

D · I · S

Understanding Innovation and Sustainability in Digital Organizations

A mixed-method approach to defining, operationalizing, and managing the digital–innovation–sustainability nexus

Prof. Dr. Sabrina Schork

Research Professor, TH Aschaffenburg — University of Applied Sciences, Economy and Law

Co-authors: Dilan Özdemir-Kaluk · Cudi Zerey

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Roadmap

What we'll cover in the next 20 minutes

01

Motivation & research gap

Why a fragmented DIS literature is a problem worth solving

02

Method

Systematic literature review — bibliometric + qualitative

03

Three findings

Definitions · operationalization · positive organizational effects

04

The three-level DIS model

Ecosystem, organization, solution — our core conceptual contribution

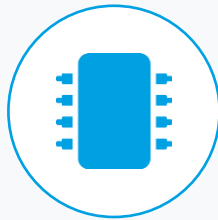
05

Implications & open questions

For theory, for management — and for the discussion that follows

Why this matters now

Three converging pressures are reshaping how organizations create value



Digital acceleration

30 years of digital technology growth, sharply accelerated by COVID-19 and the rise of generative AI since 2022.



Climate urgency

Global CO₂ emissions continue to rise — innovation must now serve environmental as well as economic ends.



A literature explosion

Annual scientific output on DIS topics grew roughly five-fold between 2019 and 2023 — outpacing our ability to make sense of it.

Digitalization is no longer optional — and neither is sustainability. The question is how the two work together through innovation.

The gap, and three guiding questions

Rapid growth has outpaced conceptual consolidation

The problem



- Definitions of "digital," "innovation," and "sustainability" multiply across disciplines
- Same construct — different operationalizations — across studies
- Reported organizational effects are scattered and rarely compared
- Country and industry samples produce diverging results

Three research objectives



01 · Definitions

How are D, I, and S defined across the literature — alone and in combination?



02 · Operationalization

How are the underlying constructs actually measured in empirical studies?

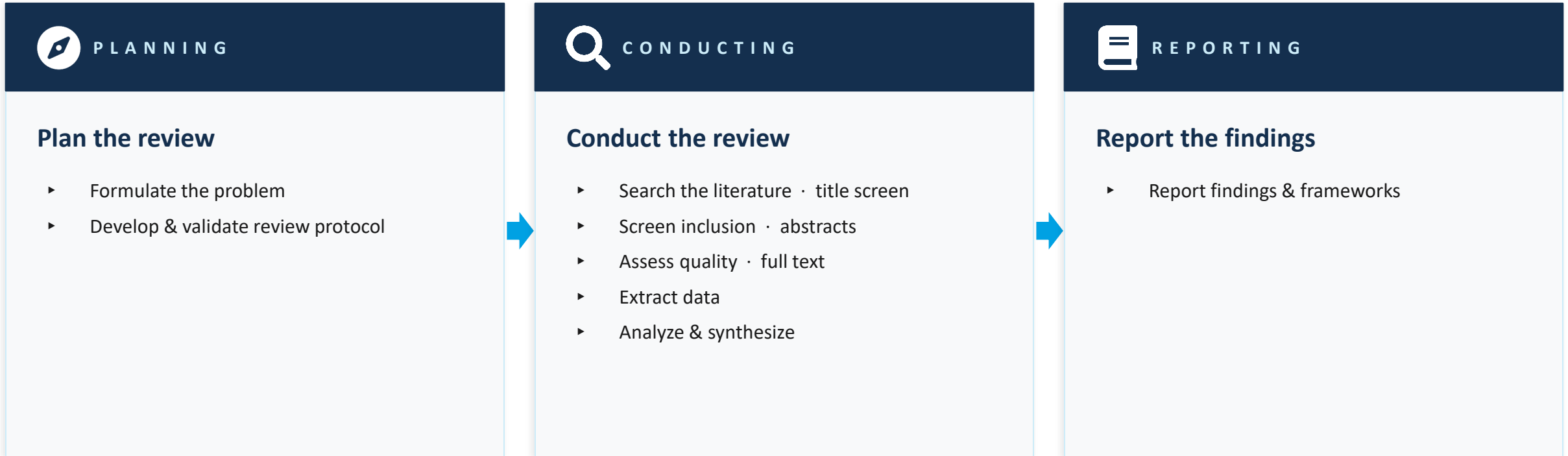


03 · Positive effects

What organizational outcomes does the combined DIS activity produce?

Method · Systematic literature review

Eight-step protocol (Xiao & Watson, 2019), combining broad bibliometrics with deep qualitative coding



Mixed-method by design: *bibliometric analysis (R package bibliometrix 4.0) on the broad sample, inductive–deductive qualitative coding on the filtered core sample.*

From 3,099 to 20 articles · five filters

Scopus, 2010–2023 · English & German · journals & reviews

3,099

Keyword search *"sustainable OR sustainability AND digital AND innovation" in title, abstract, keywords*

2,337

Duplicate removal *–762 duplicates eliminated*

112

Title fit *All three DIS terms required in the title (–2,225)*

43

Ranking fit *Journal ranked at least C in VHB-JOURQUAL (–69)*

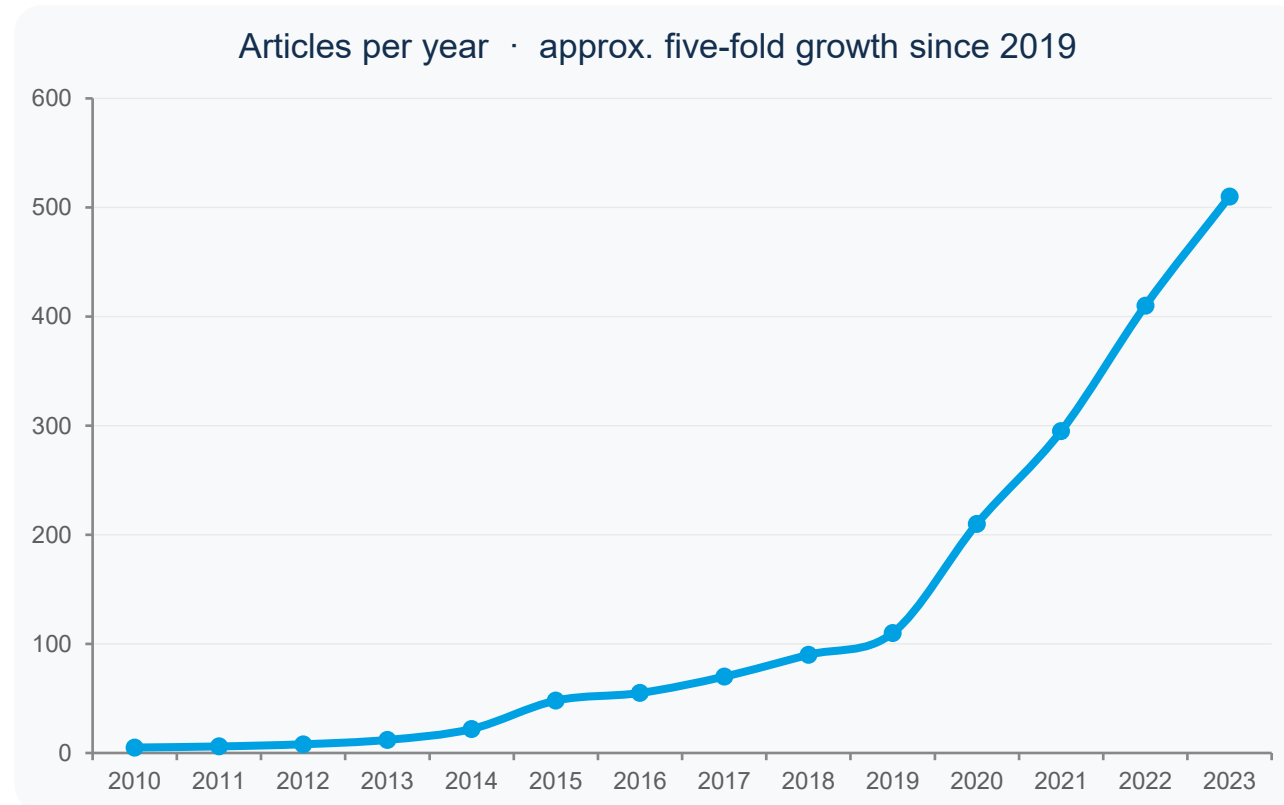
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Abstract fit *Macro / industry studies excluded · contribution to at least one of the three goals (–23)*

Final core sample: 20 articles · 6 B-ranked · 14 C-ranked

What the broad sample tells us

Bibliometric findings from 3,099 articles, 2010–2023



Emerging themes

“Innovation,” “Sustainability,” and “Digitalization” are relevant but underdeveloped.



Motor themes

Artificial intelligence and ecological sustainability operate as high-density, high-centrality motor themes.



Where it's published

Sustainability (Switzerland) leads by volume (N=214); Journal of Cleaner Production (N=22) and Technological Forecasting & Social Change (N=15) follow.

A proliferation of terms — and where they disagree

Inductive coding of the 20 core papers reveals a rich, partly overlapping vocabulary

D Digital

Terms found in the literature



- ▶ Digital (dynamic) capability
- ▶ Digital orientation
- ▶ Digital platform ecosystem
- ▶ Digital technology
- ▶ Digital transformation
- ▶ **Digitalization**

Digitalization entails firms using advanced digital technologies (i.e., AI, blockchain, cloud, big data, ICT, robotics, IoT, high-speed infrastructure – Xu et al., 2022) to alter the value proposition, value creation, and value capture components of their business models (Ardito, 2023).

I Innovation

Terms found in the literature



- ▶ Business model innovation
- ▶ **Innovation realization capability**
- ▶ Open innovation
- ▶ Organizational innovation

Innovation realization capability refers to an enterprise's ability to develop existing business opportunities (Fan et al., 2023).

S Sustainability

Terms found in the literature



- ▶ ESG management
- ▶ Sustainability
- ▶ Sustainability performance
- ▶ **Sustainable performance**

Sustainable performance consists of five items of both environmental and economic performance and three items of social performance (Xu et al., 2023).

The three-level DIS model

Most disagreement disappears once you distinguish the level of analysis



E C O S Y S T E M

The environment

Digital economy · infrastructure · sustainable industry



O R G A N I Z A T I O N

The firm and its capabilities

Digital transformation · digital capabilities & leadership · innovation capabilities · ESG management · SDI



S O L U T I O N

What the organization produces

Digital platforms, products & services · process / product / BMI · sustainable innovation

Working hypothesis: *much of the apparent contradiction in the literature is between authors operating at different levels — not between rival theories.*

Two integrated constructs worth zooming in on

At the organization level: SDI as a still under-researched construct; at the solution level: SI as a key dependent variable



SUSTAINABLE DIGITAL INNOVATION
· SDI

An organizational change process

SDI is “a long-term organizational change process to achieve the firm’s longevity needs and the livelihood of its ecosystem” (Park & Hong, 2022).

It helps implement the newest digital technology for creative solutions that address social, economic, and environmental business issues, and is also based on the frugal innovation concept (Yousaf et al., 2021).



SUSTAINABLE INNOVATION · SI

A balanced three-element output

SI is developed by considering a balanced combination of three types of elements: economic, social, and environmental.

Economic elements traditionally dominate decision making; under SI, the three are simultaneously and equally considered. Not every innovation is, as a result, sustainable (Nasiri et al., 2022).

How is DIS actually measured?

51 distinct operationalizations across the 20 core papers — not all defined, not all comparable

51

Distinct operationalizations identified

Same construct · different measurement → the comparability problem

Business model innovation

Study A: Leuzzo (2023): value capture · value delivery · value creation

Study B: Principato et al. (2023): evolution of the customer segments · customer relationships · economic model

Sustainable digital innovation

Study A: Yousaf et al. (2021): quality-price ratio, frugality, novelty vs. competitors

Study B: Zhao & Yan (2023): cost advantage, new value creation, portfolio breadth vs. competitors

Sustainability performance

Study A: Liang et al. (2023): digital value creation + digital value proposition + digital value capture

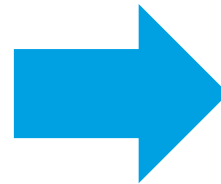
Study B: Principato et al. (2023): evolution of customer segments, relationships, economic model, platform scope

Digital constructs are the dominant drivers

Synthesizing direct positive paths reported across the 20 papers

DRIVERS · mostly digital

- ▶ Big data analytics
- ▶ Data
- ▶ Digital capabilities & flexibility
- ▶ Digital leadership
- ▶ Digital orientation
- ▶ Digital platforms
- ▶ Digital technology
- ▶ Digital transformation
- ▶ Green / sustainability-oriented innovation
- ▶ Innovation capabilities



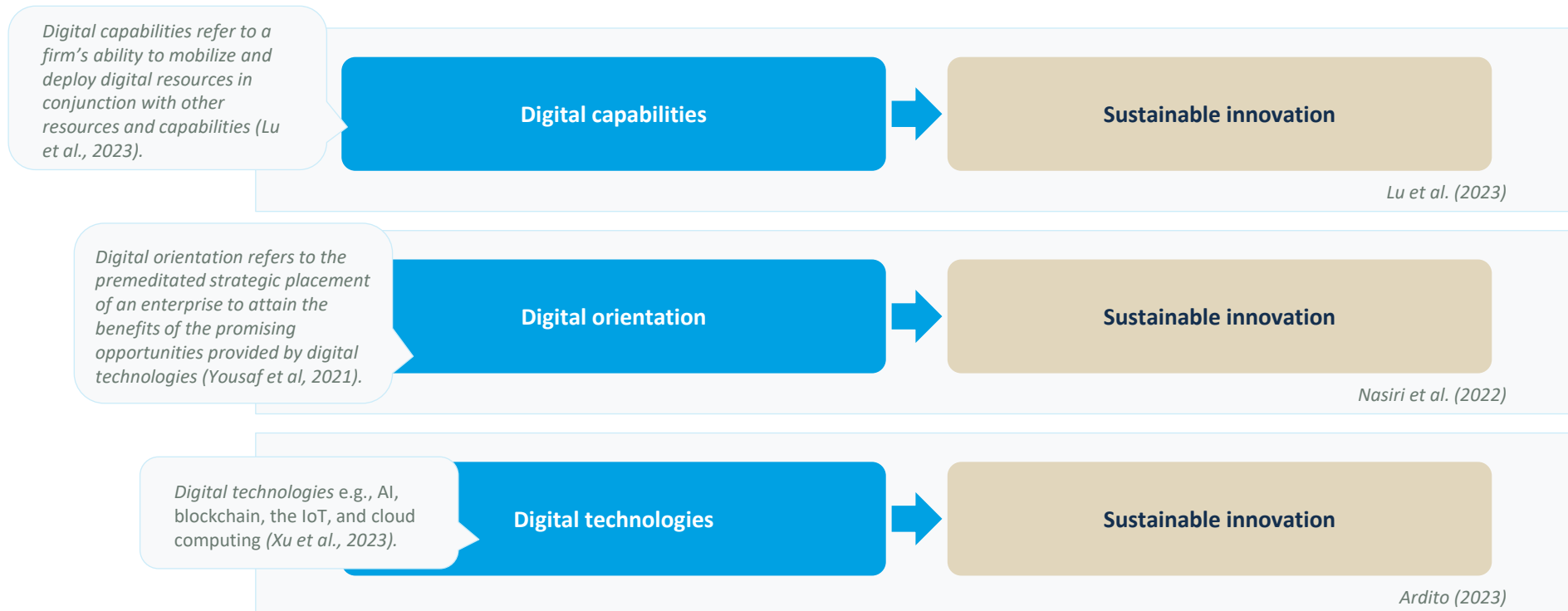
positive effect on

OUTCOMES

- ▶ Organizational innovation
- ▶ Organizational sustainability
- ▶ Sustainable innovation (eco / green)
- ▶ Sustainable business model innovation
- ▶ Sustainable digital innovation (SDI)
- ▶ Sustainable performance
- ▶ Sustainable competitive advantage

Sustainable innovation as the dominant dependent variable

Sustainable innovations are discussed as solutions achieving sustainable performance. Their drivers are foremost digital constructs.



Implications for theory

Four recommendations for the next wave of DIS research



0 1

Standardize terminology

Adopt — or at least explicitly position against — common definitions for D, I, and S. State which prior definition you extend, refine, or reject.



0 2

Separate organizational from solution-level analysis

The three-level model is meant precisely as this anchor. Mixing levels in a single construct produces the comparability problems we saw.



0 3

Focus on SDI and SI as research streams

Of all integrated constructs, SDI has the strongest theoretical promise and the thinnest empirical base. Both SDI and SI — the dominant DV — deserve dedicated programs.



0 4

Test effects in multiple country and industry contexts

Existing findings travel poorly across China, South Korea, and European samples. Replicate before you generalize.

Implications for management and organizations

Five steps to apply the three-level DIS model in practice



0 1

Apply advanced analytics

Use big data analytics and digital tools to inform decisions, not just to report on them.



0 2

Cultivate innovation-friendly leadership

Digital leadership is one of the few constructs with documented mediated effects on both innovation and sustainability.



0 3

Integrate ESG with strategy

Move ESG out of the reporting function and into the value-creation conversation.



0 4

Build an explicit DIS roadmap

Use the three-level model to decide where to act: ecosystem, organization, or solution.



0 5

Strengthen capability for sustainable digital innovation

Digital, sustainability, and innovation are mutually dependent. Treat them as a system, with performance effects in mind.

Limitations and where the work goes next

What this review does not yet do — and what we plan to do next

LIMITATIONS

- **Selection bias**
Strict filtering excludes potentially relevant work; the 20-paper core sample is deep, not exhaustive.
- **Bibliometric quantification**
Counts and citations do not measure quality — and quality conventions differ across disciplines.
- **Preliminary effects**
Effects identified should be treated as hypotheses for rigorous empirical testing, not as established facts.
- **Country & industry variance**
Findings travel imperfectly. Generalization to specific contexts requires care.

FUTURE DIRECTIONS

- **Develop a DIS maturity assessment**
A multidimensional, holistic instrument to position organizations across the three levels.
- **Country-specific application studies**
Pilot the three-level model in clusters of firms within one institutional context.
- **Deepen the SDI research program**
Tighten the construct, develop a validated scale, and test mediated paths.
- **Train managers and executives**
Translate the framework into executive education and applied programs.

“

Where could the three-level DIS model take you?

Four open questions for the discussion



Application

How would the three-level model change the way you frame your own work on digitalization, innovation, or sustainability?



Maturity

What would a useful DIS maturity assessment need to measure that current instruments do not?



Collaboration

Are there country or sector contexts where you could imagine piloting the framework?



Sustainable digital innovation

What would convince you that SDI is a meaningfully distinct construct, worth its own scale and program?

SDI helps implement the newest digital technology for creative solutions that address social, economic, and environmental business issues, and is also based on the frugal innovation concept (Yousaf et al., 2021).

Thank you.

I look forward to the discussion.

SUSTAINABLE 2026 · LISBON

Prof. Dr. Sabrina Schork

Research Professor — TH Aschaffenburg

sabrina.schork@th-ab.de · sabrinaschork.com

THE PAPER

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