

Exploring Service Ecosystem Formation in High School Science Exhibitions: A Value Co-Creation Perspective

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Abstract

This study examines the formation of a high school science exhibition service ecosystem in Taiwan region through a value co-creation lens. Drawing on service-dominant logic, it investigates how shared value propositions are established and how co-creation strategies mobilize stakeholder participation and resources. Using a qualitative case study approach based on observations, interviews, and document analysis, the findings reveal that ecosystem formation is not a linear process of alignment but a tension-driven evolution shaped by competing institutional logics, uneven resource integration, and the coexistence of value co-creation and co-destruction. While institutional arrangements facilitate coordination and engagement, they may also distort educational values by emphasizing competitive outcomes. The study further highlights the critical role of teachers as micro-level orchestrators who mediate between institutional pressures and student learning. This research contributes to service ecosystem literature by proposing a tension-driven formation model and extends value co-creation theory to educational contexts.

Keywords

Service-Dominant Logic, Value Co-Creation, Service Ecosystems, Ecosystem Formation, Science Education, Institutional Logics

1. Introduction

In recent decades, the paradigm of value creation has shifted from a firm-centric logic toward a more interactive, relational, and systemic perspective. Service-dominant (S-D) logic emphasizes that value is not embedded in outputs but is co-created through interactions among multiple actors integrating resources within

service systems (Vargo & Lusch, 2008, 2014, 2017). This perspective has catalyzed the formation of the service ecosystem concept, which conceptualizes value creation as a dynamic process embedded in networks of actors, institutions, and resource flows (Vargo & Akaka, 2012; Barile et al., 2016). Service ecosystems are characterized by loosely coupled yet interdependent actors whose coordinated activities lead to the co-creation of value-in-context (Wieczerzycki et al., 2025). As such, understanding how these ecosystems format, evolve, and are governed has become a central concern in service research (Mustak & Plé, 2020; Holmqvist & Diaz Ruiz, 2017).

Building on this theoretical foundation, scholars have increasingly explored the role of value propositions as a key mechanism for aligning actors within service ecosystems. Value propositions are not static offerings but evolving, co-created agreements that facilitate resource integration and collaboration among stakeholders (Frow et al., 2014). In ecosystem settings, particularly those involving heterogeneous actors, the formulation of shared value propositions is critical to orchestrating participation and fostering collective engagement (Donaldson et al., 2025). This orchestration often requires the presence of keystone actors who coordinate resources and guide ecosystem development through strategic governance and resource orchestration (Jacobides et al., 2018; Cui et al., 2022).

Parallel to these developments, the notion of value co-creation has gained prominence in educational contexts. Co-creation in education emphasizes collaborative learning processes in which students, teachers, institutions, and external stakeholders jointly contribute to the design and delivery of educational experiences (Dollinger et al., 2018; Zarandi et al., 2024). Within science education, the concept of ecosystem services has also been extended to highlight the educational value generated through interactions between learners and their environments (Ruppert & Duncan, 2017; Mocior & Kruse, 2016). These perspectives suggest that educational activities, such as science exhibitions, can be understood not merely as isolated events but as complex service ecosystems involving multiple actors and value exchanges (Palacios Agundez et al., 2022; Nie & Zarei, 2023).

In the context of Taiwan region, recent educational reforms further reinforce the relevance of this perspective. With the rapid advancement of digital technologies, students are increasingly required to navigate complex and dynamic environments. Traditional rote-learning approaches have been criticized for constraining critical thinking and adaptability. In response, Taiwan region's Ministry of Education implemented the 2019 Curriculum Guidelines (so-called "108 Curriculum Reform"), which emphasize competency-based learning, including inquiry and practice, as well as interdisciplinary integration. These reforms aim to cultivate students as lifelong learners capable of scientific inquiry, problem-solving, and cross-domain knowledge integration.

Within this reform context, the International Science Exhibition in Taiwan region for primary and secondary education (commonly referred to as the "Science Exhibition") serves as a critical platform for operationalizing the goals of the 108

Curriculum. Functioning as a bridge from foundational knowledge to applied inquiry, the science exhibition adopts a competition-based format to stimulate students' scientific thinking and creativity. Students are encouraged to begin with observations from their everyday lives, develop curiosity-driven questions, design experimental procedures, collect and analyze data, and ultimately present their findings through formal exhibits. Through this process, the science exhibition not only enhances individual learning outcomes but also mobilizes a wide range of stakeholders—including students, teachers, schools, government agencies, and external partners—thereby forming a multifaceted interaction system.

Despite these advances, there remains a notable gap in the literature regarding how service ecosystems are generated and constructed within secondary education settings, particularly in the context of science exhibitions. While prior studies have examined co-creation in higher education or educational service ecosystems more broadly, limited attention has been paid to the systemic processes through which value propositions are formed, stakeholder engagement is mobilized, and ecosystem structures format in high school science exhibitions.

Addressing this gap, this study adopts a value co-creation perspective to examine the generation and construction of a high school science exhibition service ecosystem. Specifically, this research seeks to answer the following questions: 1) How can a shared value proposition be established within the existing ecosystem of high school in Taiwan region science exhibitions to align diverse stakeholders and facilitate resource integration? 2) How can value co-creation strategies and activities attract stakeholder participation and resource commitment, thereby enabling the formation of a science exhibition service ecosystem?

Most importantly, this study responds to recent calls for a more nuanced understanding of value co-creation in educational contexts within service ecosystems (Vink et al., 2020; Matthies et al., 2016).

2. Literature Review

2.1. Service-Dominant Logic

Service-dominant (S-D) logic has emerged as a foundational paradigm for understanding value creation in contemporary service research. Moving beyond the traditional goods-dominant logic, S-D logic posits that service—the application of competencies for the benefit of another—is the fundamental basis of exchange (Vargo & Lusch, 2008, 2014). Within this perspective, value is not embedded in outputs but is co-created through interactions among multiple actors who integrate resources within service systems (Vargo & Lusch, 2017).

A central tenet of S-D logic is that all actors are resource integrators, and value is phenomenologically determined by beneficiaries in specific contexts (Vargo & Akaka, 2012). This shift has led to the conceptualization of service systems and, subsequently, service ecosystems as configurations of actors, resources, and institutions that co-evolve through ongoing interactions (Barile et al., 2016). Service ecosystems are defined as relatively self-contained, self-adjusting systems of re-

source-integrating actors connected by shared institutional arrangements and mutual value creation (Vargo & Lusch, 2011, 2017). Furthermore, S-D logic highlights the importance of institutions and institutional arrangements in shaping actor interactions and guiding value co-creation processes. These institutional elements—including norms, rules, and shared meanings—enable coordination and stability within complex systems (Vargo & Lusch, 2014).

In sum, S-D logic provides a robust theoretical foundation for analyzing how value is co-created through resource integration and interaction within complex service systems. It also offers a lens for understanding the formation of service ecosystems across different contexts.

2.2. Value Co-Creation

Value co-creation is a core concept within S-D logic, emphasizing that value emerges through collaborative processes among multiple stakeholders rather than being unilaterally produced by firms or institutions (Vargo & Lusch, 2008; Vargo & Akaka, 2012). Co-creation involves the integration of operant and operand resources—such as knowledge, skills, and physical assets—through interactions that generate value-in-use and value-in-context (Wieczerzycki et al., 2025).

Scholars have increasingly examined value co-creation as a dynamic and context-dependent process shaped by actor engagement, institutional arrangements, and resource configurations (Frow et al., 2014). In service ecosystems, value propositions serve as key mechanisms that facilitate co-creation by aligning actor expectations and enabling coordinated resource integration. These propositions are not static but evolve through ongoing interactions and negotiations among stakeholders (Donaldson et al., 2025).

In the educational domain, value co-creation has gained significant attention, particularly in higher education settings. Co-creation in education involves collaborative learning processes in which students, educators, and other stakeholders jointly contribute to knowledge creation and learning experiences (Dollinger et al., 2018). Such approaches have been shown to enhance engagement, learning outcomes, and the relevance of educational services (Zarandi et al., 2024). Moreover, studies on educational ecosystem services highlight how interactions between learners and their environments generate educational value beyond formal classroom settings (Mocior & Kruse, 2016; Ruppert & Duncan, 2017). Accordingly, understanding value co-creation requires attention not only to individual interactions but also to the broader ecosystem in which these interactions are embedded.

Overall, value co-creation provides a critical lens for examining how stakeholders collaboratively generate value, particularly in complex and multi-actor environments such as educational systems.

2.3. Service Ecosystem Formation

The concept of service ecosystem formation focuses on how networks of actors, resources, and institutions emerge and evolve into coherent systems of value co-

creation. From a structural perspective, ecosystems consist of heterogeneous actors—including individuals, organizations, and institutions—whose interactions are shaped by shared rules and governance mechanisms (Jacobides et al., 2018). The formation of such ecosystems often involves the orchestration of resources and the alignment of stakeholder interests, which can be facilitated by keystone actors playing a central coordinating role (Cui et al., 2022). These actors contribute to ecosystem stability and growth by enabling resource flows and fostering collaboration among participants.

Service ecosystem formation is also closely linked to the development of shared value propositions that attract and align stakeholders. As actors recognize mutual benefits and opportunities for collaboration, they become more willing to participate and invest resources, thereby reinforcing ecosystem development (Frow et al., 2014; Donaldson et al., 2025).

In addition, recent studies highlight the importance of context in shaping ecosystem formation. Ecosystems are embedded in specific social, cultural, and institutional environments that influence actor behavior and value creation processes (Matthies et al., 2016; Holmqvist & Diaz Ruiz, 2017). In educational settings, for example, service ecosystems may involve interactions among students, educators, institutions, and external stakeholders, with value co-creation occurring through both formal and informal learning activities (Nie & Zarei, 2023; Palacios Agundez et al., 2022).

Despite growing interest in service ecosystems, research on their formation in secondary education contexts remains limited. Most existing studies focus on business or higher education ecosystems (e.g., Dollinger et al., 2018; Nie & Zarei, 2023; Zarandi et al., 2024), leaving a gap in understanding how ecosystems format in contexts such as high school science exhibitions. Although prior research has examined educational value creation and ecosystem services (Mocior & Kruse, 2016; Ruppert & Duncan, 2017; Palacios Agundez et al., 2022), these studies primarily emphasize conceptual or higher-level educational settings rather than the dynamic formation processes of multi-actor ecosystems in secondary education. These settings involve unique configurations of actors and institutional arrangements, requiring further exploration of how value propositions are established (Frow et al., 2014), how stakeholders are engaged, and how resource integration processes unfold within evolving service ecosystems (Vargo & Akaka, 2012; Vink et al., 2020).

In summary, service ecosystem formation is a complex, multi-level process driven by actor interactions, resource integration, and institutional dynamics. Investigating this process within the context of high school science exhibitions can provide new insights into the mechanisms through which educational service ecosystems format and develop.

3. Research Methodology

3.1. Research Design

This study aims to explore the formation of a high school science exhibition ser-

vice ecosystem, focusing on multi-actor interactions and value co-creation processes. Given the exploratory and process-oriented nature of the research questions, a qualitative research approach is adopted as the primary research strategy. Qualitative methods are particularly appropriate for investigating complex social phenomena, uncovering underlying mechanisms, and capturing context-dependent interactions in real-world settings (Yin, 2018).

Specifically, this study employs a case study research design to examine how value propositions are established, how stakeholders engage in co-creation activities, and how resource integration contributes to the formation of a service ecosystem. The case study approach enables an in-depth understanding of contemporary phenomena within their real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2018). This methodological choice is consistent with prior service ecosystem research, which emphasizes contextual richness, processual analysis, and multi-level interactions (Vargo & Akaka, 2012; Vink et al., 2020).

The focal case of this study is the High School Science Exhibition in Taiwan region, situated within the Primary and Secondary School Science Fair organized by the NTSEC. Rather than focusing on a single competition event, the study examines the service ecosystem surrounding high school science exhibition activities, including stakeholder interactions during project development, mentoring, resource integration, and exhibition participation.

The empirical boundary encompasses key stakeholder groups involved in the ecosystem, including science exhibition teachers, school administrators, education bureau officials, and competition organizers. Data were collected from two public high schools in northern Taiwan region, together with the New Taipei City Education Bureau, the Hsinchu City Government, and the Hsinchu City Department of Education. Additional evidence was obtained from relevant official documents, competition guidelines, and science exhibition materials.

This case was selected through purposeful sampling because Taiwan region's science exhibition system represents a mature, nationally institutionalized educational platform involving extensive collaboration among schools, government agencies, and supporting organizations. It therefore provides an information-rich case for examining how shared value propositions, resource integration, and institutional tensions collectively shape the formation of an educational service ecosystem (Patton, 2014; Yin, 2018).

3.2. Sampling and Participants

The interview participants were selected using purposive sampling to ensure representation of key stakeholders within the science exhibition service ecosystem. Purposive sampling is appropriate for qualitative research that seeks to obtain rich, information-oriented cases rather than statistical representativeness (Yin, 2018).

Drawing on the service ecosystem perspective, this study considers a broad

range of actor groups involved in the ecosystem, including students (science exhibition participants), supervising teachers, school administrative personnel, judges and evaluators, as well as officials and organizers associated with the science exhibition. Such multi-actor sampling aligns with prior research emphasizing the heterogeneity and interdependence of actors in service ecosystems (Holmqvist & Diaz Ruiz, 2017; Donaldson et al., 2025).

Six informants represented multiple organizational levels within the science exhibition ecosystem. They included two science exhibition teachers (H1 and H2), one school principal (P1), and three government officials (G1-G3) responsible for science education policy, exhibition organization, and program implementation. Together, they provided perspectives on project supervision, school-level coordination, institutional support, policy development, and exhibition governance, enabling the study to capture ecosystem dynamics across multiple stakeholder groups.

Although students and judges were identified as important actors in the science exhibition ecosystem, they were not directly interviewed in this study. Findings related to these stakeholder groups are therefore derived from non-participant observations and documentary evidence, and are interpreted in conjunction with interview data from teachers, school administrators, and government officials through data triangulation (Yin, 2018).

3.3. Data Collection and Analysis

To capture the complexity of the science exhibition service ecosystem, this study adopts multiple data collection methods, including field observation, in-depth interviews, and document analysis. The use of multiple sources of evidence is recommended in case study research to enhance construct validity and provide a comprehensive understanding of the phenomenon (Yin, 2018).

Data collection was conducted over a period from November 20, 2025, to April 30, 2026, allowing the researcher to observe the preparation and implementation phases of science exhibition activities. This time frame enabled the capture of dynamic interactions among stakeholders and the evolution of value co-creation processes within the ecosystem.

First, participant observation was conducted during the science exhibition guidance and preparation processes. Observational methods enable researchers to capture real-time interactions, informal practices, and tacit behaviors that may not be fully articulated by participants (Yin, 2018). In the context of service ecosystems, observation is particularly valuable for identifying interaction patterns and resource integration activities among actors (Barile et al., 2016).

Second, semi-structured interviews were conducted to gain deeper insights into participants' experiences, perceptions, and interpretations of value co-creation processes. Semi-structured interviews allow flexibility to explore emergent themes while maintaining consistency across cases, making them suitable for exploratory qualitative research (Yin, 2018). This approach is widely used in studies of co-

creation and educational service ecosystems to capture stakeholders' subjective meanings and engagement processes (Dollinger et al., 2018; Nie & Zarei, 2023).

Third, document analysis was employed as a supplementary data source. Relevant documents included competition guidelines, school-related materials, and official announcements or press releases. Document analysis provides contextual and institutional insights and supports triangulation by corroborating evidence from observations and interviews (Yin, 2018).

The collected data were analyzed using a qualitative content analysis approach. Qualitative content analysis enables systematic examination of textual data to identify patterns, themes, and relationships relevant to the research questions (Yin, 2018).

The analysis followed an iterative and inductive process, including data familiarization, open coding, axial coding, and theme development. Through constant comparison across data sources, key themes related to value propositions, co-creation activities, stakeholder roles, and ecosystem formation processes were identified. This iterative approach is consistent with process-oriented research in service ecosystems, which emphasizes the dynamic and evolving nature of actor interactions and resource integration (Vink et al., 2020).

Furthermore, the analysis incorporated theoretical sensitization from service-dominant logic and service ecosystem theory to interpret the empirical findings. This combination of inductive and theory-informed analysis enhances both the depth and rigor of the study (Vargo & Akaka, 2012).

In addition to interviews, non-participant observations were conducted throughout the data collection period and during science exhibition project supervision and preparation activities. Observations focused on teacher-student interactions, mentoring practices, project discussions, and resource coordination. Documentary evidence included official science exhibition regulations, competition guidelines, government reports, school documents, and public announcements. Observation notes and documentary materials were analyzed alongside interview transcripts to provide contextual understanding, corroborate participants' accounts, and refine the final themes through data triangulation (Yin, 2018).

To ensure the rigor and trustworthiness of the study, several strategies were employed. First, data triangulation was conducted by integrating multiple data sources, including observations, interviews, and documents, to enhance the credibility of findings (Yin, 2018). Second, the study ensured transparency and consistency in data collection and analysis procedures, contributing to reliability.

Data analysis followed an iterative coding process in which interview transcripts, observation notes, and documentary evidence were first coded into first-order concepts, then grouped into second-order categories, and finally synthesized into overarching themes. For example, statements referring to *performance pressure* and *resource constraints* were initially coded and subsequently categorized as competing institutional logics and resource integration-inequality, contributing to the theme of shared value proposition under institutional tension. Similarly,

codes related to teacher mentoring, stakeholder collaboration, and resource mobilization were integrated into value co-creation mechanisms, leading to the theme of service ecosystem formation through value co-creation. The final themes were developed iteratively through constant comparison across multiple data sources and interpreted using the theoretical perspectives of service-dominant logic and service ecosystem theory.

3.4. Case Boundary and Case Selection

4. Findings

This study reveals that the formation of a high school science exhibition service ecosystem in Taiwan region is not a linear or purely collaborative process but rather a dynamic interplay between value alignment and structural tensions. The findings identify two interrelated processes: 1) the construction and contestation of shared value propositions, and 2) the activation of value co-creation mechanisms under conditions of resource inequality and institutional pressure.

These processes unfold through interactions among students, teachers, schools, and government actors, ultimately shaping the formation—yet also distortion—of the science exhibition service ecosystem.

4.1. Constructing and Contesting Value Propositions

1) Dual Value Logics: Educational Ideals vs. Competitive Outcomes

The findings reveal a fundamental tension between two competing value logics within the science exhibition ecosystem: educational ideals and competitive outcomes. On the one hand, the official value proposition emphasizes inquiry-based learning, scientific thinking, and student-centered exploration. On the other hand, the linkage between science exhibitions and academic advancement has transformed competitions into outcome-driven systems focused on awards and rankings.

As one teacher (H1) critically noted, “When science exhibitions become tied to academic advancement, winning awards becomes the ultimate goal... the essence of student-centered learning is completely lost.” This shift results in a distortion of value propositions, where the emphasis moves from learning processes to performance outcomes.

This tension illustrates that shared value propositions are not inherently stable but are continuously negotiated and contested among actors within the ecosystem.

2) Institutional Reinforcement and Legitimization of Value

Institutional actors play a critical role in both reinforcing and reshaping value propositions. Government agencies and competition organizers legitimize science exhibitions as platforms for cultivating scientific literacy and innovation. For example, government officials emphasized that science exhibitions represent “students’ courage to ask questions and continuously experiment,” highlighting their educational significance (G1).

At the same time, institutional mechanisms—such as rankings, awards, and me-

dia recognition—reinforce a performance-oriented value system. Secondary data show that elite schools, such as Taipei First Girls High School, consistently achieve top rankings through systematic training, resource integration, and professional mentoring. These achievements strengthen institutional narratives of excellence but also contribute to escalating competition standards.

As a result, value propositions become institutionally embedded yet stratified, benefiting resource-rich actors while marginalizing others.

3) Resource Inequality and Fragmented Value Alignment

The findings indicate that resource inequality extends beyond differences in physical facilities or financial support; it is deeply embedded in institutional arrangements that shape actors' ability to participate in value co-creation. Although science exhibitions emphasize inquiry-based learning and collaboration, the allocation of financial resources and external support mechanisms varies considerably across schools, creating unequal opportunities for participation and innovation.

Teacher H1 noted that many schools do not receive dedicated funding for science exhibition activities, forcing teachers to purchase experimental materials or seek external resources on their own. This unequal distribution of resources places resource-constrained schools at a structural disadvantage, while schools with stronger university connections and financial support are better positioned to produce competitive projects.

This institutional inequality is further illustrated by Teacher H2, who described the additional burden associated with securing educational resources: "Our school's science exhibition policy does not provide dedicated funding, nor does it include mechanisms for collaborating with universities. Usually, I have to apply for grants from the Ministry of Education, the NTSEC, or other school projects to obtain funding for equipment. Most of the time, I have to manage everything by myself—implementing projects while simultaneously supervising students. It is extremely exhausting." (H2)

The interview further revealed that teachers frequently assume the risks associated with applying for external grants. Whether funding applications succeed or fail, the time and administrative costs are largely borne by individual teachers. In the absence of systematic institutional support, considerable effort is redirected toward fundraising and project administration rather than teaching and mentoring. Consequently, teachers' professional energy becomes fragmented, and the time available for inquiry-based instruction is substantially reduced.

These findings suggest that resource inequality is not merely a shortage of financial support but reflects an institutional imbalance in resource integration capabilities. Rather than functioning as an equitable educational ecosystem, science exhibitions rely heavily on the personal commitment, social networks, and grant-writing capacities of individual teachers. As a result, the officially promoted educational value proposition—cultivating scientific inquiry through authentic learning—is inconsistently realized across schools.

The unequal distribution of institutional support also contributes to fragmented

value alignment among stakeholders. While government agencies emphasize scientific literacy and inquiry-based learning, teachers are frequently compelled to devote significant effort to obtaining financial resources before meaningful educational activities can even begin. Consequently, value co-creation becomes unevenly distributed across the ecosystem, as actors differ substantially in their ability to mobilize and integrate critical resources.

4) Reclaiming the Original Educational Value Proposition

Despite these tensions, the findings also indicate a persistent effort among educators to reclaim the original educational value proposition of science exhibitions. Teachers emphasize that the purpose of science fairs is to cultivate curiosity, independent thinking, and problem-solving abilities.

As H1 articulated, “The original intention is not competition, but to guide students through a process—from nothing to something—so they can develop their own thinking and complete their own work.”

This reflects an underlying normative value layer within the ecosystem, which continues to shape actor motivations and provides a foundation for potential realignment toward authentic co-creation.

4.2. Value Co-Creation Strategies under Institutional Constraints

1) Guided Co-creation and Intensive Teacher Mediation

Value co-creation within the science exhibition ecosystem is primarily mediated through intensive teacher-student interactions. Teachers act as key orchestrators, guiding students through topic selection, experimental design, and knowledge integration.

However, this co-creation process is highly demanding. As H1 described, “From identifying a topic to completing the project, it may take 8 months to over a year... both teachers and students must endure significant pressure.”

This highlights that co-creation is not frictionless but requires substantial time, emotional investment, and cognitive effort, positioning teachers as central yet burdened actors in the ecosystem.

2) Ecosystem-level Resource Orchestration

At the ecosystem level, value co-creation is enabled through resource orchestration across multiple actors. Government initiatives connect schools with universities, expert mentors, and funding programs. For example, New Taipei City’s “student research grant program” integrates academic and professional resources to enhance student research capacity (G3).

Similarly, large-scale science exhibition events demonstrate coordinated resource mobilization, involving multiple sectors such as education, transportation, and tourism (G1). These efforts illustrate how institutional actors act as ecosystem enablers, facilitating large-scale co-creation.

3) Structured Co-creation in Elite Schools

In resource-rich environments, value co-creation becomes highly structured and institutionalized. Elite schools develop systematic training programs that inte-

grate curriculum design, mentoring systems, and interdisciplinary collaboration.

For instance, Taipei First Girls High School provides structured support across experimental design, data analysis, and scientific communication. As teacher H1 noted, effective co-creation involves “integrating multiple resources around the student, including external experts, school support systems, and parental involvement.”

This demonstrates that co-creation effectiveness is strongly dependent on institutional capacity and resource availability.

4) Co-creation as a Double-edged Mechanism

While co-creation strategies enhance participation and outcomes, they may also produce unintended consequences. The findings indicate that excessive emphasis on performance leads to phenomena such as “outsourcing” or excessive external intervention, where student ownership of projects is diminished.

As H1 critically stated, “Science exhibition projects are often associated with ‘outsourcing’... the final output sometimes exceeds students’ actual capabilities.”

This suggests that co-creation, when driven by competitive pressure, may shift from genuine collaboration to instrumental resource accumulation, resulting in value co-destruction within the ecosystem.

5. Discussion

5.1. Reframing Value Co-Creation in Educational Service Ecosystems

This study extends S-D logic by demonstrating that value co-creation in educational contexts is not inherently harmonious but is often shaped by competing value logics and institutional pressures. While S-D logic posits that value is co-created through resource integration among actors (Vargo & Lusch, 2008, 2017), the findings reveal that such processes may simultaneously produce value alignment and value distortion.

Specifically, the science exhibition ecosystem illustrates how value-in-context is not uniformly experienced but varies depending on actors’ positions and access to resources. This aligns with recent calls to examine value co-creation across multiple contextual levels (Wieczerzycki et al., 2025), but further suggests that context is not neutral—it is structured by institutional incentives such as competition rankings and academic advancement.

Moreover, this study highlights that value propositions are not stable coordination devices but are continuously negotiated, contested, and reshaped within the ecosystem. This finding deepens the conceptualization of value propositions as dynamic and socially constructed mechanisms (Frow et al., 2014), particularly in educational service ecosystems where multiple stakeholders pursue divergent goals.

5.2. From Value Co-Creation to Value Co-Destruction

A key theoretical contribution of this study is the identification of value co-destruction dynamics within the science exhibition ecosystem. While prior research

has predominantly emphasized the positive outcomes of co-creation, recent scholarship has acknowledged that interactions among actors may also lead to unintended negative consequences (Mustak & Plé, 2020).

The findings show that excessive emphasis on competition and performance can lead to practices such as external intervention or “outsourcing,” where students’ ownership of learning is diminished. In such cases, resource integration does not enhance value but instead undermines the educational purpose of the system.

This suggests that co-creation processes may become instrumentalized, shifting from collaborative learning to strategic resource accumulation. As a result, the ecosystem exhibits both value creation (e.g., skill development, innovation) and value co-destruction (e.g., pressure, inequality, loss of authenticity).

By empirically illustrating these dual dynamics, this study contributes to a more balanced understanding of service ecosystems, supporting the argument that co-creation and co-destruction are co-existing and interdependent processes rather than mutually exclusive outcomes.

5.3. Institutional Logics and Ecosystem Governance

The findings also contribute to the literature on service ecosystem governance by highlighting the role of institutional logics in shaping actor behavior and ecosystem outcomes. S-D logic emphasizes the importance of institutions and institutional arrangements in coordinating interactions (Vargo & Lusch, 2014), yet this study shows that such arrangements may simultaneously enable and constrain value co-creation.

In the science exhibition ecosystem, institutional mechanisms—such as competition rules, evaluation criteria, and reward systems—serve as governance structures that guide actor participation. However, these same mechanisms also reinforce a performance-oriented logic that may conflict with educational values.

This dual role reflects the complexity of ecosystem governance, where institutional arrangements do not simply facilitate coordination but actively shape the direction and quality of value creation. The findings resonate with ecosystem theory suggesting that governance is not centralized but distributed among multiple actors, including government agencies, schools, and teachers (Jacobides et al., 2018; Cui et al., 2022).

Importantly, this study identifies teachers who mediate between institutional pressures and student learning. Their role extends beyond instruction to include resource integration, emotional support, and value translation, highlighting the importance of actor-level agency in ecosystem governance.

5.4. Ecosystem Formation as a Tension-Driven Process

This study advances service ecosystem theory by conceptualizing ecosystem formation as a tension-driven process (Figure 1). While prior research often portrays ecosystems as self-adjusting and collaborative systems (Vargo & Akaka, 2012; Barile et al., 2016), the findings suggest that ecosystem formation is shaped by ongoing

ing tensions between: 1) educational value vs. competitive value; 2) co-creation vs. co-destruction; 3) resource integration vs. resource inequality.

These tensions generate dynamic feedback loops that influence actor engagement and system evolution. Rather than converging toward equilibrium, the ecosystem continuously adapts through negotiation and reconfiguration.

This perspective complements existing research on service ecosystem design (Vink et al., 2020) by emphasizing that ecosystem formation is not solely a matter of intentional design but also of emergent processes shaped by conflict, negotiation, and adaptation.

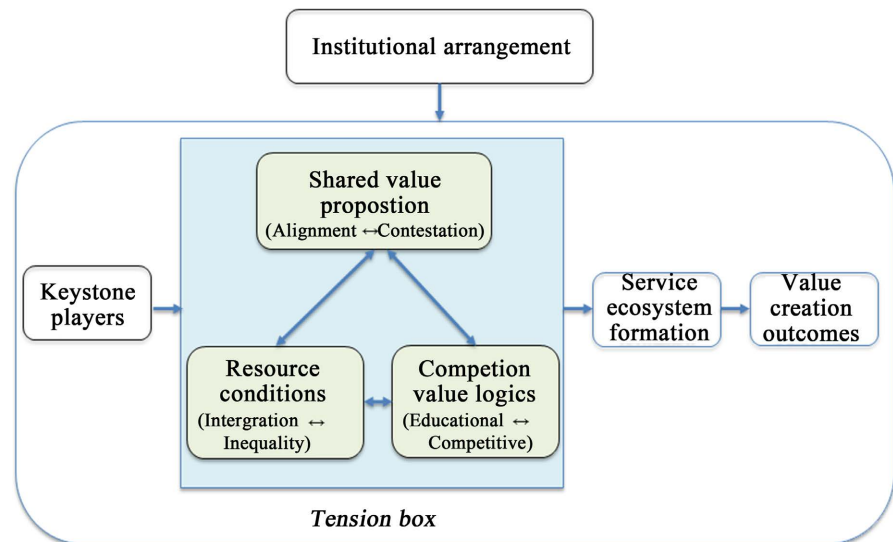


Figure 1. Tension-driven formation model of a high school science exhibition service ecosystem.

Figure 1 presents a tension-driven model of service ecosystem formation in educational contexts. At the top level, institutional arrangements—including policies, curriculum frameworks, and evaluation systems—form an overarching governance structure that shapes the entire process from actor engagement to ecosystem outcomes.

Under this institutional context, keystone players (e.g., teachers, and supporting organizations) initiate interactions that enter a “tension box,” which constitutes the core analytical space of the model. Institutional arrangements influence how these actors define goals, mobilize resources, and engage in collaborative practices. In this sense, institutional arrangements do not merely provide context, but actively shape and constrain the configuration of ecosystem dynamics.

Within the tension box, three interdependent dynamics continuously interact: 1) shared value propositions, which oscillate between alignment and contestation; 2) competing value logics, reflecting tensions between educational and performance-oriented values; and 3) resource integration processes, which are inherently linked to inequality in access and capability.

These three dynamics are mutually constitutive. The shared value proposition

both shapes and is shaped by competing logics and resource conditions, while competing logics and resource integration simultaneously reinforce and constrain each other. Importantly, institutional arrangements permeate these interactions by influencing evaluation criteria, legitimacy structures, and resource distribution.

Through this continuous interplay, actors engage in sensemaking, negotiation, and situated practices within the tension box. Service ecosystem formation does not arise from a linear or sequential process but emerges from the sustained interaction and organization of these tensions under institutional influence.

As these dynamics stabilize—without necessarily being resolved—the system evolves toward service ecosystem formation, which subsequently leads to value creation outcomes encompassing both value co-creation and value co-destruction. These outcomes reflect not only the internal dynamics of the tension box but also the broader institutional conditions that shape participation, resource accessibility, and performance expectations.

5.5. Theoretical Implications

This study offers several theoretical contributions to service research:

First, it extends S-D logic by demonstrating that value co-creation in educational ecosystems is shaped by institutional tensions and competing logics, rather than being inherently collaborative.

Second, it advances the understanding of value co-destruction, showing how co-creation processes may generate negative outcomes under conditions of performance pressure and resource inequality.

Third, it contributes to service ecosystem theory by proposing a tension-driven formation model, emphasizing the dynamic interplay between alignment and conflict in ecosystem formation.

5.6. Managerial and Policy Implications

From a practical perspective, the findings suggest that policymakers and educators should reconsider how science exhibition systems are designed and evaluated.

First, reducing the overemphasis on competition outcomes—such as decoupling science exhibitions from academic advancement—may help realign value propositions with educational goals. Second, enhancing resource accessibility for under-resourced schools can promote more inclusive participation. Third, supporting teachers as key co-creation facilitators—through training, funding, and workload adjustments—can strengthen the sustainability of the ecosystem. Finally, designing co-creation activities that emphasize learning processes rather than outcomes can foster more authentic engagement and long-term educational value.

6. Conclusion and Implications

6.1. Conclusion

This study examines the formation of a high school science exhibition service ecosystem in Taiwan region through a value co-creation lens. Drawing on service-

dominant logic, the findings demonstrate that ecosystem formation is not a linear process of alignment but a tension-driven evolution shaped by competing institutional logics, uneven resource integration, and the coexistence of value co-creation and co-destruction.

Specifically, while shared value propositions facilitate stakeholder coordination and resource mobilization, they are simultaneously influenced—and at times distorted—by performance-oriented institutional pressures. The study further highlights the pivotal role of teachers who mediate between institutional expectations and student learning processes, thereby sustaining ecosystem interactions.

By integrating insights from service ecosystem theory and educational practice, this research contributes to the literature in three ways. First, it advances understanding of value co-creation by demonstrating its embeddedness within institutional tensions. Second, it extends service ecosystem research by proposing a tension-driven formation model, emphasizing the dynamic interplay between alignment and conflict. Third, it brings the service ecosystem perspective into the context of secondary education, offering a novel empirical setting for theory development.

From a practical perspective, the findings suggest that policymakers and educators should reconsider the design of science exhibition systems. Reducing the overemphasis on competitive outcomes, enhancing resource accessibility, and supporting teachers' facilitation roles are critical for fostering a more inclusive and sustainable educational service ecosystem.

6.2. Limitations and Future Research Directions

This study should be interpreted in light of several limitations. First, the research adopts a qualitative case study design focusing on the high school in Taiwan region science exhibition context. While this approach enables in-depth exploration of ecosystem formation processes, the findings are context-specific and may limit generalizability to other educational systems or cultural settings (Yin, 2018). Future studies could examine similar phenomena in different national or institutional contexts to enhance external validity.

Second, the study relies on a relatively small number of interview informants, primarily representing teachers, school administrators, and government officials. Although multiple data sources—including observations and documents—were used to strengthen validity through triangulation, perspectives from other key actors, particularly students and judges, were not directly captured through interviews. This may constrain the comprehensiveness of the analysis regarding actor-level experiences and value perceptions.

Third, the cross-sectional nature of the data limits the ability to fully capture the longitudinal dynamics of service ecosystem formation. Ecosystems evolve over time through iterative interactions and institutional adjustments; however, this study provides a snapshot of these processes rather than tracing their temporal evolution.

Finally, while the study identifies tensions between value co-creation and co-

destruction, it does not quantitatively assess their relative impacts or causal relationships. As such, the findings remain primarily interpretive and theory-building in nature.

Building on these limitations, several avenues for future research are suggested. First, future studies could adopt comparative and cross-contextual designs to examine how service ecosystem formation varies across different educational systems, cultural environments, or institutional arrangements. Such research would contribute to a more nuanced understanding of context-dependent value co-creation processes.

Second, incorporating multi-actor perspectives, particularly through direct engagement with students, judges, and parents, would provide a more holistic view of value co-creation dynamics. Future research could employ mixed-method approaches to capture both subjective experiences and measurable outcomes across stakeholder groups.

Third, longitudinal studies are needed to investigate how service ecosystems evolve over time, particularly in response to policy changes, technological advancements, or shifts in institutional logics. Tracking ecosystem development across multiple cycles of science exhibitions would offer deeper insights into processes of stabilization, adaptation, and transformation.

Fourth, future research could further explore the dual dynamics of value co-creation and co-destruction, including identifying boundary conditions under which co-creation leads to positive or negative outcomes. Quantitative or experimental designs may help clarify causal mechanisms and strengthen theoretical generalization.

Author Contributions

Conceptualization, Chen, C.-L.; methodology, Chen, C.-L.; investigation, Lin, Y.-C.; formal analysis, Lin, Y.-C.; writing—original draft preparation, Lin, Y.-C.; visualization, Lin, Y.-C.; writing—review and editing, Chen, C.-L. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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