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UNIVERSITY–WORKPLACE KNOWLEDGE TRANSFER IN THE AGE OF AI, PART I:

BARRIERS AND DELAY MECHANISMS BETWEEN HIGHER EDUCATION AND INDUSTRY

This study examines barriers to university–workplace knowledge transfer (KT) in the context of artificial intelligence (AI) and digital transformation, with a particular focus on the emergence of delays. Based on a bibliometrically informed review of recent literature (2020–2026), 82 relevant studies were identified, from which 16 were selected for in-depth qualitative synthesis. The findings reveal six recurring barrier categories, including strategic misalignment, legal and transactional frictions, resource constraints, cultural gaps, internal digitalization deficits and limited absorptive capacity. The study introduces a process-oriented perspective by linking these barriers to delay mechanisms across different KT phases. Results suggest that delays are systemic, cumulative and reinforced across multiple levels. The paper contributes a dynamic understanding of KT inefficiencies, forming the basis for a subsequent analysis of enabling mechanisms and governance solutions.

Introduction

The acceleration of artificial intelligence (AI) and digital transformation has intensified the strategic importance of knowledge transfer between universities and workplaces. Organizations increasingly rely on external knowledge sources to redesign processes, adopt data-driven technologies, and develop new capabilities, while universities are expected to contribute not only skilled graduates but also applied research and continuous learning solutions that respond to rapidly evolving labor-market demands (Doering, & Timinger, 2020; Evans, & Miklosik, 2023; Arya et al., 2025). In this context, university–workplace collaboration has become a central mechanism for innovation, skills development and regional competitiveness.

The selected time frame of this review (2020–2026) is justified not only by the post-COVID acceleration of digital transformation but also by the unprecedented growth of artificial intelligence research and applications during this period. Bibliometric studies indicate that AI-related scientific output increased substantially after 2022, particularly following the emergence of generative AI technologies and large language models, which accelerated organizational interest in AI adoption, digital skills and university–industry collaboration (Dwivedi et al., 2023; Donthu et al., 2024). Consequently, the period after 2022 represents a qualitatively different phase in the evolution of AI-driven knowledge transfer, making the 2020–2026 interval particularly relevant for examining barriers and delays in university–workplace collaboration.

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At the same time, the rapid pace of AI-driven technological change has introduced a critical new dimension to knowledge transfer: time. In contrast to more stable domains, where knowledge may retain its relevance over longer periods, AI-related knowledge is highly time-sensitive, and its value depends on how quickly it can be transferred, adapted and embedded into practice. As a result, delays between knowledge generation and its application can significantly reduce the effectiveness and impact of collaboration. Despite this, the temporal dynamics of knowledge transfer—particularly the mechanisms through which delays emerge—remain underexplored in the existing literature.

Although policy frameworks such as Industry 4.0 and Education 5.0 strongly promote closer university–industry engagement, empirical studies suggest that knowledge transfer remains uneven and frequently underperforms expectations. Prior research consistently shows that successful collaborations depend on more than technological compatibility. Senior management commitment, effective communication structures and active stakeholder involvement have been identified as key enabling conditions, particularly in complex digitalization projects (Evans, & Miklosik, 2023). However, even in the presence of these enabling factors, many collaborations fail to achieve timely and effective outcomes.

The literature points to a persistent set of barriers that constrain the translation of academic knowledge into workplace practice. Strategic goal misalignment between universities and firms, rigid contractual and intellectual-property regimes, limited resources, and cultural or communicative distance continue to slow collaboration, especially in AI-related projects that require rapid iteration and shared data infrastructures (Álvarez-Castañón, & Palacios-Bustamante, 2021; Ruan et al., 2024). In addition, differences in organizational routines, incentives and capabilities further complicate the transfer process, often resulting in fragmented or delayed outcomes.

Beyond technological and organizational barriers, the literature increasingly highlights the importance of human resource-related factors in shaping knowledge-transfer outcomes. In AI-driven environments, knowledge transfer depends heavily on employees' digital competencies, learning orientation, motivation to engage in continuous upskilling, and the existence of organizational cultures that support experimentation and knowledge sharing. Deficiencies in these areas may create additional delays by limiting both the ability of universities to prepare relevant competencies and the ability of firms to absorb and apply new knowledge in practice (Polese et al., 2021; Tereshchenko et al., 2024; Arya et al., 2025).

A notable limitation of existing research is its strong focus on successful collaboration cases, which risks obscuring the structural and relational conditions that lead to stalled or failed initiatives. Moreover, most studies treat knowledge transfer as a static or outcome-oriented phenomenon, rather than as a multi-stage process in which delays can accumulate across different phases. This limitation is particularly relevant in AI-driven contexts, where the speed of knowledge flows is a critical determinant of value creation. Recent Triple Helix–oriented studies therefore call for more integrative analyses that consider universities, industry and government as interdependent actors whose interactions shape both enabling conditions and constraints for knowledge transfer (Lessa et al., 2024; Fu, & Ji, 2024).

Against this background, this review adopts a process-oriented perspective to examine how knowledge transfer unfolds in AI- and digitally driven collaboration, with a particular focus on the emergence of delays. The study addresses three linked questions. First, it synthesizes which organizational, relational, process and structural conditions most consistently shape university–workplace knowledge transfer in AI- and digitally driven contexts. Second, it identifies recurring barrier patterns reported across studies and examines how these barriers contribute to delays at different stages of the transfer process—from initiation and formalization to implementation and

embedding. Third, it explores how these barriers are distributed across universities, industry and government within Triple Helix constellations, and how the alignment or misalignment of these roles influences the timeliness and effectiveness of knowledge transfer.

By focusing on the mechanisms through which barriers generate delays, this study aims to contribute a more dynamic understanding of knowledge transfer in the age of AI. While the present paper concentrates on identifying and structuring these delay mechanisms, the second part of the study builds on these findings by examining enabling practices, governance mechanisms and a multi-layer framework designed to reduce delays and improve the effectiveness of university–workplace knowledge transfer.

Methodology

To examine how AI-enabled knowledge transfer (KT) between universities and industry is discussed in recent research, the study applied a bibliometrically informed search and selection strategy, reported in line with PRISMA principles, that combines elements of scoping-review methodology with structured reporting standards for transparent and reproducible literature reviews (Arksey, & O'Malley, 2005; Tricco et al., 2018; Page et al., 2021; Samuel, 2024; Xue et al., 2024). Searches were carried out in Web of Science Core Collection and Scopus, focusing on the intersection of three pillars: (1) KT, university–industry collaboration and innovation ecosystems; (2) artificial intelligence, digital skills and digital transformation; and (3) higher education, workplace learning and lifelong learning, while explicitly excluding highly technical, algorithm-focused AI studies. The time frame was limited to 2020–2026 to capture post-COVID digitalization, the emergence of Industry 5.0 and Education 5.0 paradigms, and the rapid acceleration of AI research and applications that occurred after 2022 with the rise of generative AI technologies and large language models (Dwivedi et al., 2023; Donthu et al., 2024). The Web of Science search produced 211 records and the Scopus search 525; after applying subject, document-type and access filters and removing 57 duplicates, 151 unique publications remained. A two-stage conceptual screening then excluded papers that did not substantively address KT, university–industry collaboration or organizational aspects of AI and digital transformation, resulting in 82 fully relevant studies. From this corpus, 16 "best-of" articles were selected for in-depth qualitative synthesis based on conceptual clarity, methodological transparency and explicit contribution to understanding KT in higher-education–industry contexts. The funnel-shaped procedure and the mapping of recurring themes were guided by principles of bibliometric synthesis and co-occurrence analysis that combine quantitative mapping with qualitative thematic integration (Tricco et al., 2018; Shen & Ho, 2020; Barrot, 2023; Akman, & Erdirençelebi, 2024).

Table 1 presents the 16 publications selected for in-depth qualitative synthesis from the final corpus of 82 relevant studies. The selected articles were grouped according to their dominant contribution to the research topic. The sample includes studies on university–industry collaboration barriers and enablers, AI-enabled knowledge-transfer infrastructures, Triple Helix and innovation ecosystem models, open innovation, value co-creation, and curriculum- or capability-oriented approaches. This grouping shows that the review is based on a multidisciplinary evidence base combining management, higher education, innovation studies and digital transformation perspectives. Together, these studies support the identification of recurring barriers and delay mechanisms in university–workplace knowledge transfer.

TABLE 1. OVERVIEW OF THE 16 STUDIES SELECTED FOR IN-DEPTH QUALITATIVE SYNTHESIS

Category	Authors	Article title
University–industry collaboration and KT barriers/enablers	Evans, & Miklošík	*Driving Digital Transformation: Addressing the Barriers to Engagement in University-Industry Collaboration*
University–industry collaboration and KT barriers/enablers	Evans, Miklošík, & Du	*University-industry collaboration as a driver of digital transformation: Types, benefits and enablers*
University–industry collaboration and KT barriers/enablers	Tereshchenko et al.	*Emerging best strategies and capabilities for university–industry cooperation*
University–industry collaboration and KT barriers/enablers	Tereshchenko et al.	*Practice-Based Views on Key Success Elements in University-Industry Collaborative Activities*
AI and digital KT infrastructures	Asizbaev et al.	*Management Information System in the Interaction Between Universities and Business in the Age of Artificial Intelligence*
AI and digital KT infrastructures	Doering, & Timinger	*Industry-oriented Digital Transformation in Universities to Facilitate Knowledge Transfer*
AI and digital KT infrastructures	Arya et al.	*AI-enhanced competency transfer hubs: A conceptual framework for university-industry engagement and knowledge sharing*
AI and digital learning/capability development	Renz, & Hilbig	*Prerequisites for Artificial Intelligence in Further Education*
Triple Helix and innovation ecosystems	Cai, & Etzkowitz	*Theorizing the Triple Helix Model: Past, Present, and Future*
Triple Helix and innovation ecosystems	Fu, & Ji	*Government–University Relationship in China's AI Talent Development: A Triple Helix Perspective*
Triple Helix and innovation ecosystems	Lessa et al.	*Innovative Development in a University Environment Based on the Triple Helix Concepts*
Triple Helix and innovation ecosystems	Navarro et al.	*Bridging Academia and Industry in the Era of Industry 4.0 by Means of the Triple Helix*
Knowledge transfer, co-creation and market alignment	Ruan, Zhang, & Hu	*The Connection Between Academic Achievements and Market Demand*
Knowledge transfer, co-creation and market alignment	Polese, Ciasullo, & Montera	*Value Co-creation in University-Industry Collaboration*
Open innovation and local enterprise collaboration	Álvarez-Castañón, & Palacios-Bustamante	*Open Innovation from the University to Local Enterprises*
Education, curriculum and Industry 4.0 outcomes	Esangbedo et al.	*The Role of Industry-Academia Collaboration in Enhancing Educational Opportunities and Outcomes under the Digital Driven Industry 4.0*

Source: Author's compilation

Key Barriers in University–Workplace Knowledge Transfer

Effective knowledge transfer (KT) between universities and workplaces in the digital technology and AI domain faces multifaceted barriers. Six major categories of barriers are identified, each impacting the flow of knowledge from academia to industry. *Table 2* summarizes these barrier categories with examples and potential outcomes drawn from recent studies. A reflective discussion follows, highlighting the significance of each category in hindering or slowing university–workplace KT.

TABLE 2. MAJOR BARRIERS TO UNIVERSITY–WORKPLACE KNOWLEDGE TRANSFER IN DIGITAL TECHNOLOGIES/AI

Barrier category	Primary locus	Dominant KT phase affected	Main effect on knowledge transfer	Main supporting studies
Strategic and goal misalignment	University–industry interface	Initiation and alignment	Divergent incentives and time horizons weaken shared objectives, leading to fragile project foundations and limited long-term commitment.	Evans, & Miklosik, 2023; Doering, & Timinger, 2020; Lessa et al., 2024
Transactional and legal barriers	Institutional and regulatory frameworks	Formalization and contracting	Complex IP regimes and administrative procedures slow down agreement-making and increase uncertainty.	Evans, & Miklosik, 2023; Ruan et al., 2024; Álvarez-Castañón, & Palacios-Bustamante, 2021
Resource-related barriers	Organizational capacity on both sides	Implementation and scaling	Insufficient funding, time, digital competence and HR development capacity constrain the ability to sustain and expand KT activities.	Evans, & Miklosik, 2023; Tereshchenko et al., 2024; Arya et al., 2025
Cultural and communication barriers	Interpersonal and relational level	Collaboration and coordination	Incompatible professional logics and weak shared language undermine trust, reducing effective cooperation and follow-through.	Evans, & Miklosik, 2023; Álvarez-Castañón, & Palacios-Bustamante, 2021; Ruan et al., 2024
Internal digitalization barriers in universities	University internal systems	Integration into education and KT management	Fragmented digital infrastructure and rigid processes delay the incorporation of workplace technologies into curricula and collaborative projects.	Doering, & Timinger, 2020; Evans, & Miklosik, 2023; Arya et al., 2025
Absorptive capacity barriers on the workplace side	Firm-level capabilities	Uptake and utilization	Limited skills, self-efficacy and learning routines prevent academic knowledge from being internalized and transformed into practice.	Lessa et al., 2024; Ciasullo et al., 2021; Polese et al., 2021; Rotimi et al., 2025

Source: Author's compilation

Although these barriers are not unique to AI, AI amplifies their impact because knowledge becomes outdated faster, data access becomes strategically important, and specialized competencies are harder to develop and retain.

Strategic and goal misalignment constitutes a persistent barrier to university–workplace knowledge transfer. Universities are primarily rewarded for scholarly outputs and discipline-based knowledge creation, while firms expect collaboration to deliver concrete solutions, validated technologies and access to talent supporting digital transformation. When project aims are not jointly defined, universities tend to prioritise research depth and publications, whereas companies emphasise speed, efficiency and practical outcomes, creating tensions around priorities and timelines (Evans, & Miklosik, 2023). Research further shows that many small and medium-sized enterprises hesitate to engage with universities due to uncertainty about whether academic partners understand their needs, while universities must simplify internal structures and become more responsive to act as effective partners (Doering, & Timinger, 2020). At the ecosystem level, insufficient coordination and unclear roles within university-centred innovation systems weaken synergies between university, industry and government actors, increasing the risk of fragmented and short-lived initiatives (Lessa et al., 2024). In AI-related collaboration, this misalignment is amplified by the shorter life cycle of AI knowledge and the faster implementation expectations of firms.

Transactional and legal arrangements frequently act as structural bottlenecks in university–industry collaboration. Conflicts over intellectual property, unclear contractual terms and rigid administrative procedures increase uncertainty and can delay or block cooperation altogether (Evans, & Miklosik, 2023). Empirical evidence from AI-related collaboration in China illustrates how ambiguous IP ownership rules and complex university legal procedures delayed the translation of academic research into commercial products, with prolonged disputes preventing timely market entry (Ruan et al., 2024). Beyond individual cases, institutional and policy environments further shape these barriers, as rigid procurement rules and bureaucratic procedures constrain open-innovation initiatives, while the lack of integrated information systems limits the potential of digital tools to support contract management and governance (Álvarez-Castañón, & Palacios-Bustamante, 2021; Asizbaev et al., 2025). In AI projects, data ownership, algorithmic transparency and ethical governance further increase contractual complexity and delay formal collaboration.

Even when strategic alignment and contractual frameworks are in place, resource-related constraints often undermine knowledge-transfer efforts. Universities increasingly depend on shrinking public budgets, while industry funding for collaborative research remains limited and frequently short-term, discouraging sustained, application-oriented cooperation (Evans, & Miklosik, 2023). In addition, many institutions lack adequate human and technical capacity, including coherent digital infrastructure and long-term investment strategies, to support the digital transformation of knowledge-transfer processes (Doering, & Timinger, 2020). On the firm side, especially among small and medium-sized enterprises, growing financial and skill demands associated with digitalization further limit the ability to engage in long-term partnerships, reducing the scale and continuity of collaborative activities (Tereshchenko et al., 2024). From an HR perspective, resource constraints include digital talent shortages and insufficient reskilling opportunities. In AI-driven environments, these limitations are amplified by the need for advanced infrastructure and highly specialized competencies, slowing knowledge absorption and implementation (Tereshchenko et al., 2024; Arya et al., 2025).

Cultural and communication barriers arise from differences in professional norms, vocabularies and working styles between academic and workplace actors. Academic partners often prioritize methodological rigor and critical reflection, while practitioners emphasise pragmatism, speed

and operational impact, leading to incompatible approaches to problem-solving and decision-making (Evans, & Miklosik, 2023). These tensions are reinforced in broader socio-cultural contexts, where universities may frame innovation in technocratic terms that differ from how local enterprises interpret their everyday challenges, limiting mutual understanding (Álvarez-Castañón, & Palacios-Bustamante, 2021). In AI-related collaborations, such misalignments can generate mistrust and misunderstanding within the university–industry–government constellation, undermining shared sense-making and sustained engagement (Ruan et al., 2024). AI projects also require cooperation between data experts, domain specialists and end users, making shared language and mutual understanding even more critical.

Internal digitalization barriers within universities further constrain effective knowledge transfer. Studies show that many institutions continue to rely on fragmented, paper-based and slow administrative processes, making the management of collaborative projects reactive rather than agile (Doering, & Timinger, 2020). The absence of integrated digital systems and internal support structures for matchmaking, contracting and relationship management leads to missed opportunities and delayed projects (Evans, & Miklosik, 2023). Moreover, emerging collaboration models, such as AI-enhanced competency transfer hubs, presuppose access to advanced digital infrastructure, reliable data and digitally skilled staff—capabilities that many universities currently lack (Arya et al., 2025). As a result, universities struggle to keep pace with workplace innovation cycles and to integrate new digital technologies into curricula and joint projects in a timely manner. In AI-related contexts, slow curriculum renewal and fragmented internal systems increase the gap between university knowledge and workplace needs.

Finally, knowledge transfer may fail even when universities perform effectively if workplace partners lack sufficient absorptive capacity. Firms require prior related knowledge, skilled personnel and appropriate organizational routines to recognize, assimilate and exploit academic input. Where such capabilities are weak, university collaboration remains limited to isolated projects rather than translating into sustained organizational learning (Lessa et al., 2024). Case-based evidence shows that firms often participate in co-creation settings as passive users rather than active integrators of knowledge, with the absence of internal champions and learning routines preventing diffusion beyond pilot initiatives (Ciasullo et al., 2021). From an HR perspective, absorptive capacity depends on employee competencies, learning motivation and organizational support for continuous development. Therefore, effective KT requires not only access to external knowledge, but also HR practices that support its internalization and application (Polese et al., 2021; Rotimi et al., 2025). These findings suggest that barriers to knowledge transfer stem not only from academic rigidity, but also from insufficient firm-level capacities to internalize and apply externally generated knowledge.

Table 3 provides a synthetic overview of the main barriers to university–workplace knowledge transfer by positioning each barrier according to its primary locus within the system, the dominant phase of the knowledge-transfer process it affects, and its typical impact on collaboration outcomes. By condensing the detailed findings into a comparative framework, the table highlights that barriers emerge at different structural points and stages of the transfer process, reinforcing the systemic nature of delays in AI- and digitally oriented knowledge transfer.

TABLE 3. OVERVIEW OF MAJOR KNOWLEDGE-TRANSFER BARRIERS AND THEIR DOMINANT POINTS OF IMPACT

Barrier category	Primary locus	Dominant KT phase affected	Main effect on knowledge transfer
Strategic and goal misalignment	University–industry interface	Initiation and alignment	Divergent incentives and time horizons weaken shared objectives, leading to fragile project foundations and limited long-term commitment.
Transactional and legal barriers	Institutional and regulatory frameworks	Formalization and contracting	Complex IP regimes and administrative procedures slow down agreement-making and increase uncertainty, often delaying or blocking collaboration.
Resource-related barriers	Organizational capacity (both sides)	Implementation and scaling	Insufficient funding, time and digital competence constrain the ability to sustain and expand knowledge-transfer activities.
Cultural and communication barriers	Interpersonal and relational level	Collaboration and coordination	Incompatible professional logics and weak shared language undermine trust, reducing effective cooperation and follow-through.
Internal digitalization barriers (universities)	University internal systems	Integration into education	Fragmented digital infrastructure and rigid processes delay the incorporation of workplace technologies into curricula and projects.
Absorptive capacity barriers (workplace)	Firm-level capabilities	Uptake and utilization	Limited skills, self-efficacy and learning routines prevent academic knowledge from being internalized and transformed into practice.

Source: Author's compilation

TABLE 4. HR-RELATED BARRIERS TO UNIVERSITY-WORKPLACE KNOWLEDGE TRANSFER

HR barrier	Manifestation	Potential consequence
Digital skill gaps	Lack of AI and data competencies	Slow knowledge absorption
Insufficient reskilling and upskilling	Limited continuous training opportunities	Delayed implementation
Low employee self-efficacy	Resistance toward new technologies	Weak adoption
Weak learning culture	Limited knowledge sharing	Fragmented knowledge transfer
Lack of leadership support	Low managerial commitment to learning	Reduced collaboration effectiveness
Talent shortages	Insufficient experts and boundary spanners	Reduced KT capacity

Source: Author's compilation

Table 4 highlights the HR-related barriers that affect university–workplace knowledge transfer. It shows that digital skill gaps, limited reskilling, low self-efficacy, weak learning cultures, insufficient leadership support and talent shortages can slow the absorption and application of external knowledge. In AI-driven contexts, these barriers are especially relevant because employee competencies must be continuously updated.

Discussion

The findings of this review show that university–workplace knowledge transfer (KT) in AI- and digitally driven contexts is shaped by a stable set of recurring barriers that persist across countries, sectors and institutional settings. Strategic misalignment between universities and firms, transactional and legal frictions, resource constraints, cultural and communication gaps, internal digitalization deficits in universities and limited absorptive capacity on the workplace side consistently constrain the translation of academic knowledge into organizational practice (Doering, & Timinger, 2020; Álvarez-Castañón, & Palacios-Bustamante, 2021; Evans, & Miklosik, 2023; Ruan et al., 2024; Lessa et al., 2024). Importantly, these barriers rarely operate in isolation: strategic misalignment amplifies contractual complexity, weak internal digital systems increase administrative burden, and limited absorptive capacity in firms reduces the returns of otherwise well-designed collaborations. In AI-related projects, where speed, data access and iterative experimentation are critical, the cumulative effect of these constraints contributes to persistent time lags between knowledge generation and use.

These findings also highlight that the problem of knowledge transfer in AI-intensive environments cannot be fully understood without explicitly considering its temporal dimension. While the literature has traditionally focused on structural and relational aspects of university–industry collaboration, significantly less attention has been paid to how delays emerge and accumulate throughout the transfer process. In rapidly evolving technological domains such as artificial intelligence, the timing of knowledge transfer becomes a critical success factor. As prior research indicates, misalignment between academic research cycles and industry innovation timelines represents a fundamental barrier that reduces the effectiveness and impact of collaboration (Arya et al., 2025). In parallel, Industry 4.0–related studies point to a persistent gap between the competencies developed within higher education systems and the real-time needs of industry, further reinforcing the importance of timely and adaptive knowledge-transfer mechanisms (Navarro et al., 2024).

Building on these insights, the results of this study suggest that knowledge-transfer barriers can be more accurately understood as sources of delay within a multi-stage process. Rather than functioning as isolated obstacles, they generate specific types of temporal disruption that affect different phases of collaboration. Strategic misalignment slows down the initiation and alignment of joint projects, while transactional and legal barriers delay formalization and contracting processes. Cultural and communication differences weaken collaboration dynamics, reducing the efficiency of knowledge exchange, and resource or digitalization constraints interrupt implementation and scaling. Finally, limited absorptive capacity on the workplace side delays or even prevents the effective embedding of knowledge into organizational routines. Through this lens, knowledge transfer emerges as a time-sensitive, cumulative process in which delays at different stages reinforce one another and contribute to systemic inefficiencies.

From a broader perspective, these findings confirm that delays in university–workplace knowledge transfer are inherently systemic. They arise from the interaction of multiple constraints across structural, organizational, relational and capability levels, rather than from single, isolated factors. This interpretation is consistent with the logic of the Triple Helix model, which emphasizes the interdependent roles of universities, industry and government in shaping innovation outcomes (Cai, & Etzkowitz, 2020). In this context, inefficiencies in knowledge transfer can be understood as the result of misalignment not only within organizations but also across institutional spheres, where coordination failures and fragmented responsibilities contribute to delayed outcomes.

Importantly, the systemic nature of these delays also implies that isolated interventions are unlikely to produce substantial improvements. Addressing knowledge-transfer inefficiencies in AI-driven contexts requires coordinated action across multiple actors and levels, including the alignment of strategic objectives, the reduction of administrative and legal frictions, the strengthening of digital infrastructures, and the development of absorptive capacities within firms. However, while this study focuses on identifying and structuring the mechanisms through which barriers generate delays, it does not yet fully explore the corresponding solutions and enabling conditions.

Accordingly, the second part of this research builds directly on these findings by shifting the focus from barriers to enablers and solution mechanisms. It examines how effective knowledge transfer can be supported through trust-based partnerships, structured collaboration models, digitalized processes, innovation ecosystems and enhanced absorptive capacity. Furthermore, it develops a multi-layer conceptual framework that integrates these enabling factors with the differentiated responsibilities of universities, industry and government within a Triple Helix perspective, offering a more comprehensive basis for reducing delays and improving the effectiveness of AI-related knowledge transfer.

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