>
Service exchange	Integrated services	Vertical service specialization	<p>Production digitalization service. “After the platform helped us go digital, we saw two big wins. The smart workshop system got all our processes talking to each other and seriously ramped up output, and the real-time AI quality-check system made our QC super thorough and smart.” (A12)</p> <p>Large-scale production collaboration. “When a seller has a huge order, we crunch the data and split it across a dozen nearby factories, so they all chip in together, that way, production speed shoots way up.” (A4)</p> <p>Marketing digitalization service. “We entered the Taofactory platform just before Chinese New Year 2021. The factory assistants ran smart market trend analysis with us, helped pick out which items might blow up for the holiday, and we prepped festive red underwear and cozy sets in advance. Those cost-effective seasonal hits ended up selling like crazy.” (A13)</p>
		Horizontal service scaling	<p>Industry finance service. “As a gold-level factory, we can tap up to two million in credit loans with annual interest rate as low as 7%, plus interest-free installment plans. Last year, when I wanted to upgrade our equipment, my factory assistant was the first to tell me about this sweet financing offer.” (A8)</p> <p>Warehousing and logistics service. “By co-building origin warehouses with Cainiao, we’re as close to the source as possible. Factories using these warehouses cut delivery times by about 5 hours on average and slash logistics costs by roughly 15%.” (B1)</p> <p>Raw material sourcing. “In the past, sourcing even a single material could take forever. Now I just click around on the platform and instantly pull up tons of supplier options, saving me loads of time.” (A9)</p>
Institutional arrangements	Ecosystem institutional arrangements	Build a secure and shared data environment	<p>“Our exec team agreed we can’t just hoard massive data, cutting-edge tech, and industry know-how on the platform. We need to let it loose so outside companies can use it too.” (A1)</p> <p>“Right now, our new goal is to build an ecosystem powered by our platform data, where hardware vendors, software developers, system integrators, manufacturers, and other service providers all co-exist. Think of us like an outlet: plug in a fridge and it runs, plug in a washer and it runs...” (A2)</p>
		Empower regional industrial clusters	<p>“It’s not just about digitizing a few factories. The real mission is to pull together all the supply-chain resources needed for industry-wide digitalization to strengthen regional clusters.” (B3)</p> <p>“We’ve helped nearly 100 industrial belts crank out over 1 million orders a month, and around 200 belts hit over 500,000 orders a month, reviving a ton of county-level manufacturing hubs.” (B1)</p>
		Guide actor autonomy	<p>“With our push, dozens of factories in City S formed a garment alliance. On one side, they emphasizes taking ‘Internet + factory’ as an innovation-driven element to upgrade the garment industry through Taofactory. On the other, they crack down on knockoffs and cutthroat price wars to keep the market healthy.” (B4)</p> <p>“As the platform scaled up, we couldn’t keep an eye on every factory ourselves. So we negotiated with benchmark firms in each region to guide them to bridge factories, buyers, and service providers and assist in handling conflicts.” (A3)</p>

(3) Value co-creation mode and platform archetype

In summary, during the expansion stage, addressing the service focus on driving industrial upgrading, the platform owner orchestrated the three VCC strategies (multiple complementors integration, integrated services, and ecosystem institutional arrangements). This orchestration fostered a collaboration-based VCC among the platform, firm users, and complementors, driving the evolution of the platform archetype from an industrial solution platform to an industrial platform ecosystem.

The internal mechanism for collaboration-based VCC is as follows. Leveraging its network advantage, the platform owner integrated diverse ecosystem complementors through identifying and positioning complementors, empowering target complementors, and coordinating complementors relationships. This integrates their technological, relational, and asset resources, laying the resource foundation for integrated services. Based on this, the platform collaborated with diverse complementors to provide integrated services spanning procurement, production, marketing, warehousing, logistics, and finance. This realized multi-actor, multi-level reciprocal service exchange composed of vertical service specialization and horizontal service scaling. The nature of resource integration and service exchange within the ecosystem scope shaped the institutional arrangements. The platform owner and multi-actors co-generated institutional practices (building data environment, empowering regions, guiding autonomy), ensuring the viability of complementors integration and integrated services. Finally, the interplay of the three strategies propelled the platform into a ecosystem for value co-creation and sharing, enabling diverse participants to co-create and capture exchange value, functional value, and relational value.

This dynamic orchestration not only formed a collaboration-based VCC but also shaped the industrial platform ecosystem. In the **platform market** dimension, multiple complementors integration and integrated services fostered a *multilateral data collaborative network structure*, enabling cross-firm, cross-industry *network size* expansion and stimulating the *pan-domain data network effect based on multilateral collaboration*. In the **platform architecture** dimension, the three strategies significantly broadened the platform boundary and service scope while systematically deepening industrial chain digitization. The upgraded *platform scope* covered the industrial chain and across industry services. The platform owner's role evolved into the ecosystem coordinator. Relationships with participants became dynamic collaborations. *Platform interoperability* substantially improved, enabling seamless connection, flow, and sharing of enterprise and industrial chain data within and across platforms, forming nested and interlocking cooperation with the complementary platform and the actor community.

In conclusion, during the expansion stage, aiming at **driving industrial upgrading**, platform natives form a **collaboration-based VCC** by orchestrating **multiple complementors integration**, **integrated services**, and **ecosystem institutional arrangements**. This activates pan-domain data network effects based on multilateral collaboration, enabling the platform evolve into the **industrial platform ecosystem**. Taofactory significantly expanded its platform boundary and service scope while systematically deepening industrial chain digitization. It deepened its technological innovation barrier while constructing a business model barrier, significantly increasing user stickiness and platform scale, ultimately forming a high-order ecosystem advantage.

4.4 Framework for value co-creation and development of IDPs led by platform natives

Drawing on S-D logic and a longitudinal case study of Taofactory, this study constructs a process model illustrating how platform natives develop IDPs by orchestration of VCC strategies, as shown in Fig. 3. Driven by service foci across stages, the platform owner orchestrates resource integration, service exchange, and institutional arrangements. This orchestration facilitates the transformation of VCC mode from connection-based to interaction-based and ultimately to collaboration-based. These evolving VCC modes activate distinct network effects, shaping the evolution of platform archetypes from an industrial transaction platform to an industrial solution platform and eventually to an industrial platform ecosystem (Table 10).

During the initial stage, as an IDP led by platform natives, Taofactory leveraged its digital technology strengths to alleviate the most salient bottleneck in industrial development. Driven by the service focus on enhancing transaction efficiency, the platform integrated bilateral transaction information resources to attract users. Building on this, it provided transaction matching services ranging from information bridging to precise matching that effectively reduced information asymmetry between

buyers and sellers. Concurrently, the platform owner designed the value chain institutional arrangements (e.g., access thresholds and payment methods) to resolve participant pain points, thereby establishing platform trust among B2B industrial users and forming a connection-based VCC. Acting as a transaction matchmaker, the platform connected factories and e-commerce sellers, lowering transaction costs and improving traditional industrial transaction efficiency, enabling participants to capture exchange value. This orchestration activated cross-side network effects based on user scale through a connection-based VCC, enabling the successful launch of the industrial transaction platform. During this stage, the network size expanded rapidly within the industry, but the platform scope was confined to the transaction link. The network structure limited to bilateral information connection and low platform interoperability, resulted in low user stickiness and weak ecosystem advantage.

In the growth stage, confronted with insufficient customer satisfaction, the platform prioritized vertical deepening within the production link over scale expansion. Driven by the service focus of improving production efficiency, the platform broke down factory-level data silos and integrated industrial data across operational processes. Building on these data capabilities, the platform co-created digital production service solutions (e.g., production factor visualization and production process optimization) through deep, continuous interaction with firm users. Simultaneously, value system institutional arrangements, such as cultivating users' digital mindsets, motivated users to contribute their industrial knowledge, forming an interaction-based VCC. In this process, the platform acted as a production digitalization enabler, co-creating functional value and enhanced exchange value. Interaction-based VCC stimulated localized data network effects based on relationship stickiness, shaping the evolution from an industrial transaction platform to an industrial solution platform. With customized solutions developed for typical users, platform interoperability increased to a moderate level due to the integration of factory equipment and systems. The platform scope expanded from the transaction link to encompass the production link. A bilateral knowledge interactive network structure emerged between the platform and factories, which facilitated the exchange of generic digital technology and domain expertise and increased user stickiness. However, the resource-intensive nature of deep customization constrained network size expansion, hence the ecosystem advantage still required strengthening.

In the expansion stage, leveraging accumulated industrial data and customer relationships, and driven by the service focus of driving industrial upgrading, the platform integrated diverse complementors' resources. It collaborated with them to provide integrated services, which include specialized vertical services and scaled horizontal services. Concurrently, ecosystem institutional arrangements (e.g., building a secure and shared data environment) co-generated by the platform owner and participants enabled multi-actor, multi-level service exchange, forming a collaboration-based VCC. In this process, the platform acted as the ecosystem coordinator, enabling VCC with multi-actors to capture exchange value, functional value, and relational value derived from social interactions. This process activated pan-domain data network effects based on multilateral collaboration, shaping the evolution from an industrial solution platform to an industrial platform ecosystem. During this stage, the platform scope expanded across procurement, production, marketing, warehousing/logistics, and finance among diverse participants. Platform interoperability substantially improved, enabling nested and interlocking collaboration with complementary platforms (e.g., logistics, finance) and developer communities. A multilateral data collaboration network structure emerged. The platform occupied a hub position within the ecosystem, with its network size expanded to encompass the entire industrial chain and cross-industry, thus consolidating a robust ecosystem advantage.

Table 10

Value co-creation and development of Taofactory Platform.

Characteristics	Initial stage	Growth stage	Expansion stage
Service focus	Enhance transaction efficiency	Improve production efficiency	Driving industrial upgrading
Resource integration	Transaction information integration	Industrial data integration	Multiple complementors integration
Service exchange	Transaction matching service	Digital production service	Integrated services
Institutional arrangements	Value chain institutional arrangements	Value system institutional arrangements	Ecosystem institutional arrangements
VCC mode	Connection-based VCC	Interaction-based VCC	Collaboration-based VCC
Value type	Exchange value	Exchange value, functional value	Exchange value, functional value, relational value
Network effect	Cross-side network effect based on user scale	Localized data network effects based on relationship stickiness	Pan-domain data network effects based on multilateral collaboration
Network structure	Bilateral information connection	Bidirectional knowledge interaction	Multilateral data collaboration
Network size	Expansion within the industry	Limited to the industry	Entire industrial chain and cross-industry
Platform scope	Transaction; platform owner, factories, and e-commerce sellers	Transaction, production; platform owner, factories, and e-commerce sellers	Procurement, production, marketing, finance, warehousing, and logistics; platform owner and multi-actors
Platform interoperability	Low, transmit information within the platform based on standardized processes	Medium, integrate with the devices and systems of firm users	High, nested cooperation with complementary platforms and developer communities
Platform identity	Transaction matchmaker	Enabler of digital production	Ecosystem coordinator
Platform archetype	Industrial transaction platform	Industrial solution platform	Industrial platform ecosystem

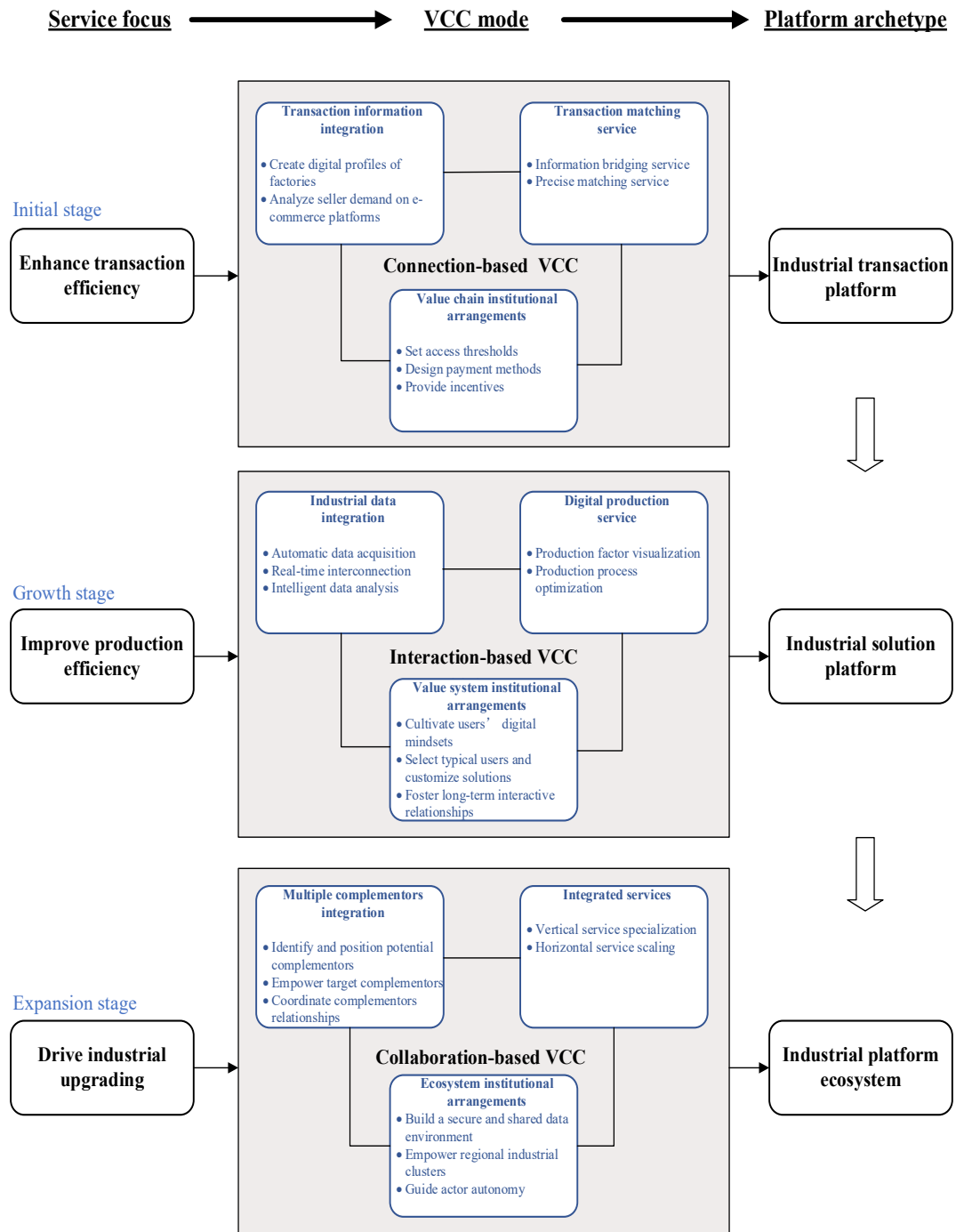


Fig. 3. The value co-creation and development of IDPs led by platform natives.

5. Discussion

In summary, the findings reveal the underlying mechanisms by which platform natives develop IDPs through the orchestration of VCC strategies. In the initial stage, driven by enhancing industrial transaction efficiency, platform natives form a connection-based VCC by orchestrating transaction information integration, transaction matching services, and value chain institutional arrangements. This stimulates cross-side network effects based on user scale within the industry, successfully launching the industrial transaction platform. In the growth stage, driven by improving production efficiency, platform natives form an interaction-based VCC by orchestrating industrial data integration, digital production services, and value system institutional arrangements. This stimulates localized data network effects based on relationship stickiness, shaping the evolution into the industrial solution platform. In the expansion stage, driven by driving industrial upgrading, platform natives form a collaboration-based VCC by orchestrating multiple complementors integration, integrated services, and ecosystem institutional arrangements. This activates pan-domain data network effects based on multilateral collaboration, enabling the evolution into the industrial platform ecosystem.

In the discussion, we will analyze the underlying mechanisms through which platform natives, as cross-boundary entrants, orchestrate value co-creation strategies to drive platform development across three stages. We will then contrast the distinct development paths of IDPs led by industrial incumbents and those led by platform natives, thereby further clarifying the theoretical contributions and boundary conditions of this study.

5.1. Value co-creation strategies and modes of IDPs led by platform natives

Existing research on IDPs has highlighted the importance of complex value co-creation within platform ecosystems, providing a foundation for understanding key VCC capabilities and VCC practices (Siaw & Sarpong, 2021; Tian et al., 2021). However, there remains a lack of systematic insight into the formation mechanisms and evolutionary processes of dynamic, multi-actor VCC within industrial platform ecosystems (H. Zhang et al., 2024), particularly for IDPs led by platform natives. Our study identifies three distinct VCC modes and their mechanisms in shaping IDP evolution. We will now discuss these in detail across developmental stages.

In the initial stage, platform strategy literature suggests that B2C platforms typically address cold-start problems by using discriminatory pricing or cross-subsidization to solve the “chicken-or-egg” dilemma and to stimulate cross-side network effects (Caillaud & Jullien, 2003; D. P. McIntyre & Srinivasan, 2017). However, in B2B industrial transactions characterized by high-reliability demands and complex processes (Anderson et al., 2022), mere information connection is insufficient to erase the trust deficit (Shree et al., 2021), especially for platform natives as new entrants to the B2B industrial market. Hein et al. (2019) argue that the first step of value co-creation in IDPs is to integrate complementary assets to incentivize supply-side partners. While platform natives without industrial physical assets cannot follow this path directly (Pauli et al., 2021). Our findings reveal that value chain institutional arrangements serve as a crucial orchestration in this stage (Sun & Gregor, 2023). Platform natives creatively convert their platform governance experience from B2C markets into institutional designs targeting user pain points in B2B industrial transactions (e.g., strict access thresholds and guarantee payment methods) (O’Mahony & Karp, 2022). This mitigates identity legitimacy disadvantages of platform natives as cross-boundary entrants and enables the smooth provision of transaction information integration and matching services between supply and demand (Khanagha et al., 2022; Su et al., 2023). Current research indicates that industrial incumbents typically launch IDPs by enhancing their own technological capabilities based on profound domain knowledge or by developing advanced production services centered around their industrial assets (Jovanovic et al., 2022; Wang et al., 2024). In contrast, for platform natives, the cross-side network effects based on user scale (activated by connection-based VCC) represent an adaptive extension of the value creation logic originally forged in B2C markets (Mosch et al., 2023). Targeting a niche market to develop an industry transaction platform thus constructs a unique platform identity built on platform natives’ resource endowments and reflects how platform distinctiveness logic evolves in B2B industrial contexts (Cennamo, 2021). Our findings challenge the prevailing platform launch strategies in IDP literature and extend the discussion in platform

strategy literature on how platforms expand into new markets, thereby refining the contextual boundaries of platform launch theory (Murthy & Madhok, 2021).

In the growth stage, mainstream literature on platform growth typically emphasizes the scale and scope economies of network effects, encouraging rapid expansion and platform envelopment (Eisenmann et al., 2011; D. McIntyre et al., 2021). However, the high customization, high reliability, and long-cycle characteristics of B2B industrial contexts necessitate that the value creation of IDP must move beyond shallow transaction connections to deep industrial production processes (Madanaguli et al., 2023). Pauli et al. (2021) note that platform natives face more formidable challenges in developing IDPs due to their lack of industrial assets, domain expertise, and B2B relationships, but they do not propose viable development strategies. Our research reveals that when entering B2B industrial market with high knowledge barriers, platform natives lacking embedded resources need to orchestrate distinct value co-creation strategies, rather than simply relying on technology or business envelopment (L. Chen et al., 2026). Our study indicates a strategic pivot in the VCC orchestration of platform natives during the growth stage: a shift from connection-based VCC pursuing horizontal scale to interaction-based VCC fostering deep knowledge integration (He & Zhang, 2022). Specifically, platform natives leverage digital technology to achieve resource liquefaction by integrating industrial production data and design value system institutional arrangements to empower users to contribute their tacit industry knowledge (Lusch & Nambisan, 2015). This process of proactively acquiring domain-specific knowledge through deep interaction transcends the passive analysis of user data common in B2C platforms (Veile et al., 2022), realizing the co-production of operant resources within specific use contexts and enabling the upgrade of digital production services (Liu et al., 2024). The orchestration of interaction-based VCC compensates for the innovation legitimacy deficit platform natives face when engaging deeply in industrial production processes (Khanagha et al., 2022; Taeuscher & Rothe, 2021). The resulting localized data network effects based on relational stickiness are key to generating positive feedback loops between machines, algorithms, and decision-making (Huber et al., 2017), which is different from homogeneous network effects based on user scale (Varga et al., 2023). These findings illustrate that the core challenge for platform natives in developing IDPs shifts from connecting bilateral markets to fostering the integration and innovation of operant resources between the platform and users (Shen et al., 2024).

In the expansion stage, existing research on B2C platform ecosystem governance, while emphasizing openness and complementor participation, often implicitly assumes that the platform owner maintains control by governing core interfaces and rules, frequently applying uniform standards to developer communities (L. Chen et al., 2022; Uzunca et al., 2022). Concurrently, while S-D logic identifies institutional arrangements as key to coordinating VCC, the mechanisms for their dynamic design and evolution within platform contexts remain underexplored (Vargo et al., 2023). The core challenge at this stage is to incentivize heterogeneous complementors to contribute their core resources and engage in collaboration-based VCC (Kretschmer et al., 2022). Our case reveals that the platform owner moves beyond merely setting rules to co-generating ecosystem institutional arrangements with key actors (e.g., co-designing data security and sharing protocols) (Shi et al., 2024). This shift towards decentralized institutional arrangements signals the platform identity transformation into an ecosystem coordinator (Nguyen & Nguyen, 2022; Springer et al., 2025). It enables multiple complementors integration and the delivery of integrated services, thereby activating pan-domain data network effects based on multilateral collaboration (Varga et al., 2023). Consequently, the key for platform natives scaling an industrial solution platform into an industry platform ecosystem lies in designing and maintaining ecosystem institutional arrangements that motivate heterogeneous actors to collaboratively deliver service bundles (Zeng et al., 2023).

In sum, unlike the relatively standardized and stable co-creation modes that platform natives exhibit in their B2C markets (Liu et al., 2025), the evolving VCC modes in IDPs are the product of orchestration across resource integration, service exchange, and institutional arrangements. The scope of resource integration expands from operand resources like transaction information to operant resources such as user knowledge and complementors' technologies (Ranjan & Read, 2021), reflecting a transition from explicit to tacit resources and from exploitative to explorative integration orientation (Chen & Cui, 2022). Service exchange evolves from platform-dominated singular service type to reciprocal, multi-actor, and multi-layered exchanges, significantly increasing in complexity (Sun & Gregor, 2023). Institutional

arrangements, as the key strategy driving the evolution of VCC modes, play an indispensable role in shaping IDP evolution (Aagaard et al., 2026). They evolve from platform-dominated, centralized unilateral arrangements to increasingly decentralized multilateral arrangements co-generated with actors, which is crucial for motivating the participation of users and complementors in VCC (Mei et al., 2022). It is important to note that in the dynamic evolution of VCC within industrial digital platforms, the relationship between higher-order VCC modes in later stages and lower-order modes in earlier stages is not one of replacement and elimination, but rather of assimilation and synthesis (Clemens et al., 2025).

Furthermore, mainstream digital platform development research focuses on direct or indirect network effects (Cennamo & Santalo, 2013; Jacobides et al., 2018), overlooking the role of data network effects from the perspective of data learning and utilization. While recent studies have begun to address data network effects, there remains a lack of clear explanation regarding how they are generated and layered in complex industrial B2B ecosystems (Varga et al., 2023). We identify three hierarchical, progressive network effects that extend Gregory's (2021) typology of data network effects and application scope. Each is activated by a different VCC mode and jointly catalyzes platform type evolution. Cross-side network effects based on user scale are activated by connection-based VCC, where value stems from connecting bilateral users (Cennamo & Santalo, 2013). However, due to industrial complexity, this effect is relatively shallow and unstable (Su et al., 2023). It cannot simply replicate the winner-takes-all dynamics in B2C markets (Jovanovic et al., 2022). Localized data network effects based on relationship stickiness are activated by interaction-based VCC (Vanhaverbeke, 2025), where value derives from the depth of integration between data capabilities and domain knowledge, leading to stronger network effects and higher switching costs (Latinovic & Chatterjee, 2024). Pan-domain data network effects based on multilateral collaboration are activated by collaboration-based VCC, where value emerges from the recombinant and innovative potential of heterogeneous complementary resources across multiple scenarios (Mancuso et al., 2024). This effect promotes generativity and ecological advantages of the IDPs (Haftor et al., 2021; Haki et al., 2024). These findings reveal that the source of competitive advantage for IDPs is cumulative and hierarchical. Advanced network effects do not arise automatically but are the result of the platform owner's orchestration of VCC strategies (Hendricks et al., 2025). This provides a novel perspective for understanding how platforms build long-term, robust ecosystem barriers and helps bridge the gap between B2C platform theory and B2B industrial ecosystem literature (Mosch et al., 2023).

5.2. IDPs led by industrial incumbents vs. IDPs led by platform natives

As the enablers of manufacturing digital transformation, IDPs are developed by two different types of leaders: industrial incumbents and platform natives. Existing research predominantly focuses on incumbents, while the unique challenges and developmental logic of IDPs led by platform natives have yet not been fully explored (Pauli et al., 2021). Based on prior literature and our case findings, we compare the two groups along initiation bottlenecks, entry points, development paths, and evolutionary trajectories, as detailed in Table 11.

In terms of initiation bottleneck, industrial incumbents primarily face traditional value chain inertia and a lack of platform mindsets and advanced digital technologies (Sjödin et al., 2022). Amidst the digital wave, due to organizational inertia and limited digital expertise, industrial incumbents may fail to recognize the high added value of digital servitization (Marheine et al., 2021). They often remain entrenched in firm-centric internal product innovation and traditional distributor systems (Beverungen et al., 2021). Furthermore, they grapple with uncertainties in co-creating value with technology partners during digitalization and may even fall into digital servitization traps (Fu et al., 2022), struggling to overcome the shift from G-D logic to S-D logic.

Platform natives face bottlenecks stemming from a deficit in industrial resource endowments, such as domain expertise, physical industrial assets, and established B2B customer relationships (Pauli et al., 2021). Adopting a specific IDP is a complex, firm-level decision for manufacturers involving production, marketing, and operation processes (Marzi et al., 2023). Platform natives' lack of industrial embeddedness results in low user trust and legitimacy deficits (Khanagha et al., 2022). This leads to difficulties in platform launch and insufficient user base. These contrasting bottlenecks influence IDPs' different entry strategies and development paths (Hannah & Eisenhardt, 2019).

In terms of entry points and development paths, industrial incumbents typically start from internally focused production links, leveraging domain-specific knowledge to address issues like production equipment compatibility and equipment monitoring and maintenance (Soellner et al., 2024), aiming to develop product or efficiency-oriented industrial platforms (Madanaguli et al., 2023). Initially, the platform scope is often confined internally, primarily connecting factory equipment and systems, with low integration of ecosystem actors (Haki, Blaschke, et al., 2024). Subsequently, to acquire digital capabilities, incumbents rely on their domain expertise, hiring specialists, or selectively partnering with technology firms. Through VCC with manufacturers, they evolve into supply chain platforms or product-service platforms (Jovanovic et al., 2022; Madanaguli et al., 2023). The platform scope expands from intra-firm to intra-industry, and services are upgraded to process optimization and industry-specific solutions. Finally, strategies like modular replication or guiding lead users to build industry sub-platforms may enable cross-industry expansion (Shen et al., 2024; Wang et al., 2024). However, lacking foundational IaaS capabilities makes it difficult to develop all-in-one full-stack platform ecosystems (Mosch et al., 2023). Future directions for IDPs led by industrial incumbents may include becoming niche providers focusing on high-barrier, industry-specific scenarios (e.g., edge real-time analytics), transforming into integration system providers connecting hardware and cloud platforms (Den Hartigh et al., 2023), or collaborating to build industrial alliance platforms (e.g., Catena-X) (Springer et al., 2025). Consequently, their typical platform archetype evolutionary path is: product platform - supply chain platform - cross-industry platform.

Platform natives, as illustrated by Taofactory, follow a contrasting path. Due to the lack of industrial embeddedness and advantages in digital technology, it strategically enters through a B2B transaction link, follow the approach of platform exploitation of its core B2C platform experience (Karhu & Ritala, 2021), utilizing connection-based VCC to enhance industrial transaction efficiency (Su et al., 2023). This approach mitigated the trust and identity legitimacy deficit as a new entrant to the B2B industrial market (Taeuscher & Rothe, 2021). This highlights that selecting an appropriate niche market is a crucial initiation strategy for IDPs led by platform natives. Subsequently, platform natives offered low-cost, customized digital production services, increasing acceptance of digital transformation among SMEs (Marzi et al., 2023). The fusion of its general digital technology with users' domain knowledge fostered interaction-based VCC, compensating for the platform natives' lack of industrial resources and overcoming innovation legitimacy challenges (Su et al., 2023). This indicates that deep interaction with industrial users is a vital growth strategy (Benitez et al., 2020). Finally, while focusing on developing foundational infrastructure, it empowered multiple complementors to provide specialized and horizontal services, upgrading into an industrial platform ecosystem. This demonstrates that collaborative VCC with multi-actors is the key strategy (Ranjan & Read, 2021). Thus, the platform archetype evolutionary path of IDPs led by platform natives is: industrial transaction platform - industrial solution platform - industrial platform ecosystem.

Critically, a key determinant of their future trajectories lies in their ability to activate pan-domain data network effects based on multilateral collaboration. This effect serves as the core lever for IDPs to expand into sustainable industrial platform ecosystems (Pauli et al., 2025).

Table 11
IDPs led by industrial incumbents vs. IDPs led by platform natives.

Characteristics	IDP led by industrial incumbents	IDP led by platform natives
Initiation bottleneck	Traditional value chain inertia, lack of platform thinking	Lack of domain knowledge, industrial physical assets, and B2B customer relationships
Entry point	Production link of large industrial firms themselves	Transaction link of small and medium-sized factories
Development path	From intra-firm to intra-industry	From outside the industry to intra-industry, and then cross-industries
Acquisition of industry knowledge	Based on their industry knowledge	Engage in in-depth interaction with firm users to accumulate industry knowledge
Platform capability building	Hire professional talents or seek external cooperation	Based on its own digital technology and B2C platform experience
Actor integration	Mainly industry partners, selectively integrate external actors	A large number of diverse and heterogeneous actors
Platform archetype	Product platform - supply chain platform - cross-industry platform	Industrial transaction platform - industrial solution platform - industrial platform ecosystem

5.3. Contribution, implications, and future research

(1) Theoretical contributions

First, a central contribution of this study is that we make a significant supplement to the literature on digital platform development through an in-depth analysis of the new phenomenon of IDPs led by platform natives. Existing research has largely examined IDPs led by industrial incumbents, emphasizing technological capabilities (Jovanovic et al., 2022; Wang et al., 2024) or business model innovation (Madanaguli et al., 2023; Su et al., 2023). Much less is known about how platform natives lacking incumbents' critical resources can develop IDPs when entering the B2B industrial market (Springer et al., 2025). By positioning platform natives as cross-boundary entrants, we develop a process model that explains how they orchestrate multi-actors value co-creation to develop IDPs. We reveal how platform natives can overcome stage-specific bottlenecks through the orchestration of three value co-creation strategies (Markfort et al., 2022). This leads to a novel developmental path from an industrial transaction platform to an industrial solution platform and ultimately to an industrial platform ecosystem (Latinovic & Chatterjee, 2024). Through comparison with IDPs led by industrial incumbents, this study provides insights into how the two types differ in their initiation bottlenecks, entry strategies, and development paths (H. Li et al., 2023). Our findings respond to Pauli (2021)'s call for investigation of the formidable challenges faced by platform natives in developing IDPs. By uncovering a new developmental pathway and the underlying mechanisms for building industrial platform ecosystems, this study enriches the literature on platform development distinctiveness logic and the evolution of industrial platform ecosystems (Cennamo, 2021; Karhu & Ritala, 2021). By introducing the missing perspective of cross-boundary entrants, our research examines how platform natives with B2C platform experience make adaptive adjustments to their capability endowments to overcome the lack of B2B industrial sector embeddedness (J. Chen et al., 2025). This approach bridges the dialogue between classic B2C platform strategy literature and B2B industrial platform literature (Mosch et al., 2023).

Second, a major contribution lies in advancing platform-based value co-creation. Although prior research has recognized the importance of VCC in platform ecosystems and has identified key VCC capabilities and VCC activities between users and platform owners (Schrieck et al., 2021; Struwe & Slepnirov, 2023; Tian et al., 2021), we still know little about the dynamic processes of VCC or how it drives platform development. Our findings show how platform natives, driven by shifting service foci, orchestrate resource integration, service exchange, and institutional arrangements to form distinct VCC modes—connection-based VCC, interaction-based VCC, and collaboration-based VCC. This responds to calls by Chandna & Salimath (2024) and De Oliveira & Cortimiglia (2017) to capture the dynamic nature of platform VCC through a longitudinal case study. We also demonstrate that higher-order VCC

modes emerging in later stages do not replace earlier modes but instead absorb and integrate them (Jia et al., 2023). Through this analysis, we identify three distinct value co-creation modes specific to IDP contexts and reveal the mechanisms through which VCC modes activate different types of network effects and shapes IDPs' evolution (Vanhaverbeke, 2025). These insights deepen the understanding of how value co-creation modes promote the IDPs' emergence and development (Tian et al., 2021).

Third, this study further contributes to the literature on S-D logic by extending its application into B2B industrial digital platform contexts. Early S-D logic literature offered a meta-theoretical framing (Ng & Vargo, 2018), and recent studies have adopted S-D logic to examine service platforms (Lusch & Nambisan, 2015; Wei & Pardo, 2022) and digital servitization (Liu et al., 2024). By applying S-D logic to analyze value co-creation within IDPs, we broaden its empirical scope and deepen its micro-level activities. In addition, previous studies often remained static and emphasized the roles of resource integration and service exchange (Blasco-Arcas et al., 2020; Hein et al., 2019), neglecting the indispensable function of the institutional arrangements (Vargo & Lusch, 2016). Our study unpacks the sub-dimensions and co-evolutionary processes of S-D logic's core constructs (resource integration, service exchange, and institutional arrangements), and further highlights the interplay among them. This deepens the understanding of the micro-level components of S-D logic (Vargo & Lusch, 2011). Moreover, our bottom-up, empirical evidence-based research bridges S-D logic as meta-theory with practice (Vargo & Lusch, 2017), enhancing its explanatory power and practical relevance.

(2) Managerial implications

As a new infrastructure deeply integrating next-generation ICT with the industrial real economy, IDPs play a pivotal role in driving the digital transformation of manufacturing and accelerating the construction of a modern industrial system. This study offers several implications for platform owners, firm users, and complementors.

For platform owners, platform natives developing IDPs should avoid transplanting their B2C platform strategies or imitating the development paths of industrial incumbents. Instead, they should orchestrate VCC strategies based on bottlenecks and capability endowments. During the initial stage, they should proactively sense the external industrial environment and assess internal capabilities, identify an appropriate niche market to stimulate network effects based on user scale to overcome trust and resource constraints. During the growth stage, they should avoid directly applying consumer internet models. Instead, they should engage in deep collaboration with firm users to compensate for industrial knowledge gaps and strengthen relationship stickiness through customized digital solutions. During the expansion stage, they should integrate multiple ecosystem complementors (e.g., financial institutions, logistics providers, software developers) to drive vertical service specialization and horizontal service scaling, creating a mutually beneficial ecosystem.

For firm users, on the one hand, they should proactively input explicit resources and tacit knowledge (e.g., domain-specific knowledge, industrial scenario expertise) into the platform. This enhances the IDPs' understanding and service capability for industrial contexts, fostering deep VCC between IDPs and firm users, enabling successful digital transformation of manufacturing. On the other hand, they should provide real-time demand feedback to help IDPs transform fragmented user needs into a recognizable demand mapping, actively achieving ecosystem synergy with the platform. Furthermore, for SMEs with a low level of digitalization, they should not blindly invest in high-tech equipment. Instead, by leveraging the empowerment of IDPs, they should adopt the approach of "small steps, fast progress, iterative trial and error" to embark on digital transformation.

For complementors, they should actively clarify their role positioning within the platform ecosystem and fully commit resources (technology, knowledge, capital) to stimulate complementarity with the platform and other participants, committing to multilateral collaborative VCC. Meanwhile, they should ensure functional differentiation from the platform, maintaining complementarity while avoiding excessive dependence.

(3) Limitations and future research

Despite employing a rigorous longitudinal case study, the findings have applicability boundaries and limitations. First, to provide a nuanced, contextualized analysis of the unique emergent phenomenon of IDPs led by platform natives, a single-case method was adopted. While we contrasted it with IDPs led by industrial incumbents in the discussion, conclusions may lack generalizability due to sample

limitations (Yin, 2017). For instance, Taofactory is a group-incubated platform, receiving substantial support from its parent, Alibaba Group. Future research could employ multiple case studies with replication and comparative analysis to generalize development processes across different IDP types and explore inter-platform competition and cooperation, thereby extending theoretical boundaries. Second, this study analyzed the VCC process primarily from the platform sponsor's perspective. Although user-side interview data was collected, we did not analyze strategies employed by users and other complementors to capture value within the platform. Future studies could shift focus to ecosystem participants, deeply analyzing their strategies within the IDP context.

In conclusion, industrial digital platforms represent fertile ground for theoretical innovation and industrial development. We call for heightened scholarly attention and continued practical exploration into their evolution, governance, and ecosystem dynamics.

Data availability

Data supporting this study cannot be made available due to commercial restrictions.

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Appendix

Illustrative interview protocol

Could you please describe the development history of the platform?

Could you please describe the key stages or major events in the platform's development journey?

Elaborating questions such as:

- Can you please provide an example?
- Why do you think this event is important?

Could you describe what challenges you encountered during the development of the platform?

Could you describe how the platform addresses these challenges?

Elaborating questions such as:

- You said that [xxx]. Can you provide an example?
- Why did the platform take that specific action?
- How did you consider the result from that specific action?

Which partners or users played pivotal roles in the platform's development?

Elaborating questions such as:

- How did the platform cooperate with [mentioned partner/user]?
- Why does the platform adopt that kind of cooperation approach towards [mentioned partner/user]?
- What impact did the cooperation with [mentioned partner/user] have on the platform?



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