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# ORGANIZATIONAL CAPABILITIES FOR DIGITAL CIRCULAR ECONOMY TRANSITIONS: A CONCEPTUAL PERSPECTIVE

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**ABSTRACT**
*Although digital technologies are broadly considered the key enabler for faster circular economy (CE) transitions, a wealth of evidence has emerged since 2024 that digital circular initiatives often do not deliver the expected outcomes, even when the technology behind the sensors, platform or the analytics is technically feasible. This concept paper proposes that the real challenge in digital CE transitions isn't the technology, but the organization and people involved. Based on secondary peer-reviewed literature and reports from OECD and WEF, the paper brings together three theoretical perspectives: the dynamic capabilities theory, the organizational culture theory and behavioural economics, and presents them in a conceptual framework that explores the link between Organizational Capabilities, Digital CE Adoption, and Circular Viability. The framework places the dynamic capabilities (sensing, seizing, and transforming) as the means of using digital tools to achieve circular results and organizational culture and behavioural/cognitive factors as enabling or constraining conditions that enable the use of these capabilities. It presents a discussion of the empirical and conceptual contributions that have been made to the concept of capability maps, digital-enabled dynamic capabilities, organizational culture obstacles to the digital transformation, and behavioural/cognitive obstacles to CE adoption, and draws managerial implications and a research agenda forward from these. The analysis indicates that there is a need for intentional capability-building, cultural adaptability and debiasing routines, in addition to technological investment, to close the digital CE performance gap.*

**KEYWORDS:** *Digital Circular Economy, Dynamic Capabilities, Organizational Culture, Behavioural Economics, Sustainability Transitions And Organizational Capabilities.*

## 1. INTRODUCTION

The circular economy (CE) is no longer a sustainable cornerstone concept, but a strategic priority. The evidence from the surveys shows that, 3 years ago, roughly 40% of the businesses surveyed saw circularity as important or extremely important, while today this figure is approaching 75% and will reach close to 95% within 3 years (World Economic Forum [WEF], Bain & Company, & University of Cambridge, 2025). Meanwhile, digitalization (involving the Internet of Things (IoT), artificial intelligence (AI), blockchain and cloud-based platforms) is always cited as a key enabler for CE strategies, aiding material traceability, predictive maintenance, take-back logistics and closed-loop business models (Piedra-Muñoz et al., 2025).

However, a data-driven, technology-based circular transition has not been realized consistently. Empirical evidence based on the Natural Resource Based View (NRBV) shows that the manufacturing sector still has challenges with the transition from digital investment to circular outcomes because of lack of openness to data exchange, the absence of a data culture and business inertia in favour of small manageable pilots rather than a deeper business change required to become a smart circular economy (SCE) (Bühler, Schuster, Schmidt, & Pflaum, 2025). Complementary evidence indicates that many of the technical capabilities needed for making the transition to circular economy are already in place, but organizational factors (lack of time allocation, gaps in capability and knowledge, and lack of common understanding of circularity) are reported as a key limitation by approximately 60% of businesses, along with financial constraints (WEF et al., 2025).

The main thesis of this paper is that the implementation of digital circular initiatives often falls short due to organizational and human factors, not just technical ones. Digital tools are not a lack in the organizations, but digital dynamic capabilities to sense circular opportunities with data, an organizational culture to act on the data and behavioural awareness to break out of linear routines that are driven by cognitive biases. This argument aligns with the recent bibliometric studies that reveal that although there is increased research interest in the field of cognitive and behavioral barriers in adopting CE, they are still a less-studied barrier than their technical and economic counterparts (Musova, Musa, & Rech, 2025).

## 2. LIMITS OF TECHNOLOGY-CENTRIC CE ADOPTION

A large flow of CE scholarship has seen the implementation of a digital technology as a near-enough recipe for circularity: if companies install IoT sensors, if they use digital product passports or if they rely on blockchain-based traceability, resource loops will close. This assumption is complicated by recent systematic evidence. The review of 266 peer-reviewed studies published from 2016–2025 reveals

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that data-driven technologies are the most prominent in both the implementation of CE and the extent of the studies that include data collection, storage, analysis, and sharing (89% of studies), yet data-driven technologies are not consistently linked to actual circular performance, suggesting strategic and organizational challenges that remain to be overcome.

The recent literature brings out three particular restrictions on the technology-centric approach. First, technology without organizational readiness leads to pilots being offered instead of transformation being scaled: survey data reveals that only a quarter of businesses have used the same technology to scale circular solutions across the different strategic archetypes – and that comparable percentages are still only piloting within one or two of them (WEF et al., 2025). Second, the inter-organizational trust and data-sharing issues that are needed for circular value chains are not solved by digital infrastructure alone: manufacturing companies report that they are reluctant to share proprietary product and material data even if there are technical solutions in place (Bühler et al., 2025). Third, the ability to transform the digital signals into the circular action relies on management cognition: experimental evidence of inventory decisions in closed-loop supply chains indicates that the greater the complexity of the reverse (circular) material flow, the more likely that the manager will ignore important system variables, and make progressively less optimal decisions, with the latter being due to behavioural responses and not to differences in the information or interface presented to them.

Collectively, this evidence suggests that digital CE transitions are more of an organizational change challenge in which technology is a means, but not an end. This reframing inspires conceptual and theoretical work presented in the rest of the paper.

## 3. THEORETICAL FOUNDATIONS

### 3.1 Dynamic Capabilities Theory

Dynamic capabilities theory sees the ability of the firm to sense opportunities and threats, respond to them by making strategic investments and re-designing their business model, and transform their assets and routines in response (Teece, D. J., 2025). Derived from CE, dynamic capabilities are the routines through which companies transform digital information to create circular value, by sensing where the material or product value is lost, seizing opportunities to invest in circular business models, and transforming their structures, incentives and processes to maintain circularity at scale. A recent capability map derived from empirical research, obtained from the analysis of 37 automotive sustainability reports and expert interviews, identifies 74 micro foundations of capabilities related to the implementation of CE making explicit the link between this capability architecture and the larger research stream of digital-sustainability (Hoppe-Ludwig et al., 2025). The paper's theoretical mechanism between digital adoption and circular outcomes is based on dynamic capabilities.

### 3.2 Organizational Culture Theory

The theory of organizational culture is the set of common assumptions, values, and norms that help members understand and react to strategic change. This systematic review of organizational culture barriers to digital transformation defines ten categories of organizational culture barriers and 44 specific barriers, such as risk aversion, siloed decision rights and data-driven ways of working, and suggest that the barriers need to be overcome by deliberately developing an adaptive culture (Nugraha, Rusu, & Perjons, 2026). Qualitative evidence from manufacturing companies reveals the absence of an innovation-driven, data-oriented culture and of a supporting mindset within functions like sales and product development as key obstacles to smart circular economy, and a general organizational inertia that can be argued as a barrier for transformational change rather than incremental change (Bühler et al., 2025). This paper considers organizational culture as a moderating condition that can either stimulate or suppress the use of dynamic capabilities.

### 3.3 Behavioral Economics

Behavioral economics is more flexible in the assumption of full managerial rationality, acknowledging that such systematic cognitive biases have an impact on sustainability-related decision-making, including loss aversion, status-quo bias, and bounded attention. A bibliometric study of 814 multidisciplinary publications in the CE domain reveals that, although the explanatory value of cognitive and behavioral barriers has been increasingly acknowledged, these are still comparatively under-explored when compared to systemic and institutional barriers (Musova et al., 2025). Complementary experimental evidence reveals that the quality of the manager's decisions decreases gradually with the level of behavioural complexity of the circular reverse-flow systems, regardless of the information available (Naumov, S., 2025). This paper adds the micro-layer of behavioural economics to the explanation of why individual managers, even in a culture-appropriate and capable organization, may under invest in digital CE opportunities.

## 4. LITERATURE REVIEW

Recent academic inquiries have increasingly examined the organizational capabilities required to enable successful digital circular economy transitions across industries.

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Hoppe-Ludwig et al. (2025) presented the most detailed capability-level evidence, as they map 74 micro foundations of dynamic capability in the context of the implementation of CE in the automotive industry, explicitly placing digitalization into a larger "twin transformation" (digital + sustainability) research stream.

Khan et al. (2026) examine how visionary leadership/eco-innovation strategic orientation influences the adoption of CE practice for 262 manufacturing companies in Pakistan and find that digital transformation acts as a mediator between the two variables.

Turkcan, Imamoglu, Ince and Erat (2025), based on survey data from 204 manufacturing companies, proved that there is a link between digital capabilities and CE practices, and that when digital and environmental strategies are aligned, this relationship is even stronger, with CE practices acting as a mediator between the two, with the effect of digital capabilities on environmental and economic outcomes. Piedra-Muñoz et al. (2025) formulate a taxonomy of digital technologies and their connections to CE strategies, and suggest that the available documentation of digital technology-to-strategy mappings is incomplete, limiting managerial choices.

Bücker et al. (2025) compile 35 factors that influence customer acceptance of circular business models, 36 organizational practices for addressing these factors, and 19 enabling digital technologies.

In a systematic review published in R&D Management, Neri et al. (2025) explain that the main moderators and mediators in the relationship between digital technology and CE are management commitment, competencies, and digital-enabled dynamic capabilities, and advocate for research on the mechanisms – not the technology – that an organization uses.

Nugraha et al. (2026) systematically identify 44 specific organizational culture barriers to digital transformation and categorize them into ten thematic categories and connect the solutions for these barriers with the deliberate development of adaptive culture.

Kirchherr (2025) builds on evidence that scaling CE business models requires bundles of managerial competencies: ecosystem orchestration, organizational ambidexterity, and institutional ambidexterity, further emphasizing the importance of capability development, rather than access to technology alone, to scaling.

The table below (Table 1) is a detailed overview and synthesis of recent academic research on organizational capacities for digital transition towards a circular economy. It draws together the main findings and gaps in research that were found in the literature, providing a comprehensive overview of the state of the knowledge and outlining the areas for further research.

**Table 1: Synthesizing the Relevant Literature**

| Study (Author & Year) | Key Findings | Limitations / Research Gaps |
|---|---|---|
| Sahoo, Kumar, Mangla, & Ishizaka (2025) | Industry 4.0 improves information capability and supports CE performance through ambidexterity. | Cross-sectional survey limits causal inference; manufacturing-focused sample reduces applicability to other industries. |
| Khan et al. (2026) | Digital transformation links leadership and eco-innovation to CE adoption. | Evidence is limited to Pakistani manufacturing firms. |
| Turkcan, Imamoglu, Ince, & Erat (2025) | Digital capabilities and strategic alignment improve CE practices and performance. | Focuses only on manufacturing firms. |
| Dogra, Bhatt, Parrey, Jasrotia, & Gandotra (2026) | Big Data, IoT, and Blockchain strengthen CE capabilities in SMEs. | Focuses on Indian manufacturing SMEs, limiting generalizability. |
| Chaudhary, Alshaghdali, & Sasso (2025) | Digital capabilities strengthen organizational resilience when resource conservation is embedded as a strategic capability. | Focused only on SMEs. |
| Bücker et al. (2025) | Identified 35 customer acceptance factors, 36 organizational practices, and 19 enabling digital technologies for circular business models. | Focuses more on customer acceptance than implementation. |
| Neri et al. (2025) | Management commitment and dynamic capabilities drive digital CE success. | Review-based evidence; lacks primary empirical validation and recommends deeper investigation of organizational mechanisms. |

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| | | |
|---|---|---|
| Musova, Musa, & Rech (2025) | Bibliometric review shows cognitive and behavioral barriers remain underexplored compared with institutional and systemic barriers. | Does not empirically test identified barriers or their organizational effects. |
| Nugraha, Rusu, & Perjons (2026) | Identified major organizational culture barriers to digital transformation. | Not specific to CE implementation. |
| Bühler et al. (2025) | Organizational culture is a key barrier to smart CE adoption. | Based on expert opinions rather than large-scale empirical evidence. |

## 5. CONCEPTUAL FRAMEWORK

On the basis of the above theoretical background and literature review, this paper suggests an integrative conceptual framework, as shown in Figure 1, which is Capabilities → Adoption → Circular Viability. The framework establishes organisational capabilities (dynamic capabilities, organizational culture, and behavioral/cognitive factors) as the drivers of the level and quality of implementation of a digital circular economy (comprising digital sensing, digital seizing, and digital transforming), in turn influencing the level of circular viability outcomes (resource-loop efficiency, operational resilience, and economic/environmental/social value creation). Based on cross-industry variation reported in more recent survey evidence (Hoppe-Ludwig et al., 2025), a set of contextual moderators are found: the maturity of the industry in terms of digitization, the stringency of regulations, the maturity of digital infrastructure and the size of the firm, which influence the strength of the circular outcomes and the learning they generate; a feedback loop is observed when evidence of circular outcomes provides a basis for learning to shape future capability development (WEF et al., 2025).

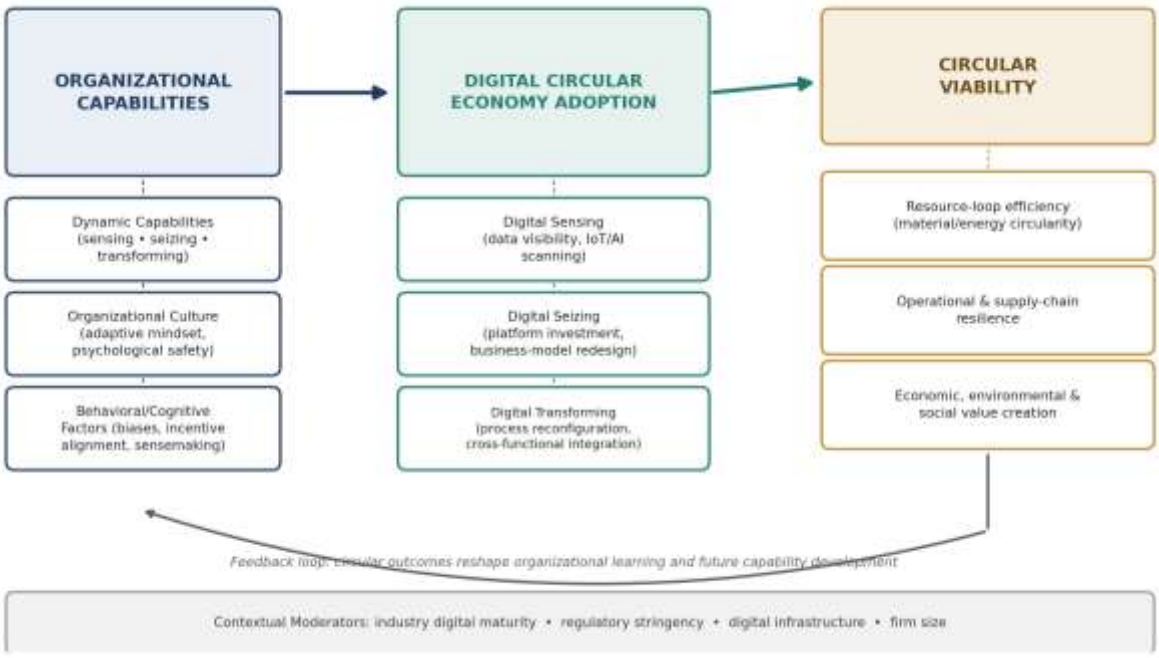


**Figure 1. Conceptual framework linking organizational capabilities, digital circular economy adoption, and circular viability. Source: Authors' own conceptualization, synthesized from Hoppe-Ludwig et al. (2025), Khan et al. (2026), Neri et al. (2025), and WEF et al. (2025).**

The framework leads to three propositions. 1: Digital technology investment positively moderates the relationship between dynamic capabilities and circular outcomes of a firm. 2: A culture which is adaptive and data-driven is a prerequisite to the digital sensing and seizing capability to become a scaled (not pilot) circular adoption. 3: managerial debiasing routines which offset loss aversion and status-quo positively moderate the seizing-to-transforming transition in digital CE adoption.

## 6. METHODOLOGY

The study has a conceptual and secondary-source research method, which is suitable for theory synthesis and framework construction. Literature was retrieved by conducting a targeted search on the databases listed above using the keywords: digital circular economy, dynamic capabilities, organizational culture, behavioral economics and CE adoption; and subsequent relevance screening on the theory of the paper. No primary survey or interview data or perception data were gathered and all empirical claims are attributed to and limited

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by cited secondary data. The method is similar to the one adopted by the conceptual paper method in the field of management and sustainability research, where the key is the integration of theory, not the testing of new empirical material.

## 7. DATA ANALYSIS AND FINDINGS

The secondary sources that were synthesized are consistent, organizational and human factors are reported as barriers to digital CE adoption as often, or more often, than financial or technical factors. Each reviewed source reported a set of barriers, which have been consolidated in Table 2.

***Table 2: Organizational and behavioral barriers to digital circular economy adoption reported in the 2024–2026 literature***

| Barrier Category | Illustrative Finding | Approx. Prevalence / Evidence | Source |
|---|---|---|---|
| Organizational / stakeholder engagement | Insufficient time allocation, capability gaps, lack of common understanding of circularity | ~60% of surveyed businesses cite as key barrier | WEF, Bain & Company, & University of Cambridge (2025) |
| Financial constraints | High upfront investment and ongoing operating costs | >65% of surveyed businesses cite as major challenge | WEF, Bain & Company, & University of Cambridge (2025) |
| Organizational culture | Lack of data-oriented, innovation-driven culture; organizational inertia favoring incremental pilots | 12 of 61 experts identify culture as a key SCE barrier theme | Bühler, Schuster, Schmidt, & Pflaum (2025) |
| Cultural barriers to digital transformation (general) | 44 specific cultural barriers across 10 thematic categories | Systematic literature review | Nugraha, Rusu, & Perjons (2026) |
| Cognitive / behavioral barriers | Underexplored relative to systemic/institutional barriers across 4 decades of research | 814 publications reviewed (1983–2023) | Musova, Musa, & Rech (2025) |
| Managerial decision complexity | Decision quality degrades as reverse-flow (circular) complexity increases | Experimental inventory-decision study | Naumov (2025) |

*Source: Compiled by the authors from cited peer-reviewed sources.*

To date, the most up-to-date secondary data on the dimensions associated with businesses' expectations of circularity comes from a global survey of 420 top executives from 10 manufacturing industries (WEF/ Bain/Cambridge), and is summarized in Table 3.

**Table 3: Executive expectations of circular economy value creation, three-year horizon (n = 420 global executives, 10 manufacturing industries).**

| Value Dimension | Positive Impact Expected (3-Year Horizon) | Neutral | Negative Impact Expected |
|---|---|---|---|
| Revenue | 73% | 17% | 10% |
| Resilience | 65% | 24% | 11% |
| GHG emissions reduction | 65% | 13% | 22% |
| Cost savings | 56% | 25% | 19% |

*Source: World Economic Forum, Bain & Company, & University of Cambridge (2025).*

The findings from Table 1 and 2, corroborate the paper's main claim that, when digital circular initiatives fail, it is predominantly because of organizational and/or behavioral reasons (reported in the literature) rather than the fact that the right technology is not available.

## 8. MANAGERIAL IMPLICATIONS

- Prioritize capacity development over a big investment in digitalization. Before scaling digital CE platforms, companies should evaluate dynamic capability maturity (sensing, seizing, transforming) as the most common company reported barrier to scale is not a technology barrier, but rather a capability barrier. (Hoppe-Ludwig et al., 2025; WEF et al., 2025).
- Get cross-functional executive buy-in. Some 70% of the businesses surveyed identified embedding circularity in business strategy with an executive cross functional mandate and clear incentives as a key enabler. (WEF et al., 2025).
- See organizational culture as an intentional design goal. Targeted interventions that fit into a framework of an adaptive-culture need to be targeted at the cultural barrier categories identified in the literature, such as risk aversion and siloed decision rights. (Nugraha, Rusu, & Perjons, 2026).

- Embed debiasing practices in circular decision-making processes. There is evidence that when there is a reverse flow of information the performance of the manager becomes more difficult with increasing complexity, so firms should use decision support routines, checklists, or structured review processes, rather than relying on the manager's unaided judgment.
- Pursue data sharing trust initiatives. Reluctance to share proprietary product and material data is a recurring barrier, so companies should go hand-in-hand with the digital infrastructure investment with contractual and governance systems that foster inter-organizational trust. (Bühler et al., 2025).
- Coordinate Digital and Environmental Strategy directly. Research suggests that digital and environmental strategies are more effective when they are integrated, not carried out as two distinct lines of action, in order to enhance the performance impact on CE outcomes. (Turkcan, Imamoglu, Ince, & Erat, 2025).

## 9. RESEARCH AGENDA

- Extensions of the capability maps that are currently available should also be extended by including dynamic-capability microfoundations for digital CE on a longitudinal level within the same organizations.
- Behavioral interventions: Experimental research is required to determine which specific debiasing interventions (e.g., structured decision supports, simplified dashboards) are effective in reducing the quality of the managerial decisions in complex circular systems.
- Cross Cultural comparison: as far as the organisational culture barriers to digital transformation are concerned, the majority of studies conducted had been based on western and east Asian samples, so cross-cultural studies across other regional and institutional contexts are warranted.
- Further research is needed on the nature and means of creation of digital-CE dynamic capability of a SME as compared to a large multinational.
- There is still lack of consistency and comparability when it comes to defining the concepts of circular viability: the combination of resource-loop efficiency, resilience and value creation.

## 10. CONCLUSION

This study has suggested that the poor performance of digital circular economy projects is not due to the technology but to organizational and human factors. The paper synthesised the recent (2024-2026) peer-reviewed literature and secondary institutional reports, and introduced a conceptual framework that merged the dynamic capabilities theory, the organizational culture theory and behavioural economics into a framework called Capabilities → Adoption → Circular Viability: organizational capabilities as the mechanism transforming digital investment into circular outcomes moderated by culture and behavioural/cognitive factors. The reviewed evidence very clearly indicates that organizational engagement, cultural adaptability and managerial decision quality are mentioned as barriers to digital CE adoption more often than, or as often as, financial or technical barriers. This means that for managers, digital CE strategy needs to be thought of as an organizational change program, with technology being a part of that program, rather than a technology deployment program, with organizational change being an add-on.

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