Synthesising Catalysts of Digital Innovation: Stimuli, Tensions, and Interrelationships

Research Paper

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Abstract. Digital Innovation is now a prerequisite for competitive advantage, yet research still lacks an integrated explanation of the forces that accelerate or impede its progress. Drawing on a structured literature review, we identify five socio-technical catalysts—Data Objects, Layered Modular Architecture, Product Design, IT and Organisational Alignment, and Platform Ecosystems—and synthesise how each simultaneously stimulates Digital Innovation and introduces countervailing tensions. Our framework clarifies these trade-offs: data monetisation raises privacy concerns; modular architectures can fragment under rigid interface rules; meaning-changing product design risks user confusion; alignment efforts stall when legacy cultures persist; and platform network effects drift toward market centralisation. By mapping these interdependencies, the study equips scholars with a consolidated analytical lens and guides managers in balancing opportunity and risk during a Digital Innovation process.

Keywords: Digital Innovation, Data Objects, Layered Modular Architecture, Product Design, Platform Ecosystems

1 Introduction

Digital Innovation (DI) is essential for global competitiveness: Companies that ignore DI risk losing market share, eroding margins, and weakening their strategic position in fast-moving industries (IDC, 2024). High-profile bankruptcies of camera makers and retailers that did not digitise their products highlight a broader lesson (Lucas and Goh, 2009): When organisations fail to recognise or act on DI catalysts, they lag behind better-adapted rivals and find it hard to recover.

Despite DI's proven impact (Yoo et al., 2024), managers and scholars still lack an integrative lens on which catalysts accelerate or slow digital change across products, processes, and business models. Catalysts act as stimuli (e.g., data commodification), driving innovation or tensions (e.g., privacy concerns, lock-in risks), limiting it (Cambridge Dictionary, 2025c, 2025b, 2025a). Prior Information Systems (IS) research often analyses single phenomena, such as Platform Ecosystems or Product Design, in isolation (Fichman et al., 2014; Fielt and Gregor, 2016; Yoo et al., 2024). This siloed view

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hinders managers' insight into catalyst interactions and restricts DI theory development (Bharadwaj et al., 2013; Hanelt et al., 2021).

A real-world example illustrates integration's importance. A photo retailer digitises prints into shareable images, enhancing AI apps with smartphone updates and app-store distribution. If the retailer ignores data availability, modular design, user focus, organisational alignment, and platform reach, it achieves only a fraction of its potential value. In contrast, competitors managing all five gain significant advantages. Recognising this blind spot, our study addresses the following research questions: *What are the primary catalysts for Digital Innovation? How do Digital Innovation catalysts interact?*

We answer through a systematic literature review (Mayring, 2015; vom Brocke et al., 2009; Webster and Watson, 2002). Identifying and analysing five core catalysts—Data Objects, Layered Modular Architecture (LMA), Product Design, IT and Organisational Alignment, and Platform Ecosystems—we synthesise their stimuli, tensions, and interrelationships.

The paper proceeds as follows: Section 2 traces the evolution of DI scholarship and key concepts; Section 3 details the review methodology; Section 4 presents catalysts, stimuli/tensions, and their links; Section 5 discusses contributions, limitations, and future research avenues.

2 What is Digital Innovation?

Research on DI shows technology's evolving role in organisations and society. In the 1970s and 1980s, corporate IT centralised operations, automated tasks, and optimised processes (Swanson, 1994). Early scholars focused on aligning IT with business goals to support strategic initiatives (Henderson and Venkatraman, 1999). IT infrastructure became essential for organisational efficiency, as back-office tools like computers in finance and ERP systems in manufacturing streamlined tasks. Until the late 20th century, research focused on tangible goods as the primary value source, viewing digital technology as an efficiency enabler rather than a driver of new offerings (Yoo et al., 2024). IT innovation centred on adopting and integrating existing technologies, while researchers emphasised IT assimilation and standardisation (Fichman et al., 2014; Wolfe, 1997). In contrast, IS innovation examined how IT artefacts could drive significant organisational changes (Swanson, 1994). The dot-com bubble's collapse in the early 2000s marked a turning point. Despite the crash, transformative technologies like smartphones and social media platforms emerged. Digitising products has led to smart devices that blur traditional industry boundaries (Yoo et al., 2024). By the 2000s, IT evolved from supporting to becoming the business, especially for digital-native firms like Google (Henderson and Venkatraman, 1999; Shapiro and Varian, 1999; Yoo et al., 2024). Digital assets fueled new markets, including software, data, and cloud services (Giustiziero et al., 2023). In the 2010s, researchers expanded DI by exploring how software, networks, data, and devices facilitated novel digital offerings (Fichman et al., 2014). This perspective goes beyond traditional IT/IS discussions by showing how digital tools disrupted markets and reshaped Platform Ecosystems (Gregory et al., 2018). Data emerged in the literature as a critical competitive asset (Swanson, 2020; Yoo et al., 2024), enabling new digital business models such as search engines, social media platforms, and on-demand services (Parker et al., 2016; Yoo et al., 2024). In the 2020s, DI became central to strategic decision-making. Researchers explored how networks, partnerships, and digital assets enhance innovation while addressing governance, privacy, and ethical challenges (Becker et al., 2023; Chatterjee et al., 2013; Nambisan, 2013, p. 20213). This overview highlights IT's evolution. Initially, it focused on process optimisation. Over time, research shifted to digital products and data ecosystems.

To ground our analysis in a consistent vocabulary, we outline nine core concepts relevant to understanding our work (Table 1). This study adopts Fichman et al.'s (2014, p. 333) DI definition, highlighting DI's transformative impact on products, processes, or business models, and the changes required by adopters.

Table 1: Concepts relevant to our work

Concept Description	Main Source
Digital Innovation: (1) "A new product, process, or business model that is perceived as new, requires significant changes on the part of adopters, and is embodied in or enabled by IT"; (2) "The carrying out of new combinations of digital and physical components to produce novel products"; (3) "A loosely coupled set of autonomous actors (people and organisations who interact without hierarchical fiat) involved in the development and implementation of innovations enabled by digital technologies".	(1) Fichman et al. (2014, p. 333); (2) Yoo et al. (2010, p. 726); (3) Wang et al. (2021)
Catalyst: A socio-technical mechanism that converts external influences into organisational change, positively (stimulus) or negatively (tension) affecting the pace and trajectory of digital innovation.	Carbajal Piña et al. (2024)
Stimulus: A stimulus, an enabler or driver, refers to significant changes in the business environment expected to impact the organisation or ecosystem positively.	Davidsson et al. (2022)
Tensions: Constraints in a catalyst create trade-offs and path dependencies, slowing or redirecting digital innovation.	Wimelius et al. (2021)
Information Technology uses a classic "box" metaphor: a blend of hardware and software processing predefined data flows. It captures, stores, and manipulates information within limited routines, while the underlying code remains mainly in the background.	Baiyere et al. (2023)
Digital technology differs from IT by distinguishing between (i) digitised objects—bit-strings stored, moved, and recombined—and (ii) sociotechnical practices that enable these objects to unlock affordances. This connects the engineering view of digitisation (encoding information as ones and zeros) with the managerial view of digitalisation (using encodings for economic effects), transcending a single "box."	Baiyere et al. (2023)

Concept Description	Main Source
Data Object: Digital Data Objects are cultural records that differ from traditional paper-based documentation by being infinitely editable, portable, and reconfigurable.	Kallinikos et al. (2013)
Layered Modular Architecture: Organise digital artefacts into layers with clear interfaces for independent innovation and quick recombination.	Yoo et al. (2010, p. 726)
Product Design: Configuring digital and physical elements to enhance functionality and redefine product meaning through integration.	Norman and Verganti (2014)
IT and Organisational Alignment: Align IT capabilities with business goals to enhance organisational performance.	Kohli and Melville (2019)
Platform Ecosystem: A digital platform facilitates interactions between complementors and users, enabling value co-creation through modular plug-ins and shared standards.	Yoo et al. (2024)

3 Research Methodology

Our study employs established literature review methodologies in IS research (Mayring, 2015; vom Brocke et al., 2009; Webster and Watson, 2002) to systematically identify, analyse, and synthesise findings on DI catalysts. Figure 1 illustrates the structured search process, detailing the filtering steps from the initial pool of retrieved articles to the final dataset used for analysis. This approach ensures comprehensive literature coverage, enabling a robust synthesis of DI Catalysts. We adopted vom Brocke's (2009) recommended set of 10 top IS journals and conducted title searches for peer-reviewed English-language articles and the search string "Innovation".[1] These journals were chosen for their reputation in the IS community based on ranking, scope, and topic fit. We searched directly within the journals' databases to obtain precise results. The retrieved 393 articles were then imported into MAXQDA for qualitative analysis (Verbi, 2025).

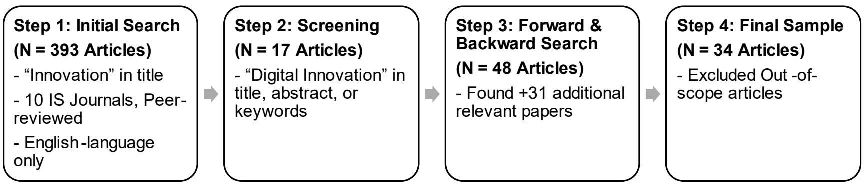

Figure 1: Representation of the Literature Review Process

[1] These journals comprise Artificial Intelligence, AI Magazine, Communications of the ACM, Decision Sciences, Decision Support Systems, European Journal of Information Systems, Information Systems Research, Journal of Management Information Systems, Management Information Systems Quarterly, Management Science.

We filtered for articles that mentioned "Digital Innovation" in titles, abstracts, or keywords, retaining 17 articles. Two coders then performed Mayring's inductive, iterative content analysis: (1) developing a coding system rooted in the author's experience aligned with the research question in the format [Catalyst].[Stimulus/ Tension], e.g. Data Objects.Datafication, (2) coding text segments, (3) refining coding system through coder discussion, we merged, split, or relabelled categories to improve conceptual clarity, (4) recoding with the revised scheme, and (5) analysing results and interrelations. The procedure uncovered five primary catalysts—Data Objects, Layered Modular Architecture (LMA), Product Design, IT–Organisational Alignment, and Platform Ecosystems—and 22 associated stimuli or tensions. We excluded articles that did not address at least one of these catalysts. We conducted forward and backwards research to strengthen coverage, which identified 31 additional key studies. We coded these papers in MAXQDA, producing a final dataset of 34 articles. This evidence-based approach ensures breadth and analytical rigour in synthesising DI catalysts, stimuli, tensions, and their interrelations.

4 Catalysts of Digital Innovation

This chapter describes key catalysts driving DI. DI rarely relies on a single technology; it arises from socio-technical catalysts—bundles of properties mobilised in two ways: Stimuli are affordances or capabilities that accelerate DI (e.g., data recombination; Davidsson et al., 2022), while tensions are constraints or risks that impede DI (e.g., data context loss; Wimelius et al., 2021). Both are situational: the net impulse from a catalyst to DI depends on how organisations execute governance and alignment choices. Figure 2 visualises this duality: "+" icons represent dominant stimuli, and "−" icons represent dominant tensions. The direction and thickness of arrows from each catalyst to DI vary over time and in different settings.

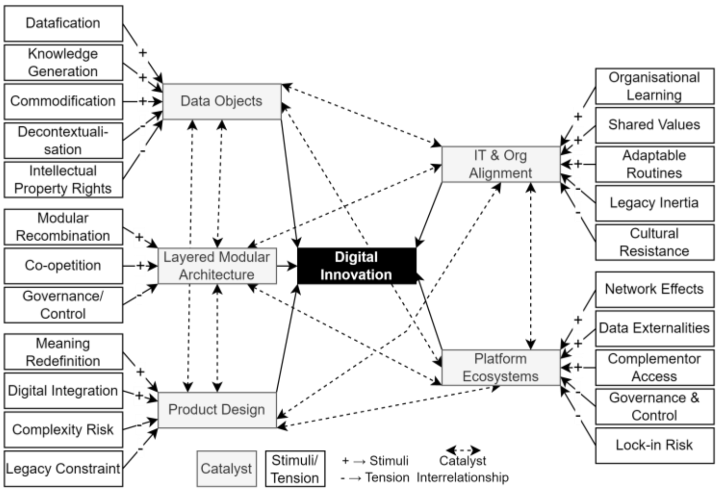

Figure 2: Five Catalysts for Digital Innovation with Stimuli (+) and Tensions (−) and Catalyst Interrelationship.

A smartphone camera exemplifies how catalysts, stimuli, and tensions connect. Photo-taking involves digitisation (Datafication & Aggregation), enabling software and social media enhancements. The LMA of a smartphone divides hardware (sensors), software (editing tools), and network capabilities (Wi-Fi), supporting Modular Recombination and quick updates. In Product Design, Digital Integration with user-friendly interfaces is vital for managing Complexity Risk for non-technical users. Internally, IT and Organisational Alignment foster learning about technologies like AI, avoiding Legacy Inertia that slows progress. Ultimately, the Platform Ecosystem (like an app store) provides Complementor Access for developers but risks Lock-in if the owner restricts distribution or imposes regulations. The following subsections detail how each catalyst stimulates and intertwines with DI tensions.

4.1 Data Objects

Alaimo and Kallinikos (2022) explain that data objects—structured, machine-readable information—can be recombined for various purposes. The term “data” distinguishes data objects from broader digital ones, emphasising their core of digital data and metadata. They are called “objects” for their duration, relative stability, and structure.

Stimuli. Data Objects drive DI through Datafication, enabling Knowledge Generation and Commodification. Datafication translates organisational and social phenomena into digital records, creating “token-based” knowledge processes (Alaimo and Kallinikos, 2022). Zuboff (1988) and Cetina Knorr (1999) explain that data like clicks or location can be recombined, altering traditional boundaries. Internal production data can merge with consumer trends, yielding new insights or products. For example, manufacturing logs can pair with real-time sales trends to refine production schedules.

Commodification occurs when data becomes tradable assets of economic relevance. For instance, real-time advertising platforms package user profiles and interaction logs as auctionable assets. This shows a trend in digital ecosystems where organisations view data as a resource to refine, sell, or bundle with other offerings (Alaimo and Kallinikos, 2022). Data monetisation interests various organisations, not only tech firms. These developments demonstrate how data objects enhance DI by integrating platforms, AI tools, and services. The cross-functional nature of data fosters applications, making it a commodity that supports strategic pivots, new business models, and ecosystem evolution (Alaimo and Kallinikos, 2022; Yoo et al., 2024). Data Objects have become crucial for DI, transitioning from administrative inputs to key value drivers.

Tensions. Data Objects can create tensions due to Decontextualisation or harm to Intellectual Property Rights. In finance, algorithm-generated credit scores may overlook important social or economic nuances, leading to biased loan decisions. Varying definitions among knowledge communities can also cause fragmentation. Though Data Objects improve agility and reusability, they need careful governance and contextual awareness to avoid reductive categorisation or unintended discrimination (Alaimo and Kallinikos, 2022). On another note, Teece (2018) cautions that market failures in data licensing arise from unclear intellectual property rights and enforcement. Prioritising profit from data while neglecting governance increases privacy and bias risks (Yoo et al., 2024). Companies may face public backlash or penalties (Teece, 2018).

4.2 Layered Modular Architecture

LMA combines layered design with modular product partitioning to enhance DI. Each layer—hardware (sensors), network (Wi-Fi), service (image processing), and content (photos)—can evolve independently. Modular components permit updates without disrupting the entire system (Yoo et al., 2010).

Stimuli. As a DI catalyst, LMA offers new possibilities through its stimuli Modular Recombination and capacity for Co-opetition. Modular Recombination enables ongoing product refinements while various companies can collaborate and compete, thus co-opetition across different layers (Yoo et al., 2010). App developers can add photo-editing modules as hardware makers improve camera sensors. This layered approach keeps products relevant, fosters collaboration, and enables rapid functionality shifts. Unlike traditional modular products, LMA supports multiple layers—devices, networks, services, and content—allowing unexpected component recombination (Yoo et al., 2010). This fosters creativity, independent innovation, and new hardware, software, and content combinations to meet market demands. Loose coupling across layers promotes idea generation and experimentation, resulting in radical rather than incremental innovations (Yoo et al., 2024, 2010). LMA system layers combine components from various industries, allowing digitised products to function as finished goods and platforms for contributors. For instance, a smartphone works out of the box while supporting new services, apps, or hardware updates. This fosters an ecosystem for developers, specialists, and users to enhance features, resulting in applications beyond the original design. Such collaboration drives innovation, keeping LMA products relevant in rapidly changing digital environments (Eisenmann et al., 2006; Henfridsson and Lindgren, 2010; Yoo et al., 2010).

LMA reshapes Co-Opetition by promoting competition and collaboration. Unlike standard modular products, it encourages complex "doubly distributed" structures, sharing control over interfaces and resources. Organisations compete on one layer, such as device hardware, while collaborating on another, like application services, resulting in Co-opetition. This fosters continuous improvement and partnerships, creating new market opportunities as platform owners leverage interface control to influence ecosystem dynamics (Ghazawneh and Henfridsson, 2013; Teece, 2018; Yoo et al., 2024).

Tensions. LMA promotes collaboration but risks fragmentation if product owners change interfaces (e.g., APIs) or impose proprietary standards. For example, a gaming console may restrict third-party accessory makers from altering hardware and software connections, stifling innovation in game controllers. This tension illustrates how LMA's openness can clash with control, creating governance challenges in balancing platform leadership and ecosystem diversity. An LMA permits rapid software updates without hardware modifications (Yoo et al., 2010). This flexibility speeds up product changes, but the lack of standardisation can fragment systems if platform owners change interface rules unilaterally (Ghazawneh and Henfridsson, 2013; Henfridsson and Lindgren, 2010). Critics claim that dominant product platform providers may misuse modularity to limit third-party innovation as they turn off APIs (Eisenmann et al., 2011). LMA encourages agility and open collaboration to prevent fragmentation.

4.3 Product Design

Product Design catalyses DI by being crucial for product adoption. It enhances functionality and defines meaning for users and markets (Norman and Verganti, 2014; Verganti, 2009).

Stimuli. Product Design enhances DI by reshaping user perceptions and product identities with Digital Integration (Norman and Verganti, 2014). These elements inspire a refined product purpose by leveraging user experiences and emotional connections (Verganti, 2009). Meaning Redefinition occurs when a design alters a product's perceived purpose, leading to new user interpretations. For instance, a typical coffee machine can become a "coffee experience" device. By adding Wi-Fi and an app, designers convert a simple brewer into a personalised café that allows users to customise brew times, share recipes, and track consumption for health insights. Thus, the product's identity shifts from a "brewer" to a "smart lifestyle companion," enhancing its value beyond basic coffee-making (Norman and Verganti, 2014; Verganti, 2009).

Digital Integration introduces software and connectivity, disrupting perceptions and enhancing functionality. Research shows the incorporation of digital components challenges outdated product assumptions (Wang et al., 2022). For example, a camera now not only captures images but also stores, shares, and edits them, evolving into a multi-functional media hub (Yoo et al., 2010). Designers envision how these adaptable elements intertwine to resonate with users' experiences and aspirations (Henfridsson et al., 2014). Innovative Product Design creates value, transcending mere product capability refinement (Verganti, 2009). It thrives on experimentation and feedback loops, although designers may rely more on insights than direct consultation with end users (Jahnke, 2013). While physical attributes play a crucial role, their integration with digital flexibility reshapes how individuals perceive a product (Kallinikos et al., 2013).

Tensions. Ignoring existing Meaning Definition confuses users and increases Complexity Risks, while clinging to outdated features creates Legacy Constraints. Balancing innovative design with real-world needs is challenging due to the rapid evolution of digital products (Yoo et al., 2010). Integrating complex digital features when users seek simplicity can undermine a product's value. For example, a smart kettle requiring an app download and Wi-Fi connection may frustrate those wanting quick convenience, leading to dissatisfaction (Jahnke, 2013; Yoo et al., 2010). Overlooking user insights may result in concepts that are too complex and lack relevance (Jahnke, 2013). Holding outdated notions, like a camera only for photography, overlooks key features such as social media integration and AI editing. Ignoring market demands risks missing user engagement opportunities and can render products obsolete (Norman and Verganti, 2014; Verganti, 2009).

4.4 IT and Organisational Alignment

IT and Organisational Alignment catalyse the integration of new technologies within a supportive culture, ensuring digital systems function as catalysts for enterprise-wide innovation (Kohli and Melville, 2019).

Stimuli. DI thrives when a company synchronises its technological capabilities with Organisational Learning, Shared Values, and Adaptable Routines (Fichman et al., 2014; Kohli and Melville, 2019). This synchronisation transforms new technologies into DI catalysts instead of mere upgrades. Organisational Learning encourages employees to improve workflows, test tools, and share insights, fostering continuous improvement (Saldanha et al., 2017). A logistics firm uses AI for route optimisation, revising routines to enhance data-driven learning. Employees jointly analyse route data, accelerating deliveries and enabling on-demand services, exemplifying digital integration as the fusion of technology with work practices (Kohli and Melville, 2019; Saldanha et al., 2017).

Shared values are essential for ensuring that technological transitions support DI. Leadership support, clear communication, and a focus on continuous learning create a culture ready for change (Kohli and Melville, 2019). Organisations can focus on their core strengths while developing effective policies and governance frameworks by partnering with external analytics or logistics providers (Yoo et al., 2024). Values that promote collaboration, trust, and data governance enhance market agility (Kohli and Melville, 2019; Thomke, 2001).

Adaptable routines develop when digital tools are in harmony with the company's vision, transforming routines into opportunities for learning (Fichman et al., 2014). Although technology can automate processes and collect data, the broader organisational context—from leadership approaches to team dynamics—determines whether insights lead to DI (Kohli and Melville, 2019).

Tensions. Due to Legacy Inertia or Cultural Resistance, IT and Organisational Misalignment can impede DI. When an organisation's culture, incentives, or leadership priorities misalign with new technologies, these tools may be underutilised or superficially applied. Legacy inertia occurs when entrenched priorities, outdated systems, and rigid structures obstruct data-centric adoption and organisational change (Swanson, 1994). After deploying a cloud scheduling system, a manufacturer keeps reporting lines and learning processes unchanged. Staff cling to siloed spreadsheets and withhold data, crippling efficiency—a misalignment from leadership's failure to embed digital practices in routines and incentives.

Cultural Resistance happens when an organisation's values conflict with digital tools. Employees may resist without managerial support or incentives, even with cloud-based systems or AI. Tools can be underused without training and encouragement. Without a culture prioritising collaboration, digital innovation can stagnate, overshadowed by comfort in existing practices or scepticism towards change (Kohli and Melville, 2019; Thomke, 2001).

4.5 Platform Ecosystems

Platform Ecosystems drive DI by linking diverse actors through shared infrastructure. The technology (e.g., operating systems, APIs) lowers entry barriers and enhances complementary offerings, enabling rapid innovation and co-creation of evolving products and services. (Yoo et al., 2024).

Stimuli. Platform ecosystems drive DI by connecting users, developers, and services, creating powerful feedback loops through Network Effects, Data Externalities, and Complementor Access (McIntyre and Srinivasan, 2017; Parker et al., 2016). Network Effects occur when a platform's value increases with more users. Apple's App Store provides APIs and design guidelines for rapid app development. A growing user base encourages third parties to create more apps, attracting users and enhancing engagement. (Eisenmann et al., 2006).

Another variant of the network effect is Data Externalities, where platforms gain value by aggregating user data (Gregory et al., 2021; Hagiu and Wright, 2023). Amazon monitors users' browsing and buying habits to provide precise recommendations, enhancing connections between buyers and sellers and encouraging ongoing platform engagement (Jones and Tonetti, 2020; Yoo et al., 2024). Traditional retailers access purchasing histories, but Amazon observes customer behaviour before, during, and after transactions, boosting its competitive advantage with data-driven insights.

Platforms stimulate innovation by granting Complementors (external developers) access to core functionalities. The Apple App Store exemplifies collaboration in DI, as Apple provides the iOS environment and developer kits, while independent developers enhance the platform with innovative apps. (Teece, 2018; Um et al., 2023). This partnership fosters rapid and diverse innovation, enabling quick user adoption.

Tensions. Platform owners' Governance, Control, and Lock-In can impede ecosystem DI. Dominant owners set interfaces and data flows, enforcing rules that disadvantage complementors and raise fairness, dependency, and antitrust concerns. Apple's App Store exemplifies this: developers gain market reach only by accepting Apple's review process and revenue share. Ecosystems thus rely on network effects to reach critical mass (McIntyre and Srinivasan, 2017; Parker et al., 2016), yet the concentration of data flows can centralise market power, diminishing competition (Yoo et al., 2024). Teece (2018) notes that platform leaders controlling resources like APIs can extract excess value, disadvantaging smaller complementors. Data network effects increase a platform's value with user data, complicating matters (Gregory et al., 2021; Hagiu and Wright, 2023). Apple and Amazon leverage data to enhance user experiences, creating exit barriers for consumers and developers. As these feedback loops expand, ethical and regulatory concerns about lock-in, fairness, and privacy emerge. (Stark and Pais, 2021).

4.6 Catalysts' Interrelation

Catalysts interrelate: Data Objects form the foundational layer for Datafication, Recombination, and Commodification (Alaimo and Kallinikos, 2022; Zuboff, 1988). They enable an adaptable, machine-readable LMA that enhances Product Design through analytics and user insights. Successful Data Object implementation requires IT and Organisational Alignment to manage data and improve Platform Ecosystems, increasing stakeholder value (Yoo et al., 2024). LMA's flexible structure aligns with Data Objects by allowing layers to manage information independently (Yoo et al., 2010). This modularity enhances Product Design, enabling feature adjustments without full system updates. A strong IT and Organisational Alignment avoids fragmentation, ensuring synchronised updates and standards while fostering rapid application development and enhancing Network Effects and Complementor Access. Product Design combines humancentred innovation with technical expertise, leveraging Data Objects to gain insights and redefine significance (Norman and Verganti, 2014). LMA's versatility allows design teams to customise modules to meet user needs. Aligning IT with organisational goals integrates innovations into corporate culture, transforming Platform Ecosystems into distribution channels and audience feedback mechanisms that foster innovation. IT and Organisational Alignment link technical initiatives with shared values and organisational learning (Kohli and Melville, 2019). This alignment is vital for implementing Data Objects across departments, transforming data into actionable insights and supporting LMA for module integration. It promotes Product Design support and efficient use of Platform Ecosystems. Successful partnerships need transparent governance, defined roles, and proper incentives. Platform Ecosystems utilise Network Effects and Data Externalities, ensuring Complementor Accessibility (McIntyre and Srinivasan, 2017; Parker et al., 2016). They use Data Objects to customise user interactions and automate services, while LMA integrates platform functions. Intentional Product Design enhances user experience and attracts participants. Aligning IT and organisational strategies is essential for effective governance, partnerships, and data flows, mitigating lock-in risks and encouraging stakeholder collaboration.

5 Contributions, Limitations and Outlook

DI is a vital source of competitive advantage, with global transformation spending projected to be nearly four trillion USD by 2027 (IDC, 2024). Research has examined DI related to products, processes, and markets; however, no study has synthesised its primary catalysts. This paper fills this gap by providing a framework of five catalysts—Data Objects, LMA, Product Design, IT and Organisational Alignment, and Platform Ecosystems—alongside their stimuli, tensions, and interrelations.

Data Objects treat information as tradeable assets, enabling new revenue models while raising privacy and bias challenges. LMA accelerates product evolution but may fragment ecosystems if platform owners change interface rules unilaterally. Product Design fosters innovation by reshaping product significance, but risks user misalignment if user feedback is ignored. IT and Organisational Alignment support digital tools; however, entrenched cultures and legacy systems can hinder this. Finally, Platform Ecosystems promote collaboration and dynamic data flows for co-creation but raise ethical concerns over market dominance and data interactions.

The **scientific contributions** of our paper are twofold. Firstly, prior studies treat each mechanism in isolation—Data Objects (Alaimo and Kallinikos, 2022), LMA (Yoo et al., 2010), Product Design (Norman and Verganti, 2014), IT and Organisational Alignment (Fichman et al., 2014), and Platform Ecosystems (McIntyre and Srinivasan, 2017; Parker et al., 2016). Our five-catalyst framework integrates these perspectives and shows how their interplay drives DI. Secondly, opportunity-centred work shows how DI broadens entrepreneurial opportunity recognition (Kreuzer et al., 2022), whereas risk-oriented studies emphasise inhibiting forces (Wimelius et al., 2021). We integrate both perspectives by pairing catalyst's stimuli (e.g., Datafication) with countervailing tensions (e.g., Decontextualisation), yielding a balanced model that better predicts heterogeneous innovation outcomes.

Our paper also makes valuable **managerial contributions.** Existing frameworks—like Mettler's (2011) capability grids for e-business transformation and the Industry 4.0 readiness index (Schumacher et al., 2019)—evaluate separate capability areas but often in isolation. Reviews indicate these models rarely consider cross-dimensional feedback impacting performance (Thordsen and Bick, 2023). Our framework examines each catalyst's interdependencies, revealing bottlenecks and identifying leverage points to enhance progress. Consequently, managers can utilise resources more efficiently and create implementation roadmaps with clear milestones. Secondly, research on platform leadership and digital supply networks stresses the need to coordinate actors beyond organisational boundaries (Gawer and Cusumano, 2014), yet offers limited guidance on how internal capabilities connect to external partnerships (Kohli and Melville, 2019). By mapping how organisational catalysts extend into Platform Ecosystems, our framework enables managers to synchronise data practices, modular interfaces and governance mechanisms within organisations and their ecosystem.

This study has **limitations**. Firstly, reviewing only ten IS journals (vom Brocke et al., 2009) and English-language publications may overlook valuable insights from other sources or interdisciplinary fields. Secondly, limiting the search to "Digital Innovation" and "Innovation" might miss relevant studies using different terms (e.g., "Digital Transformation"). Thirdly, the IS-centric focus may overlook broader managerial and societal issues that are only partially addressed. Finally, without empirical case investigations, the interactions among these catalysts, stimuli and tensions and their weight in specific contexts remain unverified, limiting generalisability.

Future research should empirically test the catalysts and causal links identified in this study by examining how organisations extract value from data while mitigating privacy and lock-in risks through governance of data as a knowledge object (Alaimo and Kallinikos, 2022; Yoo et al., 2024); comparing open and proprietary layered modular architectures to assess their effects on innovation speed; investigating how continuous user feedback drives radical product design across industries (Jahnke, 2013; Verganti, 2009); developing alignment strategies that integrate emerging technologies such as artificial intelligence into organisational processes (Fichman et al., 2014); and analysing how data network effects redistribute market power within platform ecosystems, as well as whether decentralised governance models like Data Spaces moderate winner-takes-most dynamics (Gregory et al., 2021; Yoo et al., 2024).

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