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FROM EXPLANATION TO DESIGN: A CONCEPTUAL FRAMEWORK FOR DESIGN SCIENCE IN DIGITAL ECONOMY RESEARCH

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Abstract
The rapid expansion of the Digital Economy has generated substantial explanatory knowledge about digital transformation, yet comparatively limited prescriptive knowledge about how digital systems, institutions, and ecosystems can be intentionally designed and improved. This paper addresses this gap by proposing the Digital Economy Design Science (DEDS) Framework. Drawing on a conceptual synthesis of literature on Digital Economy, Information Systems Design Science, entrepreneurship-oriented Design Science, and related socio-technical and ecosystem perspectives, the paper develops the DEDS framework comprising three interrelated dimensions: design objects, design process, and design knowledge. The framework identifies five design objects—technology, organization, institution, ecosystem, and society—and proposes an iterative five-stage process encompassing challenge and opportunity identification, socio-technical-economic design, multi-stakeholder evaluation, learning and adaptation, and transformation. It further proposes five design principles—multi-dimensionality, stakeholder plurality, dual evaluation, iterative institutional learning, and system-level value—and identifies design principles, models, governance frameworks, policy designs, and ecosystem architectures as potential forms of reusable design knowledge. The paper contributes by providing an integrative and prescriptive framework that complements explanatory Digital Economy research and connects design intervention with cumulative knowledge generation and system improvement. As a conceptual contribution, the framework requires empirical validation through case studies, Action Design Research, policy experimentation, and comparative research.
Keywords: *Digital Economy; Design Science; Digital Transformation; Socio-Technical Systems; Design Knowledge*

Introduction
Digital Economy has become one of the fastest-growing fields in business, economics, and management research. Over the past three decades, scholarly attention has expanded from information technology (Orlikowski & Iacono, 2001; Benbasat & Zmud, 2003) and electronic commerce (Turban et al., 2018; Laudon & Traver, 2024) toward broader issues including digital platforms (Nambisan et al., 2019; Parker et al., 2016), artificial intelligence (Dwivedi et al., 2021; Brynjolfsson & McAfee, 2017), fintech (Gomber et al., 2018; Lee & Shin, 2018), digital entrepreneurship (Nambisan, 2017), digital governance (Heeks, 2006; Janssen et al., 2017), digital trade (Goldfarb & Tucker, 2019), sustainability (George et al., 2021), and data-driven innovation (Trabucchi & Buganza, 2019). Recent bibliometric studies consistently show an exponential increase in Digital Economy publications since around 2017, reflecting the growing importance of digital technologies in economic development, industrial transformation, and innovation ecosystems (Wang et al., 2024; Zhang et al., 2024). At the same time, Digital Economy research has evolved from a technology-oriented niche into an interdisciplinary field that integrates economics, information systems, management, entrepreneurship, public policy, innovation studies, and sustainability science (Goldfarb & Tucker, 2019; Wang et al., 2024).

The rapid expansion of the field has also broadened its research agenda. Contemporary studies increasingly examine digital transformation within firms (Vial, 2019), platform ecosystems (Jacobides et al., 2018; Nambisan et al., 2019), artificial intelligence and intelligent automation (Dwivedi et al., 2021), digital public infrastructure (World Bank, 2024), digital inclusion (Heeks, 2022), sustainable digitalization (George et al., 2021), and the governance of emerging technologies (Janssen et al., 2017). Research has therefore moved beyond analysing information technology adoption to understanding how digital technologies reshape markets, organizations, institutions, and societies (Goldfarb & Tucker, 2019; Vial, 2019). Nevertheless, several recent reviews conclude that Digital Economy research remains theoretically fragmented despite its rapid growth. Bibliometric analyses reveal an expanding but highly dispersed body of literature spanning multiple disciplines, theories, and research traditions, with relatively limited conceptual integration (Wang et al., 2024; Zhang et al., 2024). Similarly, recent

reviews of digital development research in the Global South indicate that the literature remains relatively descriptive and context-dependent, with fragmented evidence across technological, organizational, and institutional domains, highlighting the need for stronger theoretical development and more integrated approaches to digital transformation (Heeks et al., 2024; Pyram, 2026).

A closer examination of the literature also reveals an important methodological pattern. Despite the diversity of research topics, most Digital Economy studies adopt an explanatory orientation. Bibliometric reviews indicate that the dominant objectives of Digital Economy research are to explain the adoption of digital technologies, identify determinants of digital transformation, evaluate the performance of digital platforms, or assess the economic and social impacts of digitalization (Goldfarb & Tucker, 2019; Vial, 2019; Wang et al., 2024). Similarly, systematic reviews of digital development research in the Global South observe that existing studies predominantly employ descriptive, empirical, and explanatory approaches, while relatively few attempts to generate actionable design knowledge for addressing digital transformation challenges.

Consequently, Digital Economy research has generated substantial knowledge about why digital phenomena occur and what their consequences are. Studies have investigated technology acceptance, digital innovation, platform competition, digital entrepreneurship, financial inclusion through fintech, and the effects of artificial intelligence on productivity and organizational performance (Dwivedi et al., 2021; Gomber et al., 2018; Nambisan, 2017; Vial, 2019). These studies have significantly advanced understanding of digital transformation across organizations, industries, and societies. However, they provide comparatively limited guidance for addressing the practical design questions increasingly faced by policymakers, business leaders, entrepreneurs, and development agencies.

These practical questions differ fundamentally from explanatory research questions. Governments seek guidance on how to design inclusive digital public infrastructure and regulatory systems. Businesses seek effective architectures for digital platforms and ecosystems that simultaneously create economic and social value. Development agencies aim to design digital interventions that reduce inequality while accelerating sustainable development. Likewise, emerging economies such as Indonesia continue to face complex design challenges related to digital inclusion, cybersecurity, artificial intelligence governance, digital finance, and the development of digital talent. Recent policy analyses suggest that addressing these challenges requires coordinated institutional, technological, and governance innovations rather than isolated technological solutions.

The distinction between explanation and design is therefore becoming increasingly significant. Explaining why a digital platform succeeds does not necessarily provide knowledge about how better digital platforms should be designed. Likewise, understanding the determinants of digital transformation does not automatically generate principles for designing more resilient digital ecosystems or more inclusive digital governance arrangements. The growing gap between explanatory knowledge and practical design challenges suggests that Digital Economy research requires complementary approaches capable of generating prescriptive and actionable knowledge in addition to explanatory theories.

This challenge becomes even more significant because the Digital Economy itself is fundamentally an evolving socio-technical-economic system. Digital markets, payment systems, platform ecosystems, digital identities, governance mechanisms, regulatory institutions, and data infrastructures do not emerge spontaneously. Rather, they are intentionally conceived, designed, implemented, evaluated, and continuously adapted through interactions among governments, firms, technology developers, civil society, and users (Goldfarb & Tucker, 2019; Heeks, 2022; World Bank, 2024). As Simon (1996) argues, such human-created systems belong to the Sciences of the Artificial, where the central concern is not merely understanding existing reality but designing preferred future realities. From this perspective, advancing the Digital Economy requires more than explaining existing digital systems—it also requires systematic knowledge for designing better socio-technical-economic systems that generate sustainable economic and public value.

Design Science Research (DSR) offers a promising foundation for addressing this challenge. Originating in Information Systems, DSR emphasizes the creation and rigorous evaluation of innovative artifacts that solve practical problems while simultaneously contributing to scientific knowledge (Hevner et al., 2004; Hevner, 2007; Peffers et al., 2007). More recently, scholars have begun extending Design Science beyond information technology into entrepreneurship by designing entrepreneurial opportunities, business models, and innovation processes (Dimov, 2020; Seckler et al., 2023). These developments suggest that Design Science has progressively evolved from designing technological artifacts toward designing broader organizational and socio-economic interventions. Yet despite the rapid growth of Digital Economy research, relatively little attention has been devoted to exploring how Design Science can guide the design of digital ecosystems, institutions, governance arrangements, and societal transformation.

This paper argues that Digital Economy presents a distinctive context for applying and extending Design Science because its design problems frequently involve interconnected technological, organizational, institutional, ecosystem, and societal dimensions. Building upon developments in Information Systems and Entrepreneurship, the paper proposes a conceptual framework for Design Science in Digital Economy that complements existing explanatory research by emphasizing the creation, evaluation, and improvement of digital systems capable of generating both economic and public value. Accordingly, this paper addresses the following research question: What conceptual framework can guide Design Science in Digital Economy?

The contribution is not a new Design Science methodology, but a conceptual framework that specifies how existing Design Science principles can be extended and organized for the distinctive design challenges of Digital Economy. By shifting the unit of design from technological artifacts to socio-technical-economic systems, it seeks to bridge the gap between explaining digital transformation and designing better digital futures.

Research Approach: Conceptual Literature Synthesis

This paper adopts a conceptual literature synthesis rather than a systematic literature review. This approach is appropriate when the objective is to integrate concepts and perspectives from different bodies of literature in order to develop a new conceptual framework rather than to exhaustively identify and synthesize all available studies (Snyder, 2019; Torraco, 2005). The review follows a structured but flexible process of defining relevant literature domains, identifying conceptually important sources, comparing recurring themes across the domains, and synthesizing these insights into a coherent conceptual model.

The review draws on four interconnected literature streams relevant to the development of the Digital Economy Design Science (DEDS) Framework: (1) Digital Economy research, (2) Information Systems Design Science Research, (3) Entrepreneurship Design Science, and (4) broader socio-technical, ecosystem, and public-sector design literature. The sources include foundational The review draws on four interconnected literature streams relevant to the development of the Digital Economy Design Science (DEDS) Framework: (1) Digital Economy research, (2) Information Systems Design Science Research, (3) Entrepreneurship Design Science, and (4) broader socio-technical, ecosystem, and public-sector design literature. The sources include foundational scholarly works that established the conceptual foundations of digital economics and Design Science, as well as more recent reviews and studies addressing digital transformation, digital entrepreneurship, ecosystems, digital development, and digital public infrastructure (Goldfarb & Tucker, 2019; Hevner et al., 2004; Jacobides et al., 2018; Nambisan, 2017; Vial, 2019).

The literature considered spans approximately 2001–2025, with earlier publications retained where they provide foundational concepts and methodological principles, while more recent studies are used to capture the evolving characteristics and challenges of the Digital Economy. Selection was guided by conceptual relevance rather than comprehensiveness. Sources were included when they contributed to understanding the nature of Digital Economy phenomena, the principles of Design Science, the expansion of design into entrepreneurship and organizational contexts, or the design and governance of socio-technical ecosystems.

The four literature streams were compared conceptually to identify recurring dimensions concerning design objects, design processes, stakeholder configurations, evaluation criteria, and knowledge outputs. These dimensions were then synthesized to identify what existing approaches contribute individually and what remains insufficiently integrated when addressing complex Digital Economy challenges. The resulting synthesis provides the conceptual basis for the DEDS Framework, rather than claiming empirical validation or a systematic assessment of the entire literature.

From Explanation to Design: Extending Design Science to the Digital Economy

Design Science Beyond Behavioral Science

The distinction between behavioral science and design science has long been recognized as a fundamental paradigm in the sciences of the artificial. Simon (1996) argued that while the natural sciences seek to explain and predict existing phenomena, design sciences are concerned with creating preferred future situations through purposeful intervention. Behavioral research asks what is and why it occurs, whereas design research asks what ought to be and how it can be achieved. Consequently, the primary objective of design science is not merely to understand reality but to develop artifacts, models, and interventions capable of solving practical problems while simultaneously contributing to scientific knowledge.

This distinction was subsequently adopted and refined within the Information Systems (IS) discipline. Hevner et al. (2004) proposed that IS research should consist of two complementary paradigms. Behavioral Science seeks to develop and validate theories explaining or predicting organizational and technological

phenomena. In contrast, Design Science Research (DSR) focuses on creating and evaluating innovative artifacts—including constructs, models, methods, and systems—that improve organizational performance and address real-world problems. Rather than competing paradigms, behavioral science and design science are mutually reinforcing. Behavioral research provides explanatory knowledge that informs design, while design research generates practical solutions that, in turn, enrich theoretical understanding (Hevner et al., 2004; Hevner, 2007).

Subsequent developments have further refined the philosophical foundations of Design Science. Iivari (2007) argued that Design Science should be understood as an independent research paradigm with its own epistemological assumptions rather than merely an applied branch of behavioral science. Similarly, Peffers et al. (2007) proposed a systematic Design Science Research Methodology (DSRM) consisting of problem identification, objective definition, artifact design, demonstration, evaluation, and communication. Collectively, these contributions established Design Science as a rigorous approach for producing actionable knowledge while maintaining scientific validity.

Although originally developed within Information Systems, the underlying philosophy of Design Science extends well beyond technological artifacts. Its central concern is the intentional design of solutions that improve human, organizational, and societal conditions. This broader orientation provides an important foundation for extending Design Science into Digital Economy research.

From Information Systems to Entrepreneurship

The evolution of Design Science demonstrates a gradual expansion of its objects of design. Early Design Science Research focused primarily on information technology artifacts such as decision-support systems, databases, software architectures, algorithms, and information systems. The designed artifact was typically technological, and evaluation concentrated on its functionality, efficiency, and organizational usefulness (Hevner et al., 2004).

More recently, entrepreneurship scholars have argued that Design Science can contribute beyond technological innovation by designing entrepreneurial action itself. Rather than limiting research to explaining entrepreneurial behaviour or identifying determinants of venture success, Design Science enables researchers to develop new entrepreneurial opportunities, business models, innovation processes, and organizational practices (Dimov, 2020; Seckler et al., 2023). In this perspective, entrepreneurship becomes a process of intentional design in which entrepreneurs continuously construct, test, evaluate, and refine opportunities under conditions of uncertainty.

This extension significantly broadens the scope of Design Science. The object of design is no longer confined to technological artifacts but includes organizational capabilities, institutional arrangements, and innovation ecosystems. Knowledge generated through Design Science therefore shifts from describing entrepreneurial phenomena toward developing design principles that improve entrepreneurial practice.

The evolution from Information Systems to Entrepreneurship demonstrates that Design Science is inherently adaptive. As research domains evolve, so too do the objects of design. This intellectual trajectory suggests that extending Design Science to Digital Economy represents not a methodological discontinuity but a natural progression in its development.

Why Digital Economy Requires a Design Science

Digital Economy presents challenges that differ fundamentally from those addressed by traditional Information Systems or Entrepreneurship research. While Information Systems primarily designs technological artifacts and Entrepreneurship increasingly designs ventures and business models, Digital Economy encompasses much broader socio-technical-economic systems involving governments, firms, digital platforms, financial institutions, regulatory agencies, civil society, and citizens. Digital transformation therefore occurs not within isolated organizations but across interconnected ecosystems shaped by technology, institutions, governance, and public policy (Goldfarb & Tucker, 2019; Heeks, 2022).

The literature reviewed in the previous section illustrates this complexity. Contemporary Digital Economy research investigates digital platforms, artificial intelligence, fintech, digital trade, digital public infrastructure, digital inclusion, cybersecurity, and sustainability. These issues extend beyond technological innovation because they involve institutional coordination, regulatory design, stakeholder participation, and societal outcomes. Similarly, policy analyses emphasise that digital transformation

depends not only on technological capability but also on governance quality, digital literacy, infrastructure, investment, and inclusive public institutions.

Consequently, the principal object of design in Digital Economy is no longer an isolated technological artifact but an integrated socio-technical-economic system. Such systems combine digital technologies with organizational structures, institutional arrangements, governance mechanisms, market interactions, and public value creation. Designing a national digital payment system, for example, requires not only technological innovation but also regulatory frameworks, interoperability standards, institutional collaboration, cybersecurity mechanisms, and user trust. Similarly, designing digital public infrastructure or platform ecosystems requires coordinated interventions across technological, economic, organizational, and societal dimensions.

This shift in the unit of design constitutes the central argument of this paper. Rather than viewing Digital Economy as merely another application domain for existing Design Science Research, this paper proposes that Digital Economy requires a distinct conceptualization of Design Science because its design objects are fundamentally broader and more complex. Building upon the intellectual foundations established in Information Systems and Entrepreneurship, the next section proposes a conceptual framework for Design Science in Digital Economy that reflects this expanded understanding of design.

Existing approaches provide strong design knowledge at particular levels of analysis, but they do not sufficiently integrate multiple levels of design into a single research-oriented framework for Digital Economy. DEDS provides a conceptual architecture for integrating these different design levels and evaluating their interaction as parts of a socio-technical-economic system.

DEDS builds on, rather than replaces, existing Design Science and related design approaches. Table 1 positions the framework in relation to major traditions that have informed its development. The comparison shows that existing approaches provide important foundations for artifact design, organizational intervention, entrepreneurship, socio-technical alignment, ecosystem coordination, and public-sector design, but generally emphasize particular design objects or domains. DEDS seeks to integrate these perspectives by treating technology, organization, institution, ecosystem, and society as potentially interconnected objects of design within an iterative Design Science process.

Table 2 Positioning the DEDS Framework Among Existing Design Approaches

Design Approach	Main references	Primary design object	Key orientation	Stakeholders / evaluation focus	Remaining gap for Digital Economy
Information Systems Design Science Research (DSR)	Hevner et al. (2004); Hevner (2007); Peffers et al. (2007)	IT artifacts, methods, and models	Utility, functionality, and problem-solving	Primarily users and organizations; emphasis on utility and performance	Traditionally emphasizes technological artifacts and organizational contexts rather than the broader configuration of economic, institutional, ecosystem, and societal dimensions
Action Design Research (ADR)	Hevner et al. (2004); Hevner (2007)	IT artifacts within organizational contexts	Artifact development through intervention and organizational change	Organizational actors; emphasis on contextual effectiveness and intervention	Strong contextual and intervention orientation, but less focused on multi-actor digital ecosystems, institutions, and wider societal outcomes

Design Approach	Main references	Primary design object	Key orientation	Stakeholders / evaluation focus	Remaining gap for Digital Economy
Entrepreneurship Design Science	Dimov (2020); Seckler et al. (2021)	Opportunities, ventures, business models, and entrepreneurial processes	Entrepreneurial action and value creation	Entrepreneurs and firms; emphasis on venture viability and value creation	Extends design beyond IT artifacts but focuses primarily on entrepreneurial actors and ventures rather than broader digital ecosystems and institutional arrangements
Socio-technical design	Heeks (2022); Orlikowski & Iacono (2001)	Technology–organization/social relations	Alignment between technical and social dimensions	Users, organizations, and social actors; emphasis on socio-technical fit and outcomes	Provides an important socio-technical perspective but is less explicit about integrating market, ecosystem, institutional, and public-value dimensions within a Design Science framework
Ecosystem design	Jacobides et al. (2018); Nambisan et al. (2019)	Ecosystem relationships and complementarities	Coordination, interdependence, and value creation	Multiple ecosystem actors; emphasis on relationships and ecosystem value	Highlights interorganizational relationships but is less explicit about systematic research-through-design and cumulative design knowledge
Public/policy design	Heeks (2006, 2022); World Bank (2024)	Policies, institutions, and public digital systems	Public problem-solving and digital development	Governments, citizens, communities, and other public stakeholders; emphasis on public value	Addresses institutional and societal dimensions but is not necessarily integrated with artifact-level Design Science and systematic evaluation of designed digital systems

Design Approach	Main references	Primary design object	Key orientation	Stakeholders / evaluation focus	Remaining gap for Digital Economy
Digital Economy Design Science (DEDS)	This paper; building on the above traditions	Socio-technical-economic systems	Integrated design and continuous improvement across technology, organization, institution, ecosystem, and society	Multiple stakeholders; evaluation of technical, economic, social, institutional, and public-value outcomes	Provides a conceptual framework for integrating multiple design levels through an iterative Design Science process and generating reusable design knowledge

The comparison indicates that the distinctive contribution of DEDS is not a new Design Science methodology but an integrative design scope. Its unit of design can extend across multiple levels of a Digital Economy system, while its iterative process connects multi-stakeholder evaluation and institutional learning with the generation of reusable design knowledge. DEDS therefore complements existing approaches by providing a framework for design problems that cannot be adequately addressed at the level of a single artifact, organization, venture, or policy.

The Digital Economy Design Science (DEDS) Framework

The preceding discussion suggests that extending Design Science to the Digital Economy requires more than transferring existing methodologies from Information Systems. Rather, it requires reconceptualizing the object, process, and outcomes of design in a context where technological innovation is inseparable from institutional arrangements, governance mechanisms, economic interactions, and societal transformation. Accordingly, this paper proposes a conceptual framework for The Digital Economy Design Science (DEDS) that extends the Design Science tradition while recognising the unique characteristics of digital economies as socio-technical-economic systems.

The DEDS Framework conceptualizes Digital Economy design as an iterative knowledge-generation process in which researchers and practitioners address systemic digital challenges by designing, evaluating, and continuously improving interventions across five interconnected levels: technology, organization, institution, ecosystem, and society. The framework consists of three mutually connected dimensions: *design objects, design process,* and *design knowledge* (Hevner, 2007; Hevner et al., 2004; Peffers et al., 2007; Vial, 2019).

Three dimensions of DEDS

Design objects: What is being designed?

The first dimension specifies the object or level at which intervention takes place, namely technology, organization, institution, ecosystem, and society. Table 3 summarizes this stage.

Design level	Typical design object	Examples
Technology	Digital artifacts and infrastructure	AI systems, platforms, digital identity, payment systems
Organization	Organizational arrangements and business models	Digital operating models, platform governance, digital ventures
Institution	Rules, policies, standards, and governance arrangements	Data regulation, digital rights, interoperability standards
Ecosystem	Relationships among interconnected actors	Platform ecosystems, fintech ecosystems, digital public infrastructure

Design level	Typical design object	Examples
Society	Broader socio-economic outcomes and public value	Digital inclusion, sustainability, equitable access, social resilience

The important point is that these levels are not independent. A digital platform, for example, involves technology but also organizational practices, rules governing participation, relationships among ecosystem actors, and consequences for society. Therefore, the appropriate design object may extend across several levels simultaneously (Jacobides et al., 2018; Nambisan et al., 2019; Orlikowski & Iacono, 2001; Vial, 2019). This formulation is consistent with the evolution of Digital Economy research from an emphasis on technological artifacts toward broader organizational, ecosystem, institutional, and societal transformations (Goldfarb & Tucker, 2019; Heeks, 2022; Nambisan, 2017; Vial, 2019).

Design process: How is the system designed and improved?

The second dimension specifies five iterative stages through which a Digital Economy intervention is conceived, developed, evaluated, and continuously improved. Rather than representing a strictly linear sequence, these stages form a cyclical process in which evaluation and learning can lead to redesign and renewed engagement with emerging challenges and opportunities. This iterative logic builds on the Design Science emphasis on cycles of design and evaluation while extending it to the broader socio-technical-economic context of the Digital Economy (Hevner, 2007; Hevner et al., 2004; Gregor & Hevner, 2013). Those five iterative stages are as follows:

First, challenge and opportunity identification. The process begins by identifying a significant Digital Economy problem or opportunity. Unlike conventional technology development, the problem may be systemic, involving conflicting stakeholder interests, institutional constraints, market dynamics, or societal consequences. The purpose is therefore not simply to identify technical deficiencies, but to recognize both challenges and opportunities and to explore the socio-technical-economic possibilities through which existing strengths can be leveraged and new forms of value can be created (Heeks, 2022; Vial, 2019). The inclusion of opportunities alongside problems is particularly important in Digital Economy contexts, where digital technologies can create new forms of entrepreneurship, innovation, and value creation rather than merely solve existing deficiencies (Dimov, 2020; Nambisan, 2017; Nambisan et al., 2019).

Second, socio-technical-economic design. The next stage develops an intervention appropriate to the identified challenge. Depending on the problem or opportunity, the intervention may involve a technological artifact, organizational arrangement, business model, governance mechanism, policy, ecosystem architecture, or combination of these. The central principle is that technological design should be considered together with its organizational, institutional, economic, and societal context (Hevner et al., 2004; Iivari, 2007; Orlikowski & Iacono, 2001; Vial, 2019). This broader conception of design builds on the evolution of Design Science from the design of information systems artifacts toward organizational, entrepreneurial, and broader socio-economic interventions (Dimov, 2020; Hevner, 2007; Seckler et al., 2021).

Third, multi-stakeholder evaluation. The proposed design is evaluated not only according to technical performance or organizational efficiency but also according to its consequences for different stakeholders. Evaluation may therefore include measures of usability, economic value, inclusion, institutional effectiveness, sustainability, trust, and public value. This stage recognizes that a design can be technically successful while producing undesirable outcomes at another level (Hevner et al., 2004; Gregor & Hevner, 2013). A multi-stakeholder perspective is particularly important for Digital Economy systems because value and consequences are distributed across interconnected actors rather than being confined to a single organization or technology (Jacobides et al., 2018; Nambisan et al., 2019).

Fourth, learning and adaptation. Evaluation generates knowledge about what works, what does not work, for whom, and under what conditions. This knowledge informs adaptation of the design as well as changes in organizational practices, governance arrangements, or institutional rules. Thus, failure or unintended consequences are not simply endpoints; they become sources of design learning (Gregor & Hevner, 2013; Hevner, 2007). This iterative orientation is consistent with the Design Science emphasis on repeated cycles of relevance, design, and evaluation, while extending the learning process to organizational, institutional, and ecosystem levels (Hevner, 2007).

Fifth, transformation. The final stage concerns the effects of the intervention on the wider Digital Economy system. Transformation may involve improved economic performance, new market arrangements, greater

inclusion, improved public services, stronger institutional capacity, or other forms of public and economic value. Importantly, transformation can also reveal new problems or unintended consequences, triggering another cycle of design (Heeks, 2022; Vial, 2019). The emphasis on transformation reflects the broader Digital Economy literature, which increasingly understands digitalization as a process that reshapes organizations, markets, ecosystems, institutions, and society rather than simply introducing new technologies (Goldfarb & Tucker, 2019; Nambisan et al., 2019; Vial, 2019).

How the DEDS process generates design knowledge

The DEDS process does not end with implementation. Its central research contribution is the production of reusable design knowledge (Gregor & Hevner, 2013; Hevner et al., 2004). The relationship can be represented by Figure 1.

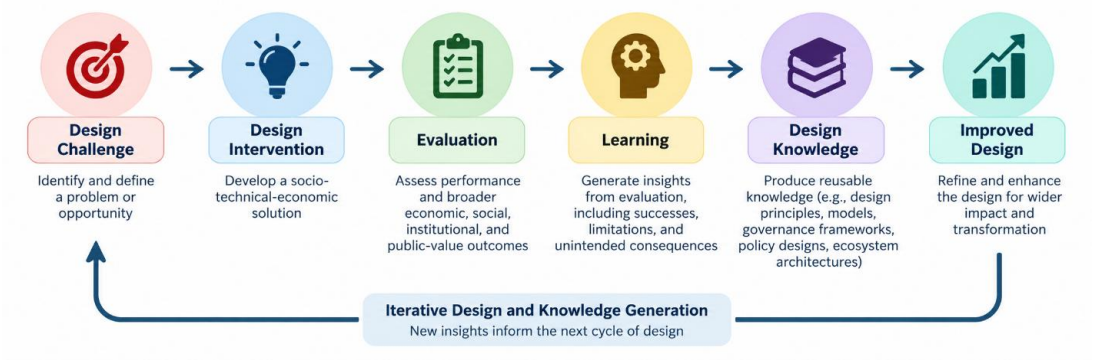


Figure 1. Knowledge-generation logic of DEDS

This sequence summarizes the knowledge-generation logic of DEDS: a *challenge or opportunity* triggers the development of a *design intervention*, which is then *evaluated* to generate *learning*. This learning is transformed into *reusable design knowledge*, which informs the *improvement and redesign* of the system.

The resulting design knowledge can take several forms, namely design principles, design models, governance frameworks, policy designs, and ecosystem architectures.

Table 4. The Resulting Design Knowledge

Type of design knowledge	What it provides
Design principles	General guidance about how a Digital Economy system should be designed
Design models	Conceptual representations of how system components should interact
Governance frameworks	Principles and mechanisms for coordinating stakeholders and institutions
Policy designs	Structured approaches to addressing systemic digital challenges
Ecosystem architectures	Configurations of actors, relationships, rules, and technological infrastructure

This distinction is important because the artifact or intervention is not the only research output. The design process should produce knowledge that can inform subsequent designs in similar or different contexts (Gregor & Hevner, 2013; Hevner et al., 2004). The emphasis on different forms of design knowledge is consistent with the Design Science literature, which distinguishes between the designed artifact and the more generalizable knowledge generated through the design and evaluation process (Gregor & Hevner, 2013; Peffers et al., 2007). It also resonates with the development of Design Science in entrepreneurship, where design principles and conceptual knowledge can emerge from the process of designing entrepreneurial opportunities and interventions (Dimov, 2020; Seckler et al., 2021). For example, designing a digital payment ecosystem may produce not only a functioning payment system but also design principles concerning interoperability, stakeholder participation, data governance, and financial inclusion. These principles can subsequently inform the design of other digital ecosystems.

The central mechanism of DEDS

The nature and complexity of the design object determine the scope of the design process. Designing an AI application may require primarily technological and organizational considerations. Designing a national digital identity system, by contrast, requires simultaneous consideration of technology, organizations, institutions, ecosystem relationships, and societal consequences (Heeks, 2022; Vial, 2019; World Bank, 2024).

Design, evaluation, and learning generate knowledge about effective configurations, mechanisms, and conditions. Repeated iterations therefore transform practical experience into potentially reusable design knowledge (Gregor & Hevner, 2013; Hevner, 2007). The resulting principles, models, governance frameworks, and architectures inform subsequent interventions. Design knowledge therefore becomes an input into future design rather than simply a final output (Gregor & Hevner, 2013).

The relationship also runs in the opposite direction. Design processes can reveal mechanisms and relationships that may subsequently contribute to explanatory theory. Thus, DEDS does not replace explanatory Digital Economy research. Instead, it creates a bidirectional relationship between explanation and design (Gregor & Hevner, 2013; Vial, 2019). DEDS integrates design objects, iterative design processes, and cumulative design knowledge so that Digital Economy research can move from explaining existing socio-technical-economic systems toward systematically designing and improving alternative ones.

DEDS Design Principles

The DEDS Framework is intended not only to describe the scope and process of Digital Economy design but also to provide prescriptive guidance for how such design should be undertaken. Based on the preceding synthesis of Design Science, Digital Economy, entrepreneurship, ecosystem, and socio-technical perspectives, five design principles are proposed.

Design Principle 1: Multi-dimensionality. Digital Economy interventions should simultaneously consider technological, organizational, institutional, ecosystem, and societal dimensions of the design problem. A digital intervention may generate consequences beyond the level at which it is initially developed. Therefore, design should consider the interactions among these dimensions rather than optimizing a single component in isolation (Hevner et al., 2004; Iivari, 2007; Jacobides et al., 2018; Vial, 2019).

Design Principle 2: Stakeholder plurality. Digital Economy designs should incorporate multiple stakeholder perspectives because system value is distributed across users, firms, governments, communities, and other ecosystem actors. The interests, capabilities, and experiences of these actors may differ, making multi-stakeholder engagement important for both design relevance and evaluation (Gregor & Hevner, 2013; Jacobides et al., 2018; Nambisan et al., 2019).

Design Principle 3: Dual evaluation. Digital Economy designs should be evaluated through both system performance and broader economic, social, institutional, and public-value outcomes. Technical functionality or organizational efficiency alone may not adequately capture whether a digital intervention creates desirable outcomes across the wider system (Hevner et al., 2004; Gregor & Hevner, 2013; Heeks, 2022).

Design Principle 4: Iterative institutional learning. Digital Economy designs should incorporate feedback and institutional learning because digital systems evolve through technological, market, regulatory, and societal change. Evaluation should therefore generate learning that can inform not only subsequent versions of the design but also organizational practices, governance arrangements, and institutional responses (Hevner, 2007; Gregor & Hevner, 2013; Heeks, 2022; Vial, 2019).

Design Principle 5: System-level value. Digital Economy design should seek value creation at the level of the wider socio-technical-economic system rather than optimizing individual technologies or organizations alone. This principle recognizes that digital transformation involves interconnected changes in technologies, organizations, markets, institutions, and society, and that value creation may therefore depend on the configuration and interaction of these elements (Goldfarb & Tucker, 2019; Jacobides et al., 2018; Nambisan et al., 2019; Vial, 2019).

Taken together, these five principles make DEDS prescriptive rather than merely descriptive. They provide practical guidance for researchers and practitioners in determining what should be considered when designing Digital Economy systems, how different stakeholders and levels should be incorporated, and how design outcomes should be evaluated and improved over time. At the same time, the principles remain sufficiently general to be applied across different Digital Economy contexts without prescribing a single type of technology, organization, or institutional arrangement.

The DEDS Framework

The three dimensions of DEDS—design objects, design process, and design knowledge—are brought together in the framework shown in Figure 1. The framework illustrates how Digital Economy challenges and opportunities are addressed through interventions that may span technological, organizational, institutional, ecosystem, and societal levels. These interventions are developed and evaluated through an iterative process of design, multi-stakeholder evaluation, learning, and adaptation, generating reusable design knowledge that informs subsequent design and system improvement.

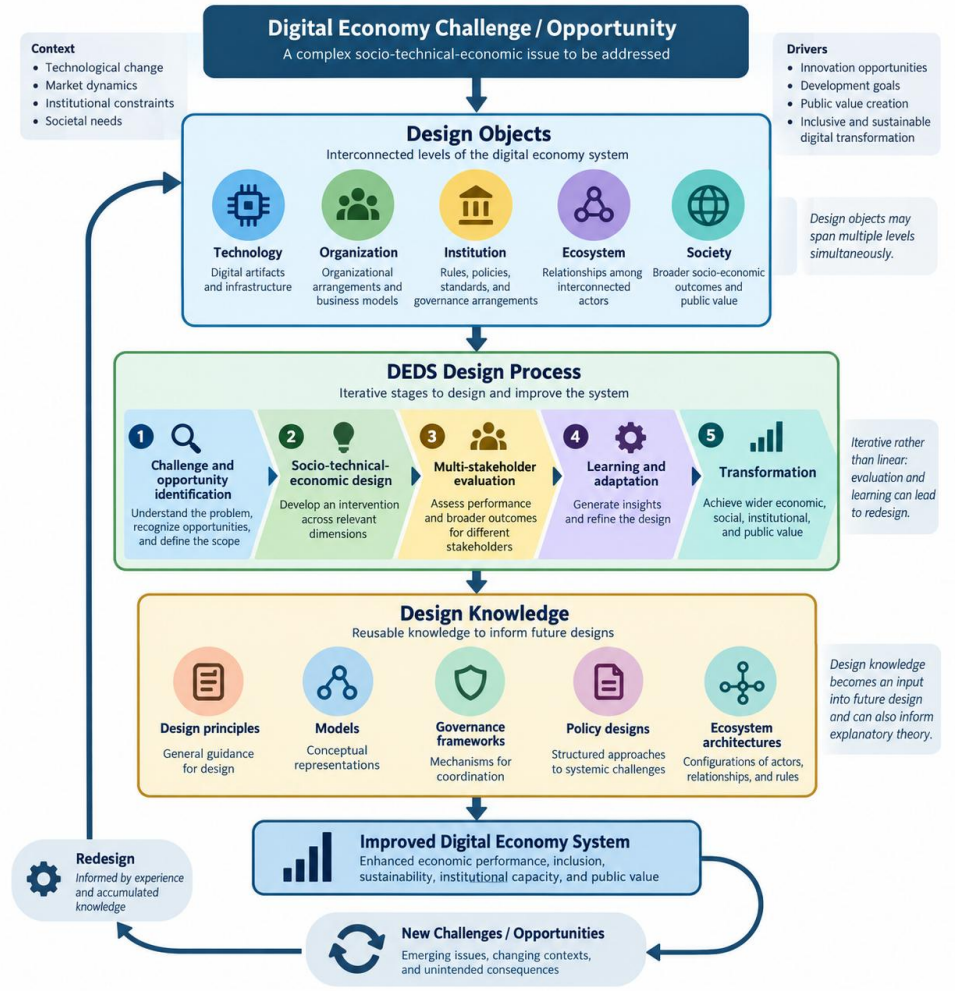


Figure 2. The Digital Economy Design Science Framework

The framework should not be interpreted as a strictly linear sequence. Rather, it represents a continuous cycle of design and learning. A Digital Economy challenge or opportunity triggers design, while evaluation generates learning and design knowledge that can improve the intervention. Transformation may subsequently reveal new challenges or opportunities, initiating another cycle of redesign. In this way, DEDS connects design intervention, evaluation, knowledge generation, and continuous system transformation, while allowing design knowledge from one cycle to inform future designs.

The distinctive contribution of DEDS does not lie in introducing Design Science as a new methodology or claiming that existing Design Science approaches cannot address Digital Economy problems. Rather, DEDS specifies how design knowledge can be generated when the design problem simultaneously involves multiple levels of a digital economy system. Existing approaches provide important foundations for artifact design, organizational intervention, entrepreneurship, socio-technical alignment, ecosystem coordination, and public-sector innovation. DEDS connects these perspectives by treating technology, organization, institution, ecosystem, and society as potentially interdependent design objects and by linking their design through an iterative process of evaluation, learning, and adaptation. Its distinctive unit of analysis is therefore not necessarily a particular artifact or organization but the configuration and interaction of multiple elements within a socio-technical-economic system.

Ultimately, the principal contribution of the DEDS Framework lies in repositioning Digital Economy as a design-oriented field of inquiry. The rapid evolution of artificial intelligence, digital platforms, fintech, and digital public infrastructure means that researchers are increasingly confronted with questions concerning the intentional design of future digital systems rather than merely explaining existing ones. As digital transformation becomes more pervasive, the capacity to generate actionable design knowledge will become increasingly important for creating digital economies that are not only technologically advanced but also inclusive, resilient, sustainable, and socially beneficial.

The DEDS Framework therefore complements existing explanatory paradigms by providing a conceptual foundation for producing knowledge that simultaneously advances theory and improves practice. In doing so, it bridges the longstanding divide between explanation and design and proposes a new research agenda for Digital Economy scholarship.

Implications of the Digital Economy Design Science (DEDS) Framework

The proposed DEDS Framework has important implications for both the future development of Digital Economy research and the practice of digital transformation. Rather than replacing existing explanatory approaches, DEDS complements them by expanding the scope of inquiry from understanding digital phenomena to intentionally designing and improving digital systems. Its implications follow directly from the five design principles of multi-dimensionality, stakeholder plurality, dual evaluation, iterative institutional learning, and system-level value.

Implications for Research

For researchers, the principle of multi-dimensionality encourages Digital Economy research to move beyond studies focused on individual technologies or organizations toward research that examines interactions among technology, organization, institution, ecosystem, and society. This broadens the possible objects of Design Science from digital artifacts to more complex socio-technical-economic systems.

The *principle of stakeholder plurality* further implies that design research should incorporate the perspectives and interests of multiple actors. Researchers can therefore investigate not only whether a digital intervention works technically, but also how its design affects users, firms, governments, communities, and other ecosystem participants.

The *principle of dual evaluation* expands the criteria by which Digital Economy designs are assessed. Technical performance and organizational efficiency remain important, but they should be considered alongside economic, social, institutional, sustainability, and public-value outcomes. This encourages researchers to develop richer evaluation approaches for digital interventions.

The *principle of iterative institutional learning* positions design as a continuing process rather than a one-time intervention. Researchers can study how feedback, unintended consequences, technological change, market evolution, and regulatory responses generate learning that informs subsequent redesign. This creates opportunities to connect Design Science with longitudinal and context-sensitive research.

Finally, the principle of system-level value encourages researchers to consider whether an intervention improves the wider digital system rather than simply optimizing an individual artifact, organization, or transaction. Accordingly, DEDS encourages research that complements explanatory questions with design questions concerning how digital systems can be intentionally configured to create economic and societal value.

These principles also expand the expected outputs of Digital Economy research. In addition to explanatory theories, researchers can develop design principles, models, governance frameworks, policy designs, and ecosystem architectures that provide reusable knowledge for subsequent interventions.

Implications for Practice

For practitioners, the five principles provide a practical orientation for designing and implementing digital transformation. Multi-dimensionality implies that technology implementation should be considered together with organizational capabilities, institutional arrangements, ecosystem relationships, and societal consequences. Digital transformation should therefore not be treated simply as the adoption of new technologies.

Stakeholder plurality implies that governments, businesses, users, communities, and other relevant actors should be involved in the design and evaluation of digital systems. This is particularly important where digital systems create interdependencies among actors or distribute benefits and risks unevenly.

Dual evaluation requires practitioners to assess both system performance and broader outcomes. A digital platform, payment system, or public digital service, for example, should be evaluated not only in terms of

efficiency and adoption but also in terms of inclusion, trust, sustainability, institutional effectiveness, and public value.

The *iterative institutional learning* principle means that implementation should incorporate mechanisms for feedback, monitoring, learning, and adaptation. Digital transformation should therefore be understood as an evolving process in which designs can be modified in response to changing technologies, markets, regulations, and stakeholder experiences.

Finally, the **system-level value** principle encourages practitioners to avoid optimizing individual organizational interests at the expense of the wider ecosystem. For businesses, particularly platform companies and digital startups, this means considering how business models, governance arrangements, and technological choices contribute to sustainable value creation across the broader ecosystem.

Implications for Policymakers

For policymakers, DEDS has a particularly important implication: policy and regulation should be treated as components of the digital system being designed rather than as external constraints imposed after technological development. This follows directly from the principles of multi-dimensionality and system-level value.

The principle of *stakeholder plurality* further suggests that digital policies should incorporate the perspectives of businesses, technology providers, users, civil society, and affected communities. Dual evaluation requires policymakers to assess not only economic efficiency and technological performance but also inclusion, equity, sustainability, trust, and public value. The principle of iterative institutional learning is particularly relevant to regulation because digital technologies and markets evolve faster than many existing institutional arrangements. Digital policies therefore need mechanisms for experimentation, feedback, evaluation, and revision rather than being treated as fixed solutions. Taken together, these principles position policy design as an integral part of Digital Economy system design. DEDS therefore provides policymakers with a way to connect technology, markets, institutions, stakeholder interests, and public value within a single iterative design process.

Conclusion

The rapid expansion of Digital Economy research has significantly advanced understanding of how digital technologies transform organizations, markets, industries, and societies. Nevertheless, this paper argues that the field remains predominantly explanatory, with much research focusing on the determinants, processes, and consequences of digital transformation. While such knowledge remains essential, it provides comparatively limited guidance for designing and continuously improving the complex digital systems, institutions, ecosystems, and governance arrangements required to address emerging challenges and realize new opportunities.

To address this gap, the paper proposed the Digital Economy Design Science (DEDS) Framework as a conceptual extension of Design Science to the broader Digital Economy domain. Drawing on developments in Information Systems, Entrepreneurship, and related socio-technical, ecosystem, and public-sector design perspectives, DEDS shifts attention from individual artifacts or ventures toward socio-technical-economic systems in which technology, organization, institution, ecosystem, and society are interconnected design objects.

The framework integrates three mutually connected dimensions: design objects, design process, and design knowledge. The design process consists of five iterative stages: challenge and opportunity identification, socio-technical-economic design, multi-stakeholder evaluation, learning and adaptation, and transformation. Rather than representing a linear sequence, these stages form a continuous cycle in which evaluation and learning inform redesign, transformation generates new challenges and opportunities, and accumulated design knowledge informs subsequent interventions.

The paper further proposed five DEDS Design Principles: multi-dimensionality, stakeholder plurality, dual evaluation, iterative institutional learning, and system-level value. Together, these principles make DEDS not merely a descriptive framework but a prescriptive orientation for Digital Economy design. They guide researchers and practitioners in determining what should be considered in design, whose perspectives should be incorporated, how outcomes should be evaluated, how learning should inform adaptation, and how value should be considered at the level of the wider system.

The contribution of DEDS is therefore not to replace existing Design Science approaches but to connect and extend them for Digital Economy contexts in which design problems cross technological, organizational, institutional, ecosystem, and societal boundaries. It also broadens the potential outputs of design research beyond individual artifacts to include design principles, models, governance frameworks, policy designs, and ecosystem architectures. Importantly, governance and policy are treated not simply as external constraints on digital

innovation but as potential components of the digital system that can themselves be designed, evaluated, and adapted.

For practice, DEDS provides a conceptual basis for integrating technological innovation with organizational change, stakeholder participation, institutional learning, governance, and public value. For policymakers, it highlights the importance of designing regulatory and institutional arrangements together with digital infrastructures and markets. For researchers, it opens a pathway for complementing explanatory Digital Economy research with systematic inquiry into how better digital futures can be designed and evaluated.

This paper is conceptual and therefore has important limitations. The DEDS Framework has not yet been empirically validated across different Digital Economy contexts, and the proposed principles require further examination regarding their applicability, interactions, and boundary conditions. Future research should therefore test DEDS through multiple case studies, Action Design Research, living laboratories, policy experimentation, and comparative studies across industries, ecosystems, and countries. Such research can refine the framework and generate context-specific design principles and cumulative design knowledge.

Ultimately, Digital Economy research should not be limited to explaining how digital transformation occurs. It should also contribute to designing and improving the digital futures that societies, organizations, and institutions seek to create. By bridging explanation and design, the Digital Economy Design Science (DEDS) Framework provides a conceptual foundation for a more integrative, iterative, and action-oriented Digital Economy scholarship.

References

Benbasat, I., & Zmud, R. W. (2003). The identity crisis within the IS discipline: Defining and communicating the discipline's core properties. MIS Quarterly, 27(2), 183–194.

Brynjolfsson, E., & McAfee, A. (2017). Machine, platform, crowd: Harnessing our digital future. W. W. Norton.

Dimov, D. (2020). Toward a design science of entrepreneurship. In A. Fayolle (Ed.), A research agenda for entrepreneurship and context (pp. 123–138). Edward Elgar Publishing.

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. International Journal of Information Management, 57, 101994.

George, G., Merrill, R. K., & Schillebeeckx, S. J. D. (2021). Digital sustainability and entrepreneurship: How digital innovations are helping tackle climate change and sustainable development. Entrepreneurship Theory and Practice, 45(5), 999–1027.

Goldfarb, A., & Tucker, C. (2019). Digital economics. Journal of Economic Literature, 57(1), 3–43.

Gomber, P., Koch, J.-A., & Siering, M. (2018). Digital finance and FinTech: Current research and future research directions. Journal of Business Economics, 88(5), 537–580.

Gregor, S., & Hevner, A. R. (2013). Positioning and presenting design science research for maximum impact. MIS Quarterly, 37(2), 337–355.

Heeks, R. (2006). Implementing and managing eGovernment. Sage.

Heeks, R. (2022). Digital development: Understanding digital transformation in low- and middle-income countries. Routledge.

Heeks, R., Ospina, A. V., Foster, C., Gao, P., Han, X., Jepson, N., Schindler, S., & Zhou, Q. (2024). China's digital expansion in the Global South: Systematic literature review and future research agenda. The Information Society, 40(2), 69–95. https://doi.org/10.1080/01972243.2024.2315875

Hevner, A. R. (2007). A three cycle view of design science research. Scandinavian Journal of Information Systems, 19(2), 87–92.

Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design science in information systems research. MIS Quarterly, 28(1), 75–105.

Iivari, J. (2007). A paradigmatic analysis of information systems as a design science. Scandinavian Journal of Information Systems, 19(2), 39–64.

Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. Strategic Management Journal, 39(8), 2255–2276.

Janssen, M., van der Voort, H., & Wahyudi, A. (2017). Factors influencing big data decision-making quality. Journal of Business Research, 70, 338–345.

Laudon, K. C., & Traver, C. G. (2024). E-commerce 2024: Business, technology, society (19th ed.). Pearson.

Lee, I., & Shin, Y. J. (2018). Fintech: Ecosystem, business models, investment decisions, and challenges. Business Horizons, 61(1), 35–46.