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From collective knowledge to rapid, sustainable digital design: Extending DEKA-CoPs with absorptive capacity and design thinking in food biodiversity networks

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ABSTRACT

Sustainable digital solutions for biodiversity and food system transformation stall because heterogeneous stakeholder knowledge is hard to integrate and translate into implementable artefacts. This conceptual article explains how stakeholder collaboration can accelerate sustainable digital solution design by integrating absorptive capacity and design thinking within a DEKA-CoPs (Digitally Enhanced Knowledge Architecture for Communities of Practice) extension. We conceptualise high-quality stakeholder co-creation configurations as expanding epistemic diversity and enabling collective knowledge mobilisation. Mobilised knowledge strengthens absorptive capacity by improving the collective ability to recognise, assimilate and apply biodiversity, heritage and market knowledge to design decisions. Absorptive capacity then enables a design thinking cycle that stabilises problem framing and compresses learning through prototyping and testing, yielding quality-adjusted acceleration. We further theorise boundary conditions: programme configurations in Slow Food biodiversity work (Ark of Taste, Presidia, Earth Markets, Cooks' Alliance, Food Gardens in Africa, Slow Food Travel) moderate the conversion of mobilised knowledge into absorptive capacity, while ecosystem coordination moderates the impact of design thinking enactment on acceleration. The framework contributes to knowledge management and innovation research by specifying a capability-process-governance explanation of solution acceleration and by offering guidance for policymakers and practitioners seeking to scale legitimate digital solutions that protect biodiversity without erasing local authenticity.

Introduction

Sustainability transitions increasingly depend on digital solutions that can be designed, tested, and adopted across networks of organisations and communities. Yet, despite the proliferation of platforms, dashboards, traceability tools, and participatory apps, progress is often constrained by a translation problem that is as practical as it is theoretical. Sustainability relevant knowledge is dispersed across actors, deeply contextual, and frequently tacit, while digital solution design requires explicit choices, prioritised requirements, and testable artefacts. In multi-stakeholder settings, collaboration can broaden the solution space and strengthen legitimacy, but it can also slow development by amplifying ambiguity, multiplying viewpoints, and raising coordination costs.

In many sustainability settings, digital tools stall not because technology is unavailable, but because diverse stakeholder knowledge is difficult to integrate into shared requirements and testable artefacts. Existing research explains knowledge mobilisation and digital innovation yet offers only partial guidance on how collective knowledge architectures translate into faster design cycles under plural legitimacy and representation constraints. We address this gap by extending DEKA-CoPs with absorptive capacity and design thinking to explain when stakeholder collaboration produces quality-adjusted design acceleration rather than drift.

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Our paper aims to explain when and how stakeholder collaboration and co-creation accelerate sustainable digital solution design through absorptive capacity and design thinking, rather than merely enriching participation. Our paper contributes to the innovation and knowledge management literatures by extending the DEKA-CoPs (Digitally enhanced Knowledge Architecture for Communities of Practice) perspective introduced by Cacciolatti et al. (2025b) from a digitally enhanced collective knowledge architecture to a design acceleration mechanism. We specify a capability chain that links collective knowledge mobilisation to faster, quality-adjusted design cycles through absorptive capacity and design thinking. We further contribute by theorising ecosystem coordination as a moderating condition: the presence of a leading organisation that convenes, aligns, and arbitrates among stakeholders is often the difference between productive co-creation and protracted drift.

Prior DEKA-CoPs theory (Cacciolatti et al., 2025b) positions digitally enhanced communities of practice as a collective knowledge architecture that supports knowledge transformation and reuse. What it does not yet explain is when such an architecture translates into faster design outcomes under legitimacy and representational integrity constraints. We address this by theorising a staged knowledge-to-artefact translation pathway: DEKA-CoPs collective knowledge mobilisation stabilises traceable boundary objects and reduces repetitive discovery, absorptive capacity converts heterogeneous inputs into prioritised design decisions, and design thinking enactment converts those decisions into prototypes, tests, and implementable specifications. The contribution is not capability stacking, but rather a falsifiable translation logic for accelerating design under plural legitimacy and representational integrity constraints, conditioned by programme configuration and ecosystem coordination.

Several research streams offer strong foundations, but they remain only partially integrated around the acceleration question, because the literature in digital transformation is extensive, yet diverse and fragmented (Hafeez et al., 2025; Hanelt et al., 2021; Quttainah & Ayadi, 2024), and the innovation research still lacks an explanation of innovation speed through consolidated mechanisms (Ellwood, Grimshaw & Pandza, 2017).

Knowledge management scholarship has established that knowledge is created and mobilised through social practice, shared repertoires, and situated problem solving, not only through formal repositories (Brown & Duguid, 1991; Nonaka, 1994). In the meantime, information systems research has shown how digital technologies reshape innovation by enabling recombination (Perotti et al., 2025), layered architectures, and new organising logics that distribute innovation work across actors and artefacts (Yoo et al., 2010). The knowledge management systems literature clarifies how digital infrastructures can support knowledge capture, retrieval, and transfer, while also warning that systems do not automatically yield usable knowledge in decision contexts (Alavi & Leidner, 2001). Taken together, these perspectives illuminate why knowledge infrastructures matter. What they explain less clearly is how collaborative knowledge is converted into a sequence of concrete design moves that shortens cycle time without compromising sustainability integrity, cultural fit, or stakeholder legitimacy.

In such a scenario, absorptive capacity theory is particularly relevant for closing this gap because it addresses not only access but also conversion. It explains how organisations recognise the value of new information, assimilate it, and apply it to innovation and performance (Cohen & Levinthal, 1990). Later work distinguishes the acquisition of knowledge from the capability to transform and exploit it (Zahra & George, 2002). Furthermore, dynamic capabilities research complements this by emphasising the ability to sense opportunities, seize them through commitment and design choices, and transform organisational configurations to deliver outcomes under changing conditions (Teece, 2007). Yet, these literatures typically assume a focal organisation. In sustainability-oriented ecosystems, knowledge is distributed across producers, intermediaries, users, and civic actors, and the central challenge is often translating plural knowledge claims into coherent design artefacts that can be prototyped and tested. This rationale underpins our systemic approach to innovation and knowledge management in this research paper.

However, a further limitation of our current understanding of sustainable digital transformation concerns governance and coordination in digital innovation. Digital innovation frequently exhibits distributed agency and circular causality: multiple actors shape both the problem and the solution as digital artefacts evolve and are recombined across contexts (Nambisan et al., 2017). For instance, in biodiversity traceability initiatives (e.g., OpenSc[1]), producers, market organisers, chefs, and consumers often reshape both what a system must represent (provenance, authenticity, seasonal variability) and how it functions (data fields, verification routines, interface prompts), so the 'problem' and the 'solution' co-evolve as the artefact travels across contexts (Nambisan et al., 2017). A short Earth Markets illustration later in the paper shows how a programme-embedded design coalition can stabilise a provenance template and test protocol quickly when coordination enables closure on evidence thresholds and legitimacy criteria. As shown in ecosystem research, value creation depends on interdependence, complementarity, and coordination without full hierarchy (Jacobides et al., 2018). In practice, effective co-creation requires orchestration mechanisms that sustain knowledge mobility, manage interdependence, and prevent fragmentation (Dhanaraj & Parkhe, 2006). This is where coordination becomes decisive. A lead organisation that acts as a glue can reduce interpretive drift, clarify decision rights, and bring closure to contested trade-offs, especially when stakeholders hold divergent incentives or when sustainability is defined differently across communities.

Therefore, we ground our work in knowledge management theory and extend Cacciolatti et al.'s (2025b) DEKA-CoP model for digital transformation and generate some propositions to enhance sustainable agrifood systems. In that sense, we chose food biodiversity networks in specific because they provide a revealing setting for theorising these mechanisms as they combine urgent sustainability challenges with strong cultural and place-based constraints. We ground our DEKA-CoP model extension in Slow Food biodiversity programmes, not treated only as illustrative cases but as instances of distinct governance and value-creation configurations. Each configuration involves a distinctive mix of stakeholders and knowledge types (tacit biodiversity heritage knowledge, production know-how, market feedback, local narratives of authenticity) and relies on different mechanisms for diffusion. For instance, some configurations privilege discovery and nomination dynamics, others emphasise stewardship and standards-in-practice, while others intensify market learning loops or build demand-side legitimacy through culinary translation. These differences matter for design acceleration because they shape what knowledge is available, how it is validated, how quickly it can be codified into requirements, and how adoption legitimacy is established.

Building on this setting, we contribute to the field by positing that stakeholder co-creation accelerates sustainable digital design when tacit knowledge is channelled through a digitally enhanced collective knowledge infrastructure (DEKA-CoPs), converted through absorptive capacity into actionable requirements and design decisions. These are enacted through disciplined design thinking cycles that make assumptions explicit and test them in context. We use design thinking as a translation process, treating empathise, define, ideate, prototype, and test as a structured translation logic that can shorten learning loops when knowledge is plural, and constraints are socio-cultural as well as technical.

Thus, in this paper, we address the following main research questions: in what ways can stakeholder co-creation, mediated by DEKA-CoPs, absorptive capacity, and design thinking cycles, accelerate the

[1] www.opensc.org

design of sustainable digital solutions in food biodiversity networks? Under what coordination conditions is this acceleration most likely?

Accordingly, our objectives are to explain the staged translation pathway and to specify when coordination and programme configuration strengthen or weaken its ability to accelerate design. Consistent with recent work that distinguishes design thinking as a concept from its enactment, we focus on execution quality and cadence as determinants of quality-adjusted speed (Carlgren et al., 2016). We also argue that coordination strengthens this pathway by integrating knowledge claims, arbitrating trade-offs, and aligning experimentation with governance expectations in biodiversity networks.

Novelty and theoretical grounds. DEKA-CoPs explains how digitally enhanced communities of practice mobilise and reuse knowledge artefacts across boundaries, but it does not yet explain when that architecture produces faster design outcomes under legitimacy and representational integrity constraints. We extend DEKA-CoPs by specifying a staged translation pathway, where mobilisation supports coalition-level absorptive capacity and design thinking enactment, and where programme configuration and ecosystem coordination determine whether iteration yields quality-adjusted acceleration or churn.

We further specify boundary conditions. First, programme configuration shapes how easily mobilised knowledge becomes absorptive capacity because codifiability, feedback cadence, and representational integrity risks differ across governance and value-creation configurations. Second, ecosystem coordination shapes whether design thinking enactment yields quality-adjusted acceleration, as it reduces decision latency and enables closure on what is good enough to prototype, test, and scale. Our outcome is quality-adjusted design acceleration, defined as shorter iteration cycles subject to legitimacy and representational integrity constraints. In Appendix 2, we report the key terms used in this paper.

This paper is structured as follows: Section 2 presents the theoretical foundations of the study, beginning with an explanation of the Slow Food movement context and its biodiversity programmes as governance and value-creation configurations, and then developing the theoretical pillars of stakeholder co-creation, and the extension of the DEKA-CoPs model through collective knowledge mobilisation and design thinking cycles. Section 3 presents the conceptual model and derives some propositions. Section 4 discusses the study's implications for knowledge management and sustainable digital innovation and outlines practical implications for policymakers and practitioners. Section 5 presents the conclusions, acknowledging limitations, and identifying avenues for future research.

Theoretical foundations

Study context and rationale: slow food and biodiversity programme configurations

Slow Food provides an analytically useful setting for theorising accelerated design of sustainable digital solutions because it operates as a trans local movement where biodiversity safeguarding is pursued through multiple programmes that combine cultural heritage, agroecological practice, and market making (Cacciolatti et al., 2024). Prior research has examined Slow Food as a distinctive socio-economic movement, showing how its value propositions are tightly bound to identity, place, and practice rather than solely to standardised product attributes (Pietrykowski, 2004).

Slow Food operationalises its biodiversity agenda through multiple programmes that differ systematically in stakeholder composition, dominant knowledge types, and diffusion mechanisms, and therefore in how quickly a community can move from recognising a local sustainability challenge to stabilising and scaling a workable digital solution. However, the Slow Food Movement's internal tensions around meaning, authority, and direction have also been analysed as hegemonic and organisational struggles, highlighting that governance is not incidental but constitutive of how collective initiatives coordinate and evolve (van Bommel & Spicer, 2011).

Slow Food's biodiversity mission is explicitly concerned with safeguarding not only biological variety (species, breeds, seeds and landraces) but also the practices and cultural meaning through which biodiversity is maintained and made valuable in everyday life. This combination of biophysical diversity and heritage-in-practice is important because it makes knowledge heterogeneity an intrinsic feature of the domain rather than an analytical add-on.

Modularity is key to such programmes. We list the programmes below and report the details in Table 1 with the purpose of defining boundary conditions for the conceptual model in this paper, especially around design cycle speed and the risk of losing local legitimacy when digital artefacts travel. The current Slow Food biodiversity protection programmes are the (i) Ark of Taste, (ii) Presidia, the (iii) Earth Markets, the (iv) Cook's Alliance, the (v) Food Gardens in Africa, and (vi) Slow Food Travel.

Within the Slow Food Movement, biodiversity programmes can be treated as 'cases' in a specific theoretical sense: they are governance and value creation configurations that mobilise different stakeholders, privilege different knowledge forms, and rely on different diffusion mechanisms (Cacciolatti & Lee, 2022). This configurational diversity matters for sustainable digital solution design because the speed and quality of design cycles are shaped by what knowledge is available, how it is validated, and how legitimacy is established in situ (Brown & Duguid, 1991; Nonaka, 1994). Put differently, the same digital concept can move quickly in a configuration where feedback loops are frequent and decision rights are clear, yet they could stall where knowledge is deeply tacit, values are contested, or coordination is weak (Dhanaraj & Parkhe, 2006; Provan & Kenis, 2008).

A central implication of such configuration duality is that biodiversity programmes foreground knowledge types that are often difficult to digitise without a loss, i.e., tacit heritage knowledge, production know-how, sensory evaluation, narrative legitimacy, and place-based constraints. Knowledge management research cautions that systems can support both knowledge capture and transfer, but they do not guarantee that knowledge becomes usable for decisions, particularly when categories, incentives, and representation choices filter what counts as valid knowledge (Alavi & Leidner, 2001). This is precisely why biodiversity initiatives are theoretically revealing, as they force direct confrontation with the boundary between knowledge mobilisation and design action. The outcome of configuration duality seems to be affected by co-creation and coordination in the innovation and entrepreneurial ecosystems.

Across configurations, the conversion of mobilised knowledge into absorptive capacity depends on codifiability, feedback cadence, and representational integrity risk, but in food systems, it is also conditioned by the *food security* vs. *food safety* distinction. Food security concerns can reshape how actors interpret and prioritise safety risks, so 'what counts' as a legitimate design outcome is not stable across contexts (Malik, 2025). Ark of Taste tends to have high narrative codifiability but slower feedback cadence and high representational integrity risk when stories travel. Earth Markets are less codifiable but operate with very fast feedback loops and typically lower narrative distortion risk, although they depend more on coordination to reach closure. Presidia sit in the middle, because standards-in-practice are partially codifiable, yet legitimacy sensitivity is high and cadence often seasonal. Slow Food Travel intensifies narrative diffusion, raising distortion risk and increasing the need for coordination and validation routines.

Ecosystem stakeholder co-creation and coordination

Stakeholder co-creation scholarship provides a foundation for understanding why distributed actors can improve innovation outcomes, especially where value emerges through interaction rather than unilateral production (Payne et al., 2008; Vargo & Lusch, 2008). However, the co-creation lens becomes more demanding when the focal outcome is

Table 1
Slow food biodiversity programmes. Sources: www.slowfood.com/biodiversity-programs and www.fondazioneslowfood.com.

Programme	Features and characteristics	Governance and value creation logic	Dominant knowledge type
Ark of Taste	Global catalogue and call to action focused on endangered foods, with an emphasis on documenting products and associated cultural heritage.	Nomination-driven identification and curation, creating a shared reference infrastructure that increases visibility and motivates safeguarding through cultivation, production, and consumption.	• Heritage narratives, • Provenance descriptors • Local practice accounts • Risk signals about disappearance
Presidia	Producer-centred initiatives oriented to safeguarding biodiversity through agroecological principles and continuity of traditional production techniques.	Stewardship and standards in practice, anchored in communities of producers and place-based legitimacy, often requiring coordination around shared commitments and routines.	• Tacit craft and production know-how • Agroecological practice knowledge • Locally grounded quality and legitimacy criteria
Earth Markets	Regular markets structured as short supply chain venues that enable dialogue, learning, and trust-building between producers and consumers.	Market design as governance, setting principles and participation rules that create fair access for small-scale producers and rapid feedback loops for learning.	• Market feedback, trust and quality signals • Interactional knowledge from producer-consumer dialogue • Practical frictions in exchange
Cooks' Alliance	Network of cooks and producers mobilised to advocate good, clean, and fair food, and to support biodiversity through culinary practice and influence.	Boundary spanning through chefs who create demand pull and legitimacy, linking producers to consumers by translating biodiversity products into credible, desirable offerings.	• Culinary translation knowledge • Provenance communication • Legitimacy narratives • Demand signals shaped through menus and cooking practices
Food Gardens in Africa	Continent-wide network of community and school gardens focused on biodiversity, traditional knowledge, and small-scale agriculture, with a strong educational emphasis.	Capability building and diffusion through local leadership and learning infrastructures, enabling communities to preserve biodiversity while strengthening livelihoods and food security.	• Pedagogical and capability-building knowledge • Local cultivation know-how • Traditional knowledge and community organising routines
Slow Food Travel	Tourism model built around meetings and exchanges with producers, positioning farmers and food makers as storytellers of place and practice.	Territorial coordination of itineraries and services that connect food, culture, and biodiversity, aiming to educate visitors and create value through experiential authenticity.	• Experiential and narrative knowledge • Place identity and provenance stories • Visitor feedback and cross-context diffusion through storytelling

not general innovation performance (Hurtado-Palomino, De la Gala-Velásquez & Corisapra-Quintana, 2022), but the acceleration of an iterative design process. Co-creation increases the range of inputs, interpretations, and constraints, yet it can also introduce integration burdens that slow convergence on requirements and prototypes unless there is a mechanism for alignment and closure (Laursen & Salter, 2006; Provan & Kenis, 2008). The 'design' of a sustainable digital solution is not confined to a development team: users, producers, intermediaries, and institutional stakeholders shape both the problem framing and the solution architecture over time. In biodiversity networks, this distributed agency is particularly pronounced because legitimacy is co-authored by custodians of heritage, producers, and those who translate and validate provenance in markets and narratives.

Ecosystem scholarship strengthens this view by conceptualising innovation as interdependent, with complementarities and bottlenecks distributed across participants. In this framing, an ecosystem is not simply a network of relationships but a structured configuration where roles, interfaces, and alignment mechanisms determine whether innovations can be assembled and delivered (Adner, 2017; Jacobides et al., 2018). The acceleration question, therefore, becomes governance-sensitive as increasing stakeholder participation can enrich problem understanding and broaden solution options, but it can also raise coordination costs and slow decision-making.

This tension motivates our paper's explicit emphasis on coordination as a moderator. Network governance research distinguishes governance modes that range from participant-governed arrangements to lead-organisation and network administrative organisation structures, and shows that these modes shape decision rights, accountability, and conflict resolution capacity (Provan & Kenis, 2008). Innovation network orchestration adds a complementary lens as it focuses on how a coordinating actor mobilises resources, brokers knowledge, and stabilises collaboration without fully internalising control (Dhanaraj & Parkhe, 2006). In Slow Food biodiversity programmes, such coordination is often exercised through a leading organisation or an operational backbone that maintains principles, interfaces, and learning loops across actors and sites.

Open innovation research further suggests that breadth and depth of external search can improve innovative performance but also generate integration burdens as the number and heterogeneity of inputs expand (Laursen & Salter, 2006). In other words, more co-creation is not automatically faster. Acceleration requires governance arrangements that reduce integration frictions while preserving the epistemic diversity that makes co-creation valuable in the first place. Thus, we identified design thinking as an essential tool for knowledge-informed sustainable solutions to stakeholder problems. For instance, co-creation configuration quality determines the fidelity of 'empathise' (i.e., access to lived experience and situated constraints) and the precision of 'define' (i.e., shared, stable, user-centric problem framing). When there is a lack of coordination and decision rights are unclear, 'empathise' becomes selective listening and 'define' becomes a moving target. However, if coordination provides credible conflict resolution and clear prioritisation, ideation can remain pluralistic while prototypes converge quickly on shared criteria for legitimacy, usability, and sustainability. However, such criteria must be shared as absorbed knowledge in the Community of Practice (CoP). Thus, the role of CoPs is essential in stimulating the ecosystem to absorb knowledge in digitally enhanced knowledge architectures (DEKA), as already proposed by Cacciolatti et al. (2025b) in a recent study.

Knowledge utilisation: sustainable digital transformation in DEKA-CoPs

Another theoretical pillar of this study draws again on knowledge management, specifically the proposition that sustainable digital innovation depends on the mobilisation, conversion, and circulation of heterogeneous knowledge across communities. CoPs research establishes that learning and knowing are situated and socially produced;

knowledge is embedded in practice, identity, and shared repertoires, rather than residing only in formal repositories (Brown & Duguid, 1991).

Likewise, organisational knowledge creation theory provides language for how tacit and explicit knowledge interact through iterative conversion processes, and how these dynamics underpin innovation (Nonaka, 1994). This matters in food biodiversity contexts because crucial knowledge often remains tacit, embodied, and a narrative, and thus at risk of exclusion when digitalisation privileges what is easily codified or explicit. This is clear from classic knowledge management systems work, which clarifies why systems are never neutral: platforms, taxonomies, and incentives shape what is captured, whose knowledge is visible, and how it is reused (Alavi & Leidner, 2001).

For sustainability-oriented digital transformation, this means that technical design is inseparable from epistemic design choices about knowledge representation, validation, and access. In Slow Food configurations, those choices are tightly coupled to authenticity and legitimacy. A digital traceability artefact, for example, is not just a data structure but also a claim about provenance, stewardship, and narrative authority.

Knowledge transcends information and digital innovation research sharpens the argument as it emphasises recombination, generativity, and the ongoing evolution of digital artefacts. Digital solutions, too, are rarely finished products; they are reconfigured, repurposed, and integrated into new contexts, often by actors who were not part of the original design (Yoo et al., 2010). This strengthens the idea that innovation agency is therefore distributed and circular: multiple actors shape both the problem and the solution as artefacts evolve and are recombined across contexts (Nambisan et al., 2017). This is precisely why governance and coordination become central: without alignment mechanisms, digital artefacts may proliferate in ways that dilute sustainability intent or undermine local legitimacy.

Within this landscape, DEKA-CoPs are positioned as an extension that treats digitally enhanced communities not merely as communication venues but as collective knowledge architectures. The core move is to conceptualise digital tools, including AI-enabled mechanisms, as infrastructures that can accelerate knowledge flows across boundaries, provided governance and coordination address inclusion, legitimacy, and the risks of epistemic asymmetry. Thus, DEKA-CoPs should be theorised as mechanisms that stabilise and circulate knowledge artefacts without flattening place-based meaning.

If we adopt a design thinking analogy, they stabilise outputs from ‘empathise’ and ‘define’ into reusable knowledge artefacts such as stakeholder insight repositories, narrative libraries, provenance templates, and shared boundary objects. This reduces repetitive discovery work and feeds ‘ideate’ with higher-quality inputs. The acceleration implication is specific: communities can begin ideation from a traceable knowledge base rather than repeatedly reconstructing context, while still leaving space for local adaptation during prototyping and testing.

Absorptive capacity and design thinking as a sustainability solution acceleration mechanism

If co-creation brings heterogeneous knowledge into the system, the acceleration question becomes a conversion problem: how quickly and faithfully can that knowledge be recognised, integrated, prioritised, and translated into implementable digital artefacts? Absorptive capacity provides a well-established basis for this step by explaining how actors recognise the value of external knowledge, assimilate it, and apply it (Cohen & Levinthal, 1990).

Subsequent reconceptualisation distinguishes potential and realised absorptive capacity and positions it as a dynamic capability that supports knowledge creation and utilisation (Zahra & George, 2002). In stakeholder-rich biodiversity settings, the limiting factor is rarely access to information. It is the collective capability to integrate knowledge across epistemic communities with different languages, incentives, and validity criteria. This is where absorptive capacity becomes analytically useful for distinguishing productive co-creation from discursive overload.

Dynamic capabilities research complements this by clarifying why speed is not simply a matter of effort, but of micro foundations that support sensing, seizing, and transforming under uncertainty (Teece, 2007). In biodiversity networks, uncertainty is structural and ecological variation, seasonality, contested authenticity claims, and shifting market as well as regulatory conditions mean that solutions must be iterated without collapsing into drift. Absorptive capacity helps explain how collectives avoid drowning in inputs, while dynamic capabilities help explain how they reconfigure routines, roles, and interfaces to sustain momentum across iterations.

A design thinking approach provides the process counterpart to these capability logics. It offers an iterative cycle that disciplines co-creation by structuring how insights become options, and options become testable artefacts. In innovation management research, design thinking has been conceptualised as a structured learning approach that can compress cycles through prototyping, experimentation, and feedback, while also improving problem framing (Carlgren et al., 2016; Micheli et al., 2019).

For this paper, we do not treat design thinking as a generic design method. It is the innovation mechanism that makes ‘knowledge-to-artefact’ conversion visible and possible to theorise in a setting where knowledge is heterogeneous, politically charged, and deeply place-based. Thus, the combination of absorptive capacity and design thinking together clarifies why acceleration is feasible but not automatic. Absorptive capacity explains the capability side, as without routines for recognising, assimilating, and applying heterogeneous knowledge, co-creation produces noise. It prevents co-creation from becoming noise during ‘define’ and ‘ideate’ by supporting recognition, integration, and prioritisation of inputs.

Design thinking explains the process side, as without an iterative cycle that progressively stabilises problem framings and tests prototypes, collaboration can remain discursive and slow. It operationalises conversion during ‘ideate’, ‘prototype’, and ‘test’, producing implementable artefacts and measurable cycle acceleration through shorter feedback loops.

The coordination moderator then becomes the governance condition that shapes whether these mechanisms can operate at speed across an ecosystem rather than within a single organisation (Dhanaraj & Parkhe, 2006; Provan & Kenis, 2008). Coordination shapes whether iteration governance is credible, which means who, in the CoP, decides what insights are ‘good enough’ to prototype, what constitutes a valid test in culturally embedded contexts, and how learning is captured back into the DEKA-CoPs infrastructure for cross-context reuse. In what follows, we build on these theoretical foundations and introduce our conceptual model.

From collective knowledge to sustainable solutions design acceleration: A conceptual model and propositions

The model is ecosystem-level in scope, but its mechanisms operate through a focal actor we call the programme-embedded design coalition: a temporary but routinised collective of producers, coordinators, technical partners, and legitimacy holders responsible for converting shared knowledge into implementable digital artefacts. Stakeholder co-creation configuration quality and ecosystem coordination are modelled at the ecosystem governance level. DEKA-CoPs collective knowledge mobilisation is modelled at the community or network infrastructure level. Absorptive capacity and design thinking enactment are modelled at the design coalition level, which constitutes a CoP, as distributed capabilities enacted through shared routines for recognising, assimilating, and applying knowledge and for running disciplined cycles of framing, prototyping, and testing.

Furthermore, to specify the chain mechanism boundaries for the

outcome, we claim that higher quality stakeholder co-creation configurations strengthen DEKA-CoPs collective knowledge mobilisation, which in turn strengthens design coalition absorptive capacity, as it enables design thinking enactment to deliver quality-adjusted design acceleration. Programme configuration and ecosystem coordination condition these links by shaping codifiability, feedback cadence, decision rights, and closure. The conceptual model we present in this paper (Fig. 1) can be described as a staged knowledge-to-artefact pathway in which stakeholder co-creation quality shapes the strength of collective knowledge mobilisation within DEKA-CoPs, which in turn strengthens absorptive capacity and enables disciplined design thinking enactment, culminating in higher quality-adjusted design acceleration. Although absorptive capacity and design thinking are often theorised at organisational or team levels, our unit of analysis for these mechanisms is the programme-embedded design coalition, which we conceptualise as a routinised cross-actor collective responsible for converting ecosystem knowledge into artefacts (Nambisan et al., 2017; Yoo et al., 2010).

The conceptual novelty of our model lies in treating Slow Food biodiversity programmes as governance and value-creation configurations that lead to different learning loops. These loops shape which parts of the design thinking cycle are accelerated, which knowledge types dominate, and what coordination is required to preserve authenticity and sustainability intent during diffusion (van Bommel & Spicer, 2011).

A design thinking approach to sustainable digital solution design acceleration

Design acceleration is often discussed as a matter of technical throughput, yet the innovation literature has long shown that speed is frequently created (or lost) in learning cycles rather than in coding or implementation per se. Classic work in product development highlights that time-to-market improves when teams reduce late-stage rework, shift learning earlier, and tighten feedback loops through disciplined experimentation (Eisenhardt & Tabrizi, 1995; Thomke, 1998; Thomke & Fujimoto, 2000). This logic is directly relevant to sustainable digital solutions because sustainability problems, especially those grounded in biodiversity and local food cultures, are rarely well specified at the outset. They evolve as stakeholders surface new constraints (ecological, cultural, economic) and as digital artefacts are iterated and recombined across contexts (Nambisan et al., 2017; Yoo et al., 2010).

We define 'quality-adjusted design acceleration' as a reduction in the cycle time required to move from a shared problem definition to a validated prototype and implementable specification, subject to legitimacy and representational integrity constraints. This outcome is distinct from downstream adoption or impact. Acceleration can therefore be falsified where cycle time decreases but legitimacy and representational integrity deteriorate, or where legitimacy is preserved but cycle time does not improve.

We introduce a conceptual measurement blueprint, in that the speed dimension can be captured through time-to-first-test, mean iteration cycle time, and iteration cadence across the empathise, define, ideate, prototype, and test cycle. The quality constraint can be captured through stakeholder legitimacy assessments, provenance and narrative fidelity checks, and compliance with programme principles. Robustness can be captured through rework rates driven by legitimacy disputes, completeness of traceability, and portability of artefacts across contexts without distortion. Table 2 shows the conceptual blueprint.

Why design thinking, then? Agile and lean experimentation offer valuable execution logics once requirements are sufficiently stable, but biodiversity-oriented digitalisation often involves wicked problems and plural legitimacy criteria where the main bottleneck is problem framing and representational integrity rather than delivery velocity. In our study, design thinking is therefore theorised as a translation logic that disciplines early-stage learning by stabilising shared problem definitions and making contested knowledge claims testable through prototypes and stakeholder validation. Design thinking enactment can become performative and slow rather than accelerating, where ambiguity is low or decision rights remain fragmented, such that no actor can authorise closure. Design thinking will not accelerate when (i) ambiguity is low, and requirements are stable (no need for iterative reframing), or (ii) decision rights are fragmented, and no actor can agree on prototype criteria, leading to perpetual iteration without convergence.

Within that space, design thinking offers an explicit five-stage micro-

Table 2
Conceptual blueprint for quality-adjusted design acceleration.

Dimension	Conceptual meaning	Illustrative indicators	Design thinking stage linkage
Speed	Time-based reduction in cycle duration	° Time-to-first-test ° mean cycle time °iteration cadence	° from Define to Prototype ° from Prototype to Test
Legitimacy constraint	Maintaining stakeholder acceptance and plural legitimacy	° Legitimacy ratings °dispute frequency °consent or authorisation checks	Empathise, Define, Test
Representational integrity	Fidelity of biodiversity and heritage representation	° Provenance accuracy °narrative fidelity ° misrepresentation incidents	Define, Prototype, Test
Robustness	Ability to travel across contexts without drift	° Rework rate ° traceability completeness °cross-context reuse success	Ideate, Prototype, Test

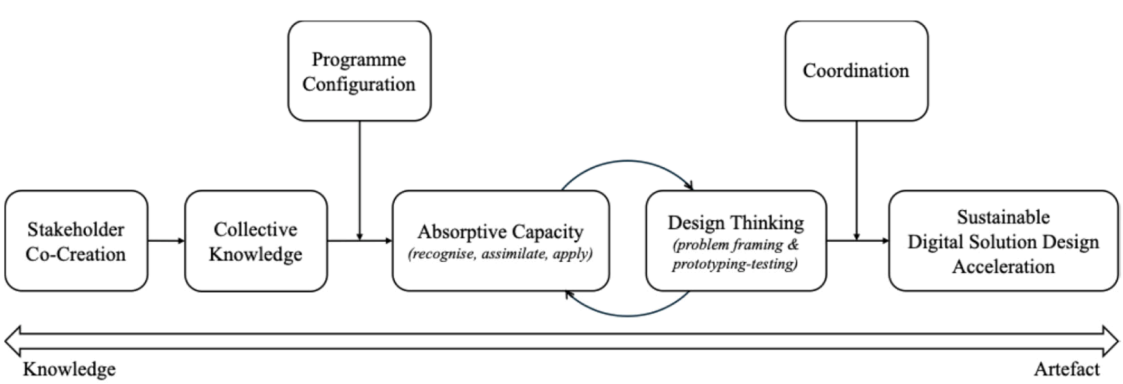

Fig. 1. Conceptual framework for absorptive capacity and design thinking as a joint sequential translation mechanism. It translates knowledge into artefacts for sustainable solutions in DEKA-CoPs (Digitally Enhanced Knowledge Architecture for Communities of Practice).

Table 3
Analytical table showing the conceptual model for absorptive capacity and design thinking as a joint sequential translation mechanism applied to the Slow Food biodiversity protection programmes.

Mechanisms	Constituting elements	Ark of Taste	Presidia	Earth Markets	Cooks' Alliance	Food Gardens in Africa	Slow Food Travel
Programme configuration	Dominant Loop	Sensing and discovery loops, nomination-driven aggregation, narrative infrastructure	Production stewardship and standard setting loops, standards-in-practice, place-based legitimacy	Rapid market learning loops, short supply chains, trust and dialogue	Demand shaping and legitimacy loops, culinary translation, reputation mechanisms	Capability building and diffusion loops, education infrastructure, local leadership	Storytelling and cross-context diffusion loops, experiential authenticity, narrative governance
Absorptive capacity	Recognise knowledge	Detect 'at risk' products and practices, identify weak signals (loss of varieties, declining producers, eroding know how), surface heritage meaning and provenance claims	Identify practice constraints, agroecological principles, tacit craft routines, and legitimacy criteria rooted in place and producer community	Recognise market frictions, trust breakdowns, consumer feedback, and producer constraints in near real time	Recognise which provenance signals and narratives shape trust and demand, identify what chefs view as credible and communicable	Recognise local constraints and learning needs, identify feasible practices and technology constraints (connectivity, devices, literacy)	Recognise authenticity expectations, representation risks, and the knowledge embedded in experience, hospitality, and place identity
	Assimilate knowledge	Converge on shared descriptors and classification logics, align terminology across territories, translate narratives into structured fields while retaining source traceability	Translate tacit craft and standards into comparable routines and boundary objects, align diverse producer interpretations, integrate technical expertise with local practice	Assimilate diverse feedback into a shared interpretation of value, trust, and acceptable claims; distinguish noise from recurrent patterns	Assimilate heritage and production knowledge into consumer-facing value propositions, align language, claims, and ethical boundaries	Assimilate knowledge through training routines and peer learning, align practices across sites while preserving local adaptation	Assimilate narratives across hosts and territories while preserving voice and context, align interpretive frames for visitors and local custodians
	Apply knowledge	Prioritise which products and knowledge claims move into digital representations (catalogue entries, provenance attributes), decide what is 'minimum viable' without distorting meaning	Embed standards into workflows and digital checks (compliance prompts, traceability checkpoints), choose trade-offs between standardisation and local variation	Apply learning to fast iterations in features such as ordering, provenance communication, verification touchpoints, and feedback capture	Apply insights to design content standards, labelling, storytelling templates, and legitimacy checks that influence adoption and willingness to pay	Apply knowledge via practical tools that embed routines (crop calendars, training modules, community reporting), build sustained use capability	Apply learning to design experience scripts, consent and representation protocols, and digital storytelling features that preserve integrity
Design thinking	Problem framing *(empathise, define)*	High emphasis on 'empathise' with custodians and local producers, and 'define' the boundaries of authenticity, provenance, and biodiversity risk	Strong 'define' work: what must be protected in practice, which claims are legitimate, what constraints are non-negotiable	'Empathise' and 'define' are grounded in repeated interactions, enabling sharper problem definitions tied to exchange moments	'Define' centres on legitimacy: what can be claimed, how provenance is communicated, what evidence is required	Heavy 'empathise' and 'define' with community, with problem framing anchored in capability and infrastructure realities	'Define' centres on representation: what authenticity means, who authorises narratives, what must remain contextual
	Prototyping and testing *(ideate, prototype, test)*	Prototype and test around representational fidelity: user comprehension of narratives, metadata adequacy, and traceability of claims rather than only adoption	Prototyping and testing focus on stewardship validity: does the tool support agreed routines and monitoring without burdening producers?	Strong prototype and test cadence: A B tests of messaging, trust cues, feedback loops, and lightweight verification routines	Prototype and test focus on communication effectiveness and legitimacy: comprehension tests, misinterpretation risks, reputational safeguards	Prototype and test often favour frugal and mobile-first solutions, testing focuses on learning outcomes, sustained use, and community ownership	Prototype and test focus on narrative integrity and experience coherence, testing involves both visitor feedback and custodian validation
Moderation effects	Programme configuration	Typically strengthens recognition and early assimilation because inputs are intentionally curated, but can weaken application if narratives remain too idiosyncratic or politically contested	Can weaken conversion to absorptive capacity when tacit know how is hard to codify and when legitimacy disputes are active; strengthens when standards and routines are stable	Typically strengthens conversion to absorptive capacity because feedback is frequent and actionable; risk is over-fitting to local market preferences	Strengthens absorptive capacity where translation conventions are stable; weakens where narratives are contested or where reputational risk is high	Strengthens absorptive capacity over time through routines and training, but may slow short-run conversion due to resource constraints	Often weakens conversion to absorptive capacity because knowledge is highly tacit and relational; strengthens when narrative protocols and consent routines are robust
	Ecosystem coordination	Moderate to high: acceleration depends on a coordinator to adjudicate inclusion, validate nominations, and manage versioning of narratives and descriptors	High: without coordination, prototypes stall in governance disputes; with coordination, application accelerates through agreed criteria and accountability	Moderate: coordination matters to prevent feature sprawl and maintain shared principles across markets	High: coordination is critical to prevent inconsistent claims and to manage reputational spillovers across actors	Very high: coordination is required for continuity, resourcing, and sustaining iterative cycles across seasons and sites	Very high: coordination is essential to avoid misrepresentation, ensure consent, and prevent drift as narratives travel

process for compressing learning without collapsing complexity, as design thinking is particularly apt to address unbounded (wicked) problems. The empathise and define stages create a structured mechanism for stabilising a problem framing under uncertainty, ideate encourages generative exploration without premature convergence, and prototype and test operationalise fast, evidence-driven iteration (Micheli et al., 2019). It should be noted that design thinking is not inherently 'fast'. It accelerates only when it disciplines the flow of stakeholder inputs into testable hypotheses and when prototyping and testing are used to adjudicate competing interpretations rather than to stage-manage consensus (Carlgren et al., 2016; Micheli et al., 2019). In sustainability contexts, this discipline is essential because actors often disagree not only on solutions but also on what counts as legitimate evidence, whose knowledge matters, and which trade-offs are acceptable, and this is common to the establishment of CoPs (Cacciolatti & Lee, 2025).

A critical implication follows for the present model. The 'front end' of design thinking is only as good as the configuration of stakeholder access, reciprocity, and decision rights that enables it. If participation is extractive or episodic, empathise becomes selective listening and define becomes politically contested and unstable. In biodiversity networks, where tacit heritage knowledge and place-based legitimacy matter, acceleration therefore depends on building a robust collective knowledge base that is both diverse and reusable across cycles, rather than repeatedly rediscovering the same insights in fragmented settings. Thus, our first proposition supports co-creation and the mobilisation of collective knowledge, and we maintain that,

Proposition 1. *Higher quality stakeholder co-creation configurations increase DEKA-CoPs collective knowledge mobilisation by expanding epistemic diversity and improving the conversion of tacit and contextual knowledge into reusable design inputs*.

Empirical illustration. Consider a programme-embedded design coalition convened around an Earth Market where producers, market organisers, a local consumer association, and a digital partner seek to reduce biodiversity loss by improving provenance trust for seasonal products. In the *empathise* stage, the coalition uses short, repeated interactions at the market to surface lived constraints: producers report that verification requests are burdensome, consumers report confusion about what counts as credible provenance, and organisers report reputational exposure when claims are contested. DEKA-CoPs collective knowledge mobilisation then helps *define* the root problem and stabilises these insights into reusable artefacts, including a shared 'provenance template' (minimum fields, custodianship metadata, and permitted claims), a narrative library (origin stories linked to named custodians), and a simple test protocol that specifies what evidence is acceptable for each claim. Absorptive capacity is enacted at coalition level through routines that recognise which inputs are decision-relevant (for example, recurring disputes about a single claim), assimilate heterogeneous knowledge into shared criteria (aligning producer feasibility with consumer trust cues), and apply it by prioritising trade-offs (for example, choosing two verification cues that can be implemented without excluding small producers). The coalition *ideates* and *prototypes* a lightweight digital feature set, such as a QR-linked product page that displays the template fields, a short narrative excerpt, and a traceable verification cue. In the *test* stage, coordination becomes decisive: the coordinating actor sets decision rights and closure rules, defines 'good enough' evidence thresholds for the pilot, and specifies what counts as a valid test (for example, reduction in disputes, improved comprehension, and no increase in producer workload). Learning from testing is captured back into DEKA-CoPs artefacts, enabling rapid iteration without eroding representational integrity or excluding key knowledge holders.

Design thinking also requires a critical reading. A recurrent concern in the literature is that 'design thinking' can become a managerial label that travels faster than its disciplined practice, producing workshops and artefacts without decision closure, or masking power asymmetries in whose needs and narratives become 'the problem' (Johansson-Sköldberg et al., 2013; Kimbell, 2011). In multi-stakeholder biodiversity settings this risk is amplified, because legitimacy claims are plural and some knowledge holders are structurally less able to contest representations once they are digitised and disseminated. Our framework treats these critiques as boundary conditions rather than objections: design thinking enactment accelerates only when coordination clarifies decision rights and test criteria, and when DEKA-CoPs artefacts preserve custodianship and traceability so that iteration is accountable rather than extractive.

The mediating mechanism of DEKA-CoPs collective knowledge mobilisation, absorptive capacity, and a design thinking approach for sustainable innovation

The DEKA-CoPs construct proposed by Cacciolatti et al. (2025b) extends well-established knowledge foundations by positioning digitally enhanced communities of practice as an architectural mechanism for collective learning and innovation, rather than as a generic collaboration space. Once problem framing and legitimacy criteria are stabilised, agile or lean methods can complement design thinking by accelerating downstream implementation and release. Communities of practice research emphasises that knowledge is situated in practice and identity, not merely stored in documents (Brown & Duguid, 1991). Organisational knowledge creation theory further clarifies that innovation depends on iterative movement between tacit and explicit knowledge, and that the conversion work itself is a central source of capability (Nonaka, 1994). This matters most when knowledge management systems scholarship demonstrates that information technologies shape what becomes visible, transferable, and reusable, thereby influencing which knowledge claims travel and whose knowledge becomes actionable (Alavi & Leidner, 2001). These foundations collectively motivate why a digitally enhanced knowledge architecture can matter for acceleration, as it reduces redundant discovery, stabilises shared representations, and makes learning traceable across iterations.

This architectural role becomes even more consequential in digital innovation. Digital artefacts are generative and continuously recombined, and innovation agency is distributed across multiple actors who shape both the problem and the solution over time (Nambisan et al., 2017; Yoo et al., 2010). For sustainability-oriented digital solutions, this recombination property is double-edged. It can accelerate diffusion of useful tools, but it can also accelerate drift, for instance, when representations of authenticity, provenance, or biodiversity are simplified and redeployed without adequate context. DEKA-CoPs collective knowledge mobilisation, therefore, needs to be understood as a specific capacity. It is the ability to capture heterogeneous knowledge (including tacit and narrative forms), translate it into reusable design inputs, and maintain sufficient traceability to preserve legitimacy when artefacts travel across settings (Carlile, 2002, 2004). In other words, DEKA-CoPs is positioned here as a mediating infrastructure that converts dispersed stakeholder knowledge into structured inputs that can feed design thinking cycles.

If DEKA-CoPs strengthens the quality and reusability of collective knowledge, it should also strengthen the capacity to recognise, assimilate, and apply that knowledge in design decisions. Absorptive capacity remains the canonical lens for this conversion problem. It was originally defined as the ability to recognise the value of external knowledge, assimilate it, and apply it for commercial ends (Cohen & Levinthal, 1990), and later reconceptualised to distinguish potential and realised absorptive capacity as part of broader dynamic capability systems (Zahra & George, 2002). In inter-organisational and ecosystem settings, absorptive capacity is especially sensitive to knowledge relatedness and interpretive alignment, which conditions whether knowledge flows become learning or noise (Lane & Lubatkin, 1998). This is precisely the challenge in biodiversity networks: knowledge is heterogeneous by

design, spanning ecological conditions, production craft, market signals, and cultural narratives. A DEKA-CoPs architecture that improves codification, boundary objects, and traceability should therefore enhance recognition (what matters), assimilation (how it fits), and application (what to do next) in the design process (Cohen & Levinthal, 1990; Carlile, 2002, 2004). Thus, our second proposition on the mobilisation of collective knowledge through absorptive capacity maintains that, conceptually, DEKA-CoPs collective knowledge mobilisation is 'infrastructure' work: it creates codified, traceable, and reusable knowledge artefacts and boundary objects that reduce repetitive discovery. On the other hand, absorptive capacity is 'decision' work: it refers to the design coalition's routines for recognising, assimilating, and applying heterogeneous inputs to prioritise trade-offs and commit to design choices under uncertainty. Therefore,

Proposition 2. *Greater DEKA-CoPs collective knowledge mobilisation strengthens absorptive capacity by improving the recognition, assimilation, and application of heterogeneous sustainability and biodiversity knowledge into design decisions*.

The acceleration claim, however, requires more than improved knowledge processing. It requires a credible pathway from collective knowledge to prototypes, tests, and implementable specifications. This is where absorptive capacity and design thinking jointly operate as a sequential translation mechanism. Absorptive capacity explains why heterogeneous inputs do not simply accumulate. It also explains how they become prioritised, integrated, and actionable (Cohen & Levinthal, 1990; Zahra & George, 2002). Design thinking then provides the process discipline that turns that actionability into iterative artefact production through prototyping and testing (Micheli et al., 2019), in a similar manner as traditional CoP generate artefacts through a reification process (Cacciolatti & Lee, 2022).

In innovation studies, experimentation and front-loading are repeatedly associated with faster development because they shift learning earlier and reduce late-stage correction (Thomke, 1998; Thomke & Fujimoto, 2000). In digital settings, where artefacts evolve through recombination, the ability to run rapid tests and to capture learning back into shared knowledge structures becomes a direct driver of cycle speed and solution robustness (Nambisan et al., 2017). The implication is a sequential mediation, where DEKA-CoPs elevates collective knowledge mobilisation, absorptive capacity converts that knowledge into disciplined design choices, and design thinking enacts those choices through iterative prototyping and testing, producing acceleration. Thus, our third proposition focuses on the sequential translation leading to design acceleration and we maintain that,

Proposition 3. *Absorptive capacity and design thinking enactment sequentially mediate the relationship between DEKA-CoPs collective knowledge mobilisation and quality-adjusted design acceleration, converting shared knowledge into prototypes, tests, and implementable specifications*.

The role of stakeholder co-creation in fostering collective knowledge

The model's antecedent of collective knowledge is stakeholder co-creation, but in this paper, we treat co-creation as a governance configuration rather than as a generic invitation to participate. This is particularly true in larger projects that require the creation of consortia, such as the Horizon projects of the European Commission, which focus on a multi-stakeholder and multi-actor approach.

We define stakeholder co-creation configuration quality as a governance arrangement characterised by four dimensions: (1) *inclusion depth*, meaning co-ownership of problem framing rather than consultation; (2) *continuity*, meaning repeated interaction across cycles that builds shared language; (3) *clarity of decision rights*, meaning explicit allocation of who decides what and when; and (4) *reciprocity and dispute resolution*, meaning credible rules for managing conflict and protecting vulnerable knowledge holders. These dimensions help us falsify Proposition 1 by separating participation volume from governance quality and by specifying the conditions under which co-creation produces reusable design inputs rather than noise.

Value co-creation research has established that value is jointly created through interactions among multiple actors who integrate resources and shape meanings, rather than being produced unilaterally by a focal organisation (Payne et al., 2008; Vargo & Lusch, 2008). Ecosystem scholarship makes the coordination stakes explicit as innovation outcomes depend on interdependencies, complementarities, and bottlenecks distributed across participants, and therefore on how roles and interfaces are structured (Adner, 2017; Jacobides et al., 2018). In biodiversity-related innovation, these interdependencies are intensified because outcomes must be legitimate not only in economic terms but also in cultural and ecological terms, which multiplies the number of stakeholders with credible claims to influence solution design.

A key critique in our design acceleration argument is that co-creation can easily slow innovation if governance is under-specified. Open innovation research shows that breadth and depth of external search can improve innovation performance (Perotti et al., 2025) but also create integration burdens and diminishing returns when variety exceeds a group's capacity to interpret and apply inputs (Laursen & Salter, 2006). In knowledge terms, co-creation increases the likelihood of semantic and pragmatic boundaries, where actors disagree on meaning and on what constitutes a workable trade-off (Carlile, 2004). In practice, this is visible when heritage custodians prioritise authenticity and cultural continuity, producers emphasise economic feasibility and seasonality, consumers focus on experience and trust, and institutional actors require standardisation and accountability. Without an explicit mechanism for translation and stabilisation, stakeholder engagement becomes a source of discursive expansion rather than accelerated convergence.

This is why the DEKA-CoPs mechanism is essential in our conceptual model and why Proposition 1 is not a trivial claim. Co-creation influences acceleration primarily through its effect on the quality, diversity, and reusability of collective knowledge. High-quality co-creation configurations create conditions for epistemic diversity to surface (breadth) while also sustaining repeated interaction that builds shared language (depth). They clarify reciprocity expectations so that tacit knowledge holders are not treated as extractive inputs, and they specify decision rights and conflict-resolution routines so that learning does not stall in governance disputes (Payne et al., 2008; Vargo & Lusch, 2008). Critically, these governance choices shape what gets codified, how it is represented, and whether it remains traceable to local contexts, which in turn conditions whether digital artefacts can travel without erasing local legitimacy (Alavi & Leidner, 2001; Carlile, 2002).

Accordingly, our paper's argument is not that 'more stakeholders' accelerates design. Rather, acceleration is more likely when stakeholder co-creation is configured to produce high-integrity collective knowledge that can be mobilised across iterative cycles and across programme contexts, which is precisely the mediating logic captured in Proposition 1 and operationalised through the DEKA-CoPs architecture.

The moderation effects of programme configuration and coordination in the ecosystem

Our model also introduces two moderation logics. The first concerns programme configuration as a boundary condition on the collective knowledge mobilisation to absorptive capacity relationship. Knowledge integration is not equally difficult across contexts, but it depends on the dominant knowledge types, the degree of codifiability, and the nature of knowledge boundaries among participants (Carlile, 2004; Lane & Lubatkin, 1998).

Programme configuration. Where configurations generate more structured, codified, and comparable inputs, recognition and assimilation are typically easier. However, where configurations rely heavily on tacit craft, embodied know-how, and contested authenticity claims, assimilation and application are more difficult and require richer

translation mechanisms (Cohen & Levinthal, 1990; Carlile, 2004). Applied to the Slow Food biodiversity portfolio, the implication is that programme configurations shape how effectively DEKA-CoPs mobilisation can be converted into absorptive capacity. For instance, Ark of Taste-type sensing and discovery loops can expand codified narratives and categories that support recognition, while Praesidium-type stewardship and standards-in-practice loops may deepen tacit craft knowledge but raise pragmatic boundaries that complicate assimilation and application. Earth Market feedback loops can shorten the distance between prototype and test by providing rapid market learning, whereas Slow Food Travel storytelling and diffusion loops may amplify representation risks that demand stricter traceability and governance.

Ecosystem Coordination. The second moderation mechanism is related to coordination as a boundary condition on whether design thinking enactment translates into design acceleration.

Coordination is not a background operational issue in distributed innovation but rather a central mechanism that determines whether interdependent actors can sustain pace, settle decisions, and mobilise resources in time (Okhuysen & Bechky, 2009). Research on fast-response organisations shows that coordination is often enacted through expertise-based, dialogic practices that enable rapid alignment under time pressure, rather than through hierarchy alone (Faraj & Xiao, 2006).

In innovation networks and ecosystems, the knowledge management literature similarly argues that a coordinating actor can broker knowledge, stabilise collaboration, and manage interfaces without fully internalising control (Dhanaraj & Parkhe, 2006). Network governance research formalises this point by distinguishing governance modes and showing that lead-organisation or network administrative structures can improve efficiency and accountability under certain conditions, especially when member heterogeneity is high (Provan & Kenis, 2008). Ecosystem strategy research aligns with this logic by emphasising that complementarities and bottlenecks must be actively managed if innovation is to move from idea to delivery (Adner, 2017; Jacobides et al., 2018).

Within our paper, coordination is therefore modelled as strengthening the link between design thinking enactment and sustainable digital solution design acceleration by reducing decision latency, aligning incentives, and maintaining iteration governance across stakeholders. Without a credible coordinating actor, design thinking cycles can become performative and slow, with empathise and ideate expanding indefinitely and prototype decisions repeatedly reopened. With coordination, cycles are more likely to remain disciplined so that tests are agreed upon, learning is captured back into DEKA-CoPs artefacts, and recombination across contexts is managed rather than left to drift. Thus, our final proposition maintains that a failure mode is therefore central to the theory. When coordination is weak, decision rights are contested or escalation pathways are absent, design thinking cycles can proliferate without closure, increasing iteration counts without improving cycle time or legitimacy. On the contrary, a credible coordinating actor can reduce decision latency by authorising boundary objects, stabilising interfaces, and defining what constitutes an acceptable test in culturally embedded contexts.

Proposition 4. *The positive relationship between DEKA-CoPs collective knowledge mobilisation and absorptive capacity is moderated by programme configuration, such that configurations with higher codifiability and faster feedback loops strengthen the relationship. Simultaneously, the positive relationship between design thinking enactment and sustainable digital solution design acceleration is moderated by coordination in the ecosystem, such that stronger coordinating capacity increases the likelihood that iterative cycles produce timely, implementable outcomes.*

In Appendix 1, we summarise the main studies underpinning the conceptual model.

Discussion and implications

This study contributes to explaining an acceleration puzzle that is increasingly visible in sustainability-oriented digital innovation: why some multi-stakeholder ecosystems move quickly from shared concern to credible digital solutions, while others stall in cycles of consultation, fragmented pilots, and contested legitimacy? We built on the theoretical foundations developed in Section 2, and developed a framework that links absorptive capacity, defined as the collective capability to recognise, assimilate, and apply heterogeneous knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002), with a design thinking approach that treats acceleration as disciplined learning through problem framing, prototyping, and testing (Carlgren et al., 2016; Micheli et al., 2019).

In this paper, we argue that the central mechanism is not simply stakeholder involvement, nor the availability of data, but the conversion of distributed knowledge into actionable artefacts through DEKA-CoPs and the governance conditions that make that conversion feasible at speed.

Our first proposition (Proposition 1) focuses on stakeholder co-creation configuration quality and collective knowledge mobilisation. It is theoretically relevant because it reframes co-creation as a configuration problem rather than a participation ideal. Value co-creation work establishes that value emerges through multi-actor interaction, resource integration, and negotiated meaning (Payne et al., 2008; Vargo & Lusch, 2008). Ecosystem research adds that such interaction is structured by interdependencies and bottlenecks, which makes the design of roles and interfaces consequential for performance (Adner, 2017; Jacobides et al., 2018). Taken together, these streams imply that co-creation breadth can increase insight diversity, but it can also raise integration costs and conflict over priorities. Open innovation research reinforces this tension by showing that external search breadth and depth can improve innovation performance while simultaneously increasing coordination and assimilation burdens (Laursen & Salter, 2006).

Our contribution through this first proposition is to make this tension explicit for sustainable digital solution design acceleration. In biodiversity contexts, co-creation that is broad but weakly governed can generate an abundance of partially compatible inputs and amplify semantic and pragmatic disagreements about what constitutes a legitimate sustainability outcome. This is where the knowledge management lens becomes decisive. Knowledge boundary research suggests that when knowledge is distributed across communities with different practices and validity criteria, effective coordination depends on translation mechanisms and shared boundary objects (Carlile, 2002, 2004). Proposition 1, therefore, positions stakeholder co-creation configuration quality as the upstream condition that determines whether heterogeneous knowledge is converted into reusable design inputs rather than remaining as fragmented narratives or contested claims.

Critically, it also highlights a risk: co-creation can produce acceleration only if it reduces repeated discovery without stripping meaning. If tacit heritage knowledge is elicited but then codified in ways that detach it from its custodians, DEKA-CoPs may become a mechanism of knowledge extraction rather than mobilisation. This tension motivates the rest of the model as acceleration is not simply more input, but better conversion and governance.

Likewise, Proposition 2 (i.e., DEKA-CoPs collective knowledge mobilisation and absorptive capacity) advances knowledge management theory by specifying how a digital knowledge architecture can strengthen absorptive capacity in an ecosystem setting. The absorptive capacity literature is often applied at the organisational level, emphasising the recognition, assimilation, and application of external knowledge (Cohen & Levinthal, 1990). Subsequent work differentiates potential and realised absorptive capacity and highlights that conversion into action is a capability (Zahra & George, 2002). A stricter reading suggests that knowledge management systems research shows that digital infrastructures shape what is captured, legitimised, and reused,

which means that architectures influence whose knowledge becomes actionable (Alavi & Leidner, 2001). Communities of practice and knowledge creation research further clarify that knowledge is situated and that innovation relies on the movement between tacit and explicit forms (Brown & Duguid, 1991; Nonaka, 1994).

Our model integrates these streams by treating DEKA-CoPs collective knowledge mobilisation as an ecosystem-level infrastructure that strengthens absorptive capacity by improving the quality and traceability of inputs. Mobilisation matters because heterogeneity is not merely informational. It is also interpretive. A DEKA-CoPs architecture that stabilises insights into reusable artefacts can support recognition by helping actors see weak signals and salient trade-offs, assimilation by creating shared descriptors and boundary objects, and application by linking knowledge claims to design decisions and test routines.

A critical implication of our second proposition is that DEKA-CoPs can also fail. If mobilisation increases the volume of codified content without improving its interpretability and legitimacy, it may weaken absorptive capacity by overwhelming recognition and creating ambiguity in assimilation. This points to an important boundary condition because knowledge mobilisation must be designed for actionability, not only for preservation. In biodiversity networks, actionability must be aligned with legitimacy, meaning that traceability and contextual integrity are not ancillary features but core architectural requirements.

Complementary to this, Proposition 3, which focuses on the sequential translation to design acceleration through absorptive capacity and design thinking, provides the acceleration mechanism by connecting capability and process. The design thinking literature is often polarised between promoters who treat it as a general solution and critics who see it as a managerial fashion. A more defensible interpretation is that design thinking is a structured learning approach whose impact depends on enactment quality, particularly the discipline of problem framing and the governance of prototyping and testing (Carlgren et al., 2016; Micheli et al., 2019).

This aligns with the innovation and product development evidence that acceleration is achieved through early learning, experimentation, and reduced late-stage rework (Cacciolatti et al., 2025; Eisenhardt & Tabrizi, 1995; Thomke, 1998; Thomke & Fujimoto, 2000). DEKA-CoPs mobilisation creates a higher-quality knowledge base, absorptive capacity prevents that knowledge from becoming noise by enabling recognition, assimilation, and application, and finally, design thinking enactment converts applied knowledge into prototypes, tests, and implementable specifications through disciplined iteration. This sequence is also consistent with the character of digital innovation, where artefacts are generative and continuously recombined, meaning that acceleration requires mechanisms for cumulative learning and reconfiguration rather than linear execution (Nambisan et al., 2017; Yoo et al., 2010).

The critical contribution of our framework with respect to Proposition 3 is that it connects acceleration to governance of iteration, not just to iteration itself. For instance, prototyping without decision closure can increase churn. Likewise, testing without agreed criteria can deepen contestation. Thus, our framework implies that 'speed' is not only a function of how quickly prototypes are produced, but of how effectively learning is captured, validated, and fed back into the shared knowledge architecture. This has direct relevance for biodiversity protection, and we maintain that rapid cycles are beneficial only if they reinforce stewardship commitments and avoid representational drift.

Finally, Proposition 4 deals with the moderating effects of programme configuration and ecosystem coordination. It introduces two moderation logics which empirically align the model with the Slow Food programme configurations that motivate our paper. First, programme configuration moderates the relationship between DEKA-CoPs mobilisation and absorptive capacity. Knowledge boundary theory suggests that the difficulty of assimilation and application depends on the type of knowledge at stake and the nature of boundaries among actors (Carlile, 2004). As shown in Table 3, in some programme configurations, dominant knowledge can be more readily codified and compared, which strengthens recognition and assimilation. In others, knowledge is heavily tacit, embodied, and normatively contested, which can make assimilation and application slower and more dependent on translation mechanisms and legitimacy safeguards.

Second, ecosystem coordination moderates the relationship between a design thinking approach and sustainable digital solution design acceleration. Coordination theory shows that timely action in complex settings depends on coordination mechanisms that generate accountability, predictability, and shared understanding (Okhuysen & Bechky, 2009). In fast-response contexts, coordination is often enacted through expertise-based and dialogic practices that enable rapid alignment under pressure (Faraj & Xiao, 2006). Collaborative governance research similarly emphasises the conditions and process requirements for sustained cross-sector collaboration.

The main theoretical implication of Proposition 4 is that design thinking cycles do not automatically translate into ecosystem-level acceleration. Without coordination, empathise and ideate can expand indefinitely, prototypes can proliferate without convergence, and tests can become contested rituals rather than decision devices. With coordination, design thinking becomes a disciplined learning system where problem framing is stabilised, prototypes are prioritised, tests are standardised where appropriate, and learning is reintegrated into DEKA-CoPs. This is particularly important for biodiversity protection because coordination helps prevent digital solutions from becoming incompatible local variants that undermine traceability, credibility, and diffusion.

Theoretical implications

Acceleration in sustainability-oriented ecosystems is not an unqualified good. Faster cycles can exclude marginal knowledge holders while privileging what is most easily codified and can increase the risk of misrepresentation when digital artefacts travel across contexts. Our framework, therefore, treats quality-adjusted acceleration as contingent on inclusivity safeguards, traceability, and coordination that protect representational integrity while still enabling closure. A practical implication of this trade-off logic is that acceleration requires explicit safeguards rather than post-hoc fixes. First, DEKA-CoPs artefacts should encode custodianship and consent alongside content, so that narratives, standards, and provenance claims remain attributable and contestable rather than becoming free-floating representations. Second, validation routines should be designed as governance mechanisms, not as technical checks, by requiring sign-off from legitimacy holders before scaling and by making 'right to refuse digitisation' explicit for sensitive heritage elements that communities do not wish to translate into digital form. Third, coordinators can reduce representational drift by maintaining audit trails and by enforcing minimum representation standards, including explicit boundaries on what may be claimed, what evidence is required, and what must remain contextual. These mechanisms do not remove tension between speed and integrity, but they make the tension governable and reduce the likelihood that accelerated iteration becomes extraction or mischaracterisation.

The findings suggest that for knowledge management theory, our study shifts attention from knowledge sharing to knowledge mobilisation for accelerated design. CoPs research and knowledge creation theory have long emphasised the situated nature of knowing and the need to translate tacit knowledge into shareable forms (Brown & Duguid, 1991; Cacciolatti, 2024; Cacciolatti et al., 2025b; Cohen & Levinthal, 1990; Nonaka, 1994; Zahra & George, 2002). Our framework extends this by proposing that in sustainability ecosystems, mobilisation must be designed to support actionability and traceability, not only preservation. This repositions DEKA-CoPs as a collective knowledge architecture that supports cumulative learning across cycles and across settings, and it provides a capability-based explanation for when such architectures accelerate rather than overwhelm decision-making (Alavi & Leidner, 2001).

For innovation theory, our study connects design thinking enactment to a capability mechanism and a governance condition. The design thinking literature often lacks specification of boundary conditions and tends to under-theorise how co-creation is converted into implementable outcomes. We integrate absorptive capacity with design thinking, and in our paper, we position problem framing, prototyping, and testing as micro foundations of acceleration that depend on the ecosystem's ability to recognise, assimilate, and apply heterogeneous knowledge. This also complements digital innovation research, which stresses distributed agency and generativity, by specifying governance mechanisms that preserve sustainability intent during recombination and diffusion (Nambisan et al., 2017; Yoo et al., 2010).

Finally, our model advances innovation ecosystem research by theorising coordination as a performance-critical moderator rather than an operational detail. Ecosystem strategy highlights alignment, complementarities, and bottlenecks (Adner, 2017; Jacobides et al., 2018), while network governance and orchestration research explains how different governance modes shape efficiency and stability (Dhanaraj & Parkhe, 2006; Provan & Kenis, 2008). Our framework adds that coordination is the condition that determines whether design thinking functions as acceleration or as churn in sustainability contexts. This is especially important for biodiversity-related innovation, where legitimacy and representation constraints make decision closure more fragile.

Practical implications

Our study also carries important practical implications. For policymakers, we propose a model for improving sustainable food systems through ecosystem coordination. Policymakers who aim to strengthen sustainable food systems and biodiversity protection should treat ecosystem coordination as an investment category, not as overhead. Our framework apologies three priority measures.

First. The need to build and resource a coordinating capacity. Sometimes biodiversity solutions may require alignment across producers, markets, civil society, and technical actors. Policy can support lead organisations or network administrative arrangements that provide stable decision rights, conflict resolution routines, and accountability mechanisms (Provan & Kenis, 2008). This can reduce decision latency and sustain design thinking cycles beyond pilot phases.

Second. The need to support shared digital knowledge infrastructures with legitimacy safeguards. Funding and standards can encourage DEKA-CoPs-style infrastructures that maintain traceability of knowledge claims, protect custodianship, and prevent misrepresentation as digital artefacts diffuse. From a policy perspective, the key is not only interoperability, but governance of representation and validation so that biodiversity and heritage are not reduced to decontextualised labels.

In food system settings, ecosystem coordination also needs to integrate the distinct logics of food security and food safety, as they generate different legitimacy criteria for digital interventions. Food security priorities emphasise availability, access, and livelihood stability, whereas food safety priorities emphasise hazard reduction, compliance, and risk management; in practice, this means that 'quality-adjusted design acceleration' cannot be assessed only through speed and adoption, but must also be constrained by credible safety validation routines and by evidence that interventions do not create new vulnerabilities for marginal producers or consumers (Malik, 2025).

Policymakers can support this by resourcing coordinating bodies to define minimum evidence requirements, approve shared verification templates, and align inspection or assurance processes with participatory learning cycles, so that rapid prototyping does not come at the expense of safety assurance or equity of access.

Third. The creation of incentives for learning-oriented experimentation with early validation. Policies that support prototyping and testing in real settings, while requiring transparent learning capture and community validation, can accelerate diffusion of credible solutions and reduce wasteful replication. This aligns with evidence that early learning and experimentation reduce late-stage rework and compress development time (Thomke, 1998; Thomke & Fujimoto, 2000).

Beyond environmental and cultural benefits, the framework has economic and commercial relevance that matters for policy design. Late-stage rework and dispute-driven redesign can be reduced as (i) *quality-adjusted design acceleration* can lower delivery costs and shorten time to credible deployment, especially where compliance and verification failures would otherwise trigger costly correction. (ii) *Shared verification* templates and traceability artefacts can reduce duplicated assurance efforts across stakeholders, lowering transaction costs for small producers who face repeated, fragmented requests for evidence. (iii) *Faster convergence* on legitimate claims can also improve market competitiveness by enabling verified provenance signals that support premium capture without relying on opaque branding. At ecosystem level, (iv) *coordination* that aligns validation routines can decrease the cost of conflict and reputational risk and strengthen the viability of biodiversity-supporting markets while keeping entry barriers manageable for small-scale and marginal producers.

Our study also has implications for practitioners designing or governing biodiversity-related digital solutions. Our framework provides a practical blueprint organised around four implementation priorities.

1. *Configure co-creation for decision-making and learning, not only participation*. Practitioners should clarify who has decision rights at the define and test stages, how conflicting interpretations of sustainability will be resolved, and how continuity will be maintained across cycles. This reduces churn and improves the likelihood that empathise produces credible, non-extractive insights (Payne et al., 2008; Provan & Kenis, 2008).
2. *Design DEKA-CoPs artefacts that are both reusable and context-sensitive*. Rather than capturing everything, practitioners should prioritise boundary objects that support translation across communities, such as provenance templates, narrative libraries with custodianship metadata, and test protocols linked to local legitimacy criteria (Carlile, 2002, 2004). This strengthens collective knowledge mobilisation without flattening meaning.
3. *Operationalise absorptive capacity as routines*. These might include the need to establish sensing routines (for example, nomination and scanning mechanisms) to surface weak signals of biodiversity risk and emerging stakeholder needs (= recognise); run structured sensemaking to align terminology, trade-offs, and criteria for legitimacy across actors (= assimilate); as well as embed decision logs and test criteria into the design cycle so that knowledge is converted into action and not left as an archive (Cohen & Levinthal, 1990; Zahra & George, 2002), i.e., apply.
4. *Enact design thinking with governance discipline*. Design thinking should be implemented as a learning system, thus with tightly defined statements, limited and prioritised prototypes, and testing that is credible to local custodians as well as to users. Without this discipline, design thinking risks becoming performative and slowing progress (Carlgren et al., 2016; Micheli et al., 2019).

Across all programmes, the biodiversity protection benefit is the same in principle, as it would get better mobilisation and conversion of heterogeneous knowledge, which improves the fidelity of what is represented, the credibility of what is verified, and the speed at which workable solutions diffuse. Where the benefit differs is in the dominant loops: sensing and discovery (Ark of Taste), stewardship and standard setting (Presidia), rapid market learning (Earth Markets), demand shaping (Cooks' Alliance), capability building (Food Gardens in Africa), and narrative diffusion (Slow Food Travel). The framework helps practitioners identify which loop is dominant and then design the knowledge architecture, absorptive routines, and testing governance accordingly.

Societal implications

At societal level, the framework speaks to how digitalisation can shape public attitudes towards biodiversity conservation and cultural heritage. When digital interventions are perceived as extractive or misrepresentative, they can undermine trust and reduce willingness to participate in conservation practices, especially among communities whose knowledge has historically been marginalised. The model supports legitimacy not only in technical terms, but in social terms, strengthening confidence that digital representations are accountable to place and practice by making traceability, custodianship, and validation explicit design requirements. This matters for food systems because provenance and authenticity are increasingly central to consumer decision-making and to policy narratives around sustainability, yet they remain vulnerable to simplification and appropriation. A coordinated approach that protects representational integrity can therefore contribute to more durable norms of responsible consumption and to broader cultural recognition of biodiversity as a shared public good rather than a marketing aesthetic.

Overall, the programme configurations indicate that the mobilisation-to-absorptive-capacity link will vary systematically with codifiability, feedback cadence, and representational integrity risk. Ark of Taste has high narrative codifiability because nominations and origin stories can be stabilised into reusable templates, but feedback cadence is slower as validation is dispersed, and representational integrity risk is high when stories travel beyond custodianship. Earth Markets are less codifiable because learning is situated in direct exchange, yet feedback cadence is very fast; distortion risk is lower, but closure becomes more coordination-dependent as rapid iteration can fragment without clear decision rights. Presidia are medium in codifiability because standards in practice can be articulated but remain embedded in craft routines; cadence is slower, often seasonal, and legitimacy sensitivity is high given stewardship commitments. Slow Food Travel intensifies narrative diffusion across contexts, raising distortion risk and increasing the need for stronger coordination and validation routines to protect representational integrity while still enabling iteration.

Conclusions

In this paper, we developed a novel conceptual framework to explain how stakeholder collaboration can accelerate the design of sustainable digital solutions in biodiversity-oriented food system networks. The central contribution is a capability and process account of acceleration that integrates absorptive capacity, defined as the collective ability to recognise, assimilate, and apply heterogeneous knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002), with a design thinking approach that frames acceleration as disciplined learning through problem framing, prototyping, and testing (Carlgren et al., 2016; Micheli et al., 2019). The framework extends the DEKA-CoPs logic (Cacciolatti et al., 2025b) by positioning digitally enhanced communities of practice as collective knowledge mobilisation architectures that convert distributed, place-based knowledge into reusable and traceable design inputs (Alavi & Leidner, 2001; Brown & Duguid, 1991; Nonaka, 1994;). It also advances ecosystem and governance scholarship by theorising coordination as a performance-critical moderator that determines whether iterative design cycles yield timely, implementable outcomes rather than churn (Adner, 2017; Dhanaraj & Parkhe, 2006; Jacobides et al., 2018; Provan & Kenis, 2008). Finally, we mapped the model to Slow Food biodiversity programmes. Our study offers a concrete set of configuration-based boundary conditions that clarify why acceleration differs across discovery, stewardship, market learning, demand shaping, capability building, and storytelling diffusion settings.

Nevertheless, our paper has some limitations. First, as a conceptual article, it does not empirically estimate effect sizes or adjudicate competing causal accounts. Second, the programme mapping relies on analytically derived mechanisms rather than direct process data, which means that the proposed learning loops and moderation effects should be treated as theoretically plausible rather than observed regularities. Third, the framework emphasises acceleration and legitimacy, but it does not fully unpack potential trade-offs between speed, inclusivity, and representational integrity, especially when digital artefacts travel across contexts and risk decontextualising heritage knowledge. Finally, while coordination is modelled as a moderator, our framework does not differentiate in detail among coordination modes and their micro foundations, for instance, how decision rights, accountability, and conflict resolution are enacted in practice (Okhuysen & Bechky, 2009).

A final practical limitation concerns implementation failure condition. Even when ecosystems endorse shared sustainability goals, the framework can underperform where (i) decision rights remain fragmented and no actor can authorise closure on evidence thresholds, (ii) verification or compliance demands impose costs that exclude marginal producers, (iii) custodianship and consent are not embedded into digital representations, allowing narratives to travel without accountability, or (iv) resource constraints prevent iterative testing from being sustained across seasons and sites. These conditions do not contradict the model, but they delimit where quality-adjusted design acceleration is feasible in practice and clarify why coordination capacity and representation safeguards are not optional.

However, these limitations open clear avenues for future research. Future work can test the model through comparative, multi-case process studies across programme configurations, combining interviews with design coalition members and analysis of digital trace data from DEKA-CoPs repositories to measure mobilisation outputs, decision routines, prototype cadence, and legitimacy disputes. A complementary design would use matched comparisons across ecosystems with different coordination modes to estimate how decision rights and closure routines moderate the design thinking enactment to the acceleration link. Finally, measurement development research can operationalise quality-adjusted acceleration using the blueprint in Section 3.2 and examine whether acceleration is achieved without compromising representational integrity and inclusivity.

A priority, we believe, is empirical process research that traces how DEKA-CoPs artefacts, absorptive capacity routines, and design thinking cycles co-evolve across programmes, using longitudinal case studies and digital trace data to observe recognition, assimilation, and application episodes as well as prototype and test cadence. A second possible avenue is comparative research on coordination modes, assessing how lead-organisation, network administrative, and participant-governed structures shape learning speed, legitimacy, and diffusion outcomes across different programme configurations (Provan & Kenis, 2008). A third avenue is measurement development, as future work could operationalise 'sustainable digital solution design acceleration' as a multidimensional construct capturing cycle speed, rework, legitimacy fidelity, and diffusion robustness, and examine how these dimensions relate under different knowledge and governance conditions. A final avenue which we identified is the normative and ethical inquiry into epistemic justice (Cacciolatti et al., 2025) and representation in digital knowledge architectures, exploring when mobilisation enables biodiversity protection and when it risks extraction or misrepresentation as solutions scale across contexts. In conclusion, future research could test whether AI-enabled features, such as semantic clustering, narrative provenance tracing, and decision-support prompts, enhance or undermine the fidelity of biodiversity knowledge in design processes, depending on governance and coordination conditions.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work the author(s) used Grammarly in order to identify grammatical mistakes. This was done cautiously, with micro-batches editing to avoid text alternations. For this purpose, we instructed the tool to "Correct only the grammar, spelling, and syntax.

Do not alter technical terminology or change the core meaning". Once this was done, we have retained final editorial veto and manually reviewed every single sentence change to verify that your exact scientific meaning remains intact. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

CRediT authorship contribution statement

Luca Cacciolatti: Writing – original draft, Formal analysis, Conceptualization. **Michael Christofi:** Writing – review & editing, Resources. **Ioannis Christodoulou:** Writing – review & editing, Resources.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix 1. List of key studies supporting the conceptual model

Construct	Role	Literature stream	Sub-domain	Model contribution	Authors
Design acceleration	DV	Experimentation and cycle-time reduction	New product development, experimentation	Provides the micro logic of accelerating learning through experimentation and switching between test modes, linking to prototyping and testing.	Thomke (1998)
		Fast adaptation and product innovation speed	Innovation speed, product development	Supports theorising speed as a function of adaptive processes, ingposition 'acceleration' as a performance dimension.	Eisenhardt and Tabrizi (1995)
Stakeholder co-creation configuration	IV	Service-dominant logic and co-creation	Service marketing, value co-creation	Establishes value as co-created through multi-actor resource integration, supporting why co-creation quality shapes empathise and define.	Vargo and Lusch (2008)
		Managing co-creation processes	Service innovation, relationship management	Provides a process view of co-creation (roles, interactions, learning), supporting design-cycle governance requirements.	Payne, Storbacka and Frow (2008)
		Open innovation search breadth and depth	Open innovation, search strategy	Supports the trade-off that wider stakeholder search can improve innovation but increases integration burdens, motivating coordination and knowledge architecture.	Laursen and Salter (2006)
Collective knowledge mobilisation	Me	Collective knowledge and CoPs in sustainability	Knowledge management, social innovation	Anchors the collective knowledge logic in CoPs and Slow Food, supporting why digital architectures can mobilise tacit heritage knowledge for innovation.	Cacciolatti and Lee (2022); Cacciolatti and Lee (2025)
		Digital CoPs and knowledge transformation cycles	Digital knowledge management, sustainable food systems	Directly supports DEKA-CoPs as a digitally enhanced knowledge architecture enabling knowledge transformation and reuse in sustainability settings.	Cacciolatti et al. (2025b)
		Communities of practice and situated knowing	Organisational learning, practice theory	Justifies why critical knowledge is situated in practice, supporting the need for architectures that preserve context while enabling diffusion.	Brown and Duguid (1991)
		Knowledge creation and tacit–explicit dynamics	Organisational knowledge creation	Underpins the need to convert tacit heritage and production knowledge into shareable artefacts without losing meaning.	Nonaka (1994)
		KM systems foundations	Information systems, KM systems	Shows that systems structure what is captured and reused, supporting epistemic design choices (traceability, validation, inclusion).	Alavi and Leidner (2001)
		Knowledge boundaries and boundary objects	Knowledge boundaries, NPD	Supports why heterogeneous knowledge creates boundaries and why boundary objects are needed for cross-stakeholder translation.	Carlile (2002)
		Boundary management mechanisms	Knowledge integration, innovation management	Provides a framework for transfer, translation, and transformation across boundaries, aligning with DEKA-CoPs traceability and reuse aims.	Carlile (2004)
Absorptive capacity	Me	Foundational absorptive capacity	Organisational learning, innovation	Provides the recognise, assimilate, apply logic that explains how heterogeneous stakeholder knowledge becomes usable design input.	Cohen and Levinthal (1990)
		Potential vs realised absorptive capacity	Strategic management, capabilities	Strengthens the mediator logic by distinguishing acquisition/assimilation from transformation/exploitation, aligning with DEKA-CoPs and design cycles.	Zahra and George (2002)
Design thinking approach to acceleration	Me	Design thinking as structured learning	Innovation management, design thinking	Supports design thinking as a repeatable organisational capability that improves problem framing and iteration, linking to acceleration.	Micheli et al. (2019)
		Design thinking in practice and capability building	Innovation practice, design methods	Helps specify design thinking enactment (problem framing, prototyping, testing) as an operational mechanism rather than a generic label.	Carlgren Rauth and Elmquist (2016)
Coordination in the ecosystem	Mo	Network governance forms	Public management, network governance	Justifies coordination as a moderator via governance mode differences (lead organisation, participant governance) affecting decision rights and speed.	Provan and Kenis (2008)
		Innovation network orchestration	Network orchestration, strategy	Explains how a hub can mobilise knowledge and stabilise collaboration without hierarchy, directly aligning with the coordinator role.	Dhanaraj and Parkhe (2006)
Programme configuration	Mo	Ecosystem alignment and bottlenecks	Ecosystem strategy	Supports the idea that different configurations vary in complementarities and bottlenecks, motivating programme-specific moderation effects.	Adner (2017)

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Construct	Role	Literature stream	Sub-domain	Model contribution	Authors
		Ecosystems as evolving organisational forms	Strategic management, ecosystems	Supports programme configurations as distinct governance and value-creation logics that shape who participates, how interfaces work, and how solutions scale.	Jacobides, Cennamo and Gawer (2018)

*DV = Dependent Variable; IV = Independent Variable; Me = Mediator; Mo = Moderator.

Appendix 2. List of terms used in the paper

DEKA-CoPs

Digitally Enhanced Knowledge Architecture for Communities of Practice, defined as a digitally supported knowledge infrastructure that stabilises reusable artefacts (templates, boundary objects, traceability records) and supports cross-boundary knowledge mobilisation.

Programme configuration

A governance and value-creation configuration (for example Ark of Taste or Presidia) characterised by a dominant learning loop, a typical stakeholder mix, and a specific mix of codifiability, feedback cadence, and representational integrity risk.

Programme-embedded design coalition

The focal collective actor that converts mobilised knowledge into implementable digital artefacts, typically involving producers, coordinators, technical partners, and legitimacy holders.

Quality-adjusted design acceleration

Reduced iteration cycle time from shared problem definition to validated prototype and implementable specification, subject to legitimacy and representational integrity constraints.

Representational integrity

The extent to which digital representations preserve meaning, provenance, and custodianship when knowledge travels across contexts, rather than being decontextualised or mischaracterised.

Closure

The ability to settle decision rights, evidence thresholds, and test criteria so that iteration produces convergence rather than perpetual re-framing.

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