

Tacit Knowledge in University Research Commercialisation: Relational Dynamics and Ethical Tensions

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Abstract: Tacit knowledge plays a critical yet often underexamined role in the commercialisation of university research. Although universities increasingly rely on formal mechanisms such as patents and licences to capture value, much of the knowledge with commercial relevance remains embedded in researchers' experience, judgement, and day-to-day practices. This makes it difficult to articulate and transfer through formal channels alone, and suggests that current approaches to commercialisation may overlook important aspects of how knowledge becomes usable and meaningful in practice. To address this, this study develops an integrated conceptual model exploring how tacit knowledge is mobilised in university research commercialisation, with particular attention to the roles of relational dynamics and ethical tensions. By synthesising the SECI model (socialisation-externalisation-combination-internalisation) and absorptive capacity theory, the article shifts the focus from artefact-centric technology transfer to relational and institutionally constrained knowledge processes. The framework introduces four theoretical propositions, highlighting that tacit knowledge does not move as a clearly defined asset but rather depends heavily on the industry partner's potential and realised absorptive capacity, as well as the depth of shared understanding. Furthermore, the analysis reveals that ethical tensions and ownership ambiguities—particularly regarding uncoded knowledge—act as structural boundaries that actively disrupt knowledge externalisation. Overall, the study develops a process-oriented view of research commercialisation, emphasising that mobilising tacit knowledge depends on interaction, capability, and institutional conditions. It suggests that universities could benefit from complementing formal, artefact-based approaches with capability-building practices that support sustained collaboration, clearer governance of knowledge ownership, and the alignment of academic and commercial values across organisational boundaries.

Keywords: Tacit knowledge, University-industry collaboration, Absorptive capacity, Science commercialisation, Research ethics

1. Introduction

Tacit knowledge that is embedded in researchers' skills, experience, and problem-solving practices constitutes a substantial yet underexploited driver of science-based commercial opportunities (Polanyi, 1966). Although universities increasingly depend on formal knowledge management systems and intellectual property mechanisms to valorise research outputs, many commercially valuable insights remain difficult to codify and transfer through patents or licensing alone. This leads to a contradiction in university-industry collaborations because the insights most crucial for innovation are often the ones that traditional commercial metrics fail to capture (Ankrah & AL-Tabbaa, 2015).

Prior research suggests that social interaction, internalisation processes, and self-motivation support tacit knowledge acquisition and enhance research performance in higher education contexts (Zhang et al., 2025). Research across different countries and institutions also shows that there is no one-size-fits-all approach: the specific organisational environment heavily shapes how people actually build and share tacit knowledge. From a commercialisation perspective, relational factors such as social capital, trust, and network embeddedness play a central role in translating tacit insights into innovation outcomes (Ganguly et al., 2019; Lo & Tian, 2020). Moreover, absorptive capacity at both individual and organisational levels shapes the ability of firms and university partners to recognise, internalise and apply tacit scientific knowledge (Miller et al., 2016).

However, a significant theoretical gap remains: existing frameworks often assume that sharing tacit knowledge is a smooth, frictionless process, ignoring the unique institutional realities of academic life (Perkmann et al., 2013). When knowledge lives within the researchers themselves rather than in official university documents, complex questions about ownership, academic responsibility, and ethical boundaries inevitably emerge (Lee, 2020; Kumar, 2010). Currently, we lack an integrated model that explains how these very real tensions and ambiguities disrupt the normal flow of knowledge in university-industry collaborations.

To address this gap, this article moves beyond artefact-centric approaches to theorise commercialisation as a socially situated and institutionally constrained process. Drawing on the SECI model (socialisation–externalisation–combination–internalisation; Nonaka, 1994) and absorptive capacity theory (Cohen & Levinthal, 1990; Zahra & George, 2002), this article proposes an integrated conceptual framework to explore how tacit knowledge is mobilised in the commercialisation of university research. Specifically, the study formulates

theoretical propositions to examine how this mobilisation unfolds, conceptualising relational dynamics as the engine of knowledge transfer and ethical tensions as the structural boundaries that shape it.

2. Theoretical Background

Today, translating academic research into societal value relies heavily on University-Industry Collaboration (UIC) (Ankrah & AL-Tabbaa, 2015). When mapping how this works in practice, literature generally points to two main paths: formal channels like licensing, and informal, relationship-based channels like joint research (Perkmann et al., 2013). Yet, while universities can easily measure formal mechanisms through traditional metrics, a significant problem arises when we consider the different types of knowledge involved

Tacit knowledge, originally conceptualised by Polanyi (1966), refers to knowledge deeply embedded in individual experience, skills, and practices and therefore difficult to articulate or codify. Within university research contexts, tacit knowledge manifests in problem-solving heuristics, experimental techniques, and disciplinary intuition developed through sustained engagement in scientific work. Unlike explicit knowledge, which can be formalised in publications or patents, tacit knowledge often remains invisible yet constitutes a critical component of scientific discovery and innovation.

Recent literature reinforces that tacit knowledge plays a central role in organisational learning and innovation processes. A systematic review by Thomas and Gupta (2022) highlights that tacit knowledge underpins creativity, decision-making, and competitive advantage, particularly in knowledge-intensive environments such as universities. However, its inherent inarticulability makes it difficult to transfer through formal mechanisms alone, thereby limiting its utilisation in commercialisation processes.

In the context of university research commercialisation, this creates a structural paradox. While universities rely on codified outputs (e.g., patents, licenses) to capture value, a substantial portion of commercially relevant knowledge remains tacit and relationally embedded (Lee, 2020). Consequently, understanding how tacit knowledge is mobilised requires moving beyond artefact-centric perspectives toward process- and interaction-based views of knowledge transfer.

3. An Integrated Model of Tacit Knowledge Mobilisation

While existing literature acknowledges the importance of tacit knowledge in university-industry collaboration (UIC), the mechanisms through which this knowledge is translated into commercial value remain theoretically fragmented. To address this, we propose an integrated conceptual model that links the knowledge conversion processes of the SECI framework (Nonaka, 1994) with the dimensions of absorptive capacity (Zahra & George, 2002), while explicitly incorporating institutional and ethical boundary conditions.

Our model posits that tacit knowledge does not move as a clearly defined or transferable asset across boundaries. Rather, its mobilisation is an iterative cycle of socialisation and internalisation that is fundamentally contingent on the receiving firm's absorptive capacity and the ethical and ownership structures of the university. Figure 1 provides a simplified conceptual framework depicting the relationships between the SECI phases, absorptive capacity dimensions, and the institutional bottlenecks examined in the following sections.

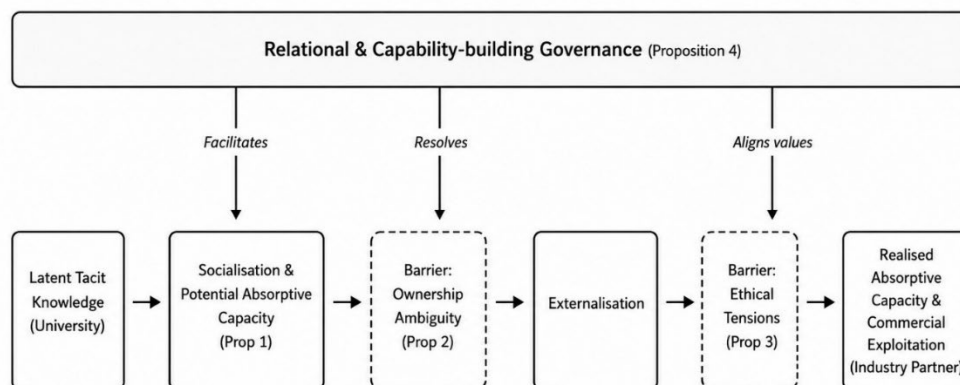


Figure 1: Integrated conceptual model of tacit knowledge mobilisation, relational dynamics, and institutional boundaries

3.1 Relational Dynamics and Potential Absorptive Capacity

Commercially relevant knowledge is often not contained in formal research outputs but remains latent, embedded in researchers' skills, experiences, and day-to-day problem-solving practices (Polanyi, 1966; Lee, 2020). These critical insights related to the feasibility, application, and adaptation of technologies are rarely captured in publications or patents; instead, such knowledge remains "in the heads" of researchers or is enacted through practice (Lee, 2020).

In the SECI framework, mobilising this latent resource requires socialisation (tacit-to-tacit transfer), which depends heavily on relational processes rather than formal artefacts (Nonaka, 1994). Meaningful knowledge exchange requires time, trust, and repeated interaction, as external partners often grasp the true value of research only through close collaboration and shared context, rather than through documentation alone (Ganguly et al., 2019; Lo & Tian, 2020). While the broader innovation literature underscores the value of extensive networks for searching for new information, the actual transfer and assimilation of highly complex, uncodified scientific knowledge cannot rely on weak ties alone; it fundamentally requires dense relational embeddedness and deep mutual trust to bridge cognitive distances across organisational boundaries (Granovetter, 1973; Hansen, 1999).

However, this relational socialisation is bounded by the actors' capabilities. At the dyadic level, external partners differ significantly in their ability to recognise, absorb, and interpret tacit academic knowledge, leading to cognitive asymmetries and potential misunderstandings during collaboration (Miller et al., 2016).

Proposition 1. In university-industry research commercialisation, the successful socialisation of latent tacit knowledge is positively moderated by the industry partner's potential absorptive capacity (acquisition and assimilation) and the depth of relational trust, rather than formal contract metrics.

3.2 The Bottleneck: Externalisation and Ownership Ambiguity

A critical friction point occurs when a university-industry project attempts externalisation. Converting tacit insights into commercial assets such as patents or licenses is not merely a technical translation but a complex, relational process of constructing a credible commercial narrative that makes sense to external partners (Palo-oja, 2018). This process is frequently disrupted by ethical and ownership-related tensions that stem from rigid institutional frameworks.

Institutional policies that automatically assign ownership or research outcomes to the university are often fundamentally misaligned with the personal, experiential, and individual nature of tacit knowledge (Lee, 2020). This misalignment creates deep uncertainty about who can legally use, share, or benefit from tacit knowledge developed within institutional settings but held by individuals (Lee, 2020). This ownership ambiguity acts as a theoretical bottleneck, altering the researcher's psychology and introducing caution into the collaborative dynamic.

When faced with this institutional misalignment, researchers exhibit cautious behaviour, intentionally limiting their openness and restricting the free flow of knowledge in collaboration with industry partners (Perkmann & Walsh, 2007). This ambiguity creates active friction between individual researchers and institutional actors, such as technology transfer offices (Lee, 2020).

Proposition 2: University regulations that uniformly claim institutional ownership over research outcomes exacerbate ownership ambiguity for uncodified knowledge, thereby creating a structural barrier that disrupts the externalisation phase of the SECI process.

3.3 Realised Absorptive Capacity and Ethical Tensions

Beyond the hurdle of externalisation, the mobilisation of knowledge relies on the firm's realised absorptive capacity—its ability to transform and commercially exploit the newly acquired academic knowledge (Zahra & George, 2002). This aligns with broader critical reconceptualisations of absorptive capacity, which emphasise that integrating external, potentially disruptive insights is not a straightforward transaction, but an iterative, non-linear process of transforming existing institutional and cognitive structures (Todorova & Durisin, 2007). Broader ethical considerations heavily constrain this phase.

The commercialisation of tacit knowledge raises significant ethical concerns among academic staff, especially regarding the potential commodification of traditional academic work and the acute conflicts between public research missions and the private commercial interests (Di Norcia, 2005; Kumar, 2010; Hamilton & Schumann,

2016). These ethical considerations are not peripheral issues since they function as active boundaries that structure the conditions under which knowledge can be mobilised.

These ethical tensions actively shape researchers' decisions about whether, how, and with whom they share their experiential knowledge (Kumar, 2010). If researchers perceive a misalignment between commercial application and academic ethics, they are likely to withhold the continuous, relational engagement required for the firm to successfully transform and exploit the knowledge (Hamilton & Schumann, 2016).

Proposition 3: Academic ethical tensions regarding the commodification of research negatively moderate the relationship between externalised knowledge and the firm's realised absorptive capacity, leading to stalled collaborations during the commercial exploitation phase.

3.4 Overcoming the Structural Paradox

Synthesising these dimensions reveals a structural paradox: universities rely on formal, artefact-based intellectual property regimes to capture value, yet the actual mobilisation of the most valuable scientific knowledge relies on open, relational, and tacit processes that are actively hindered by those very regimes (Lee, 2020; Miller et al., 2016).

To resolve this, universities seeking to strengthen science-based commercialisation must move away from purely artefact-centric, transactional approaches. Instead, they need to invest in relational and capability-building practices that support sustained collaboration, clarify the governance of knowledge ownership, and foster the development of shared understanding across organisational boundaries (Miller et al., 2016; Perkmann et al., 2013).

Proposition 4: Universities that implement relational and capability-building governance mechanisms will achieve more fluid knowledge combination and internalisation across organisational boundaries than those relying strictly on artefact-centric IP enforcement.

4. Discussion and Theoretical Implications

4.1 Theoretical Contributions

The integrated conceptual model developed in this paper offers a significant step forward from traditional, artefact-centric views of university research commercialisation. Prior literature has frequently examined knowledge creation (Nonaka, 1994), absorptive capacity (Zahra & George, 2002), and institutional ethics (Kumar, 2010) in isolation. By synthesising these frameworks, this study provides a more holistic, process-oriented understanding of how uncoded scientific value is managed across organisational boundaries. In doing so, the developed framework explicitly extends the traditional SECI model into inter-organisational and open innovation settings, demonstrating that knowledge conversion modes are not merely internal cognitive transitions but are actively regulated by macro-level institutional architectures (Zhang & Huang, 2020).

Most importantly, the model re-theorises ethical and ownership-related tensions—such as the commodification of academic work and conflicts of interest (Di Norcia, 2005; Hamilton & Schumann, 2016)—not as external nuisances or peripheral failures of technology transfer, but as core structural boundaries. These institutional conditions actively regulate researchers' willingness to engage in open knowledge exchange and shape the entire commercialisation pathway (Lee, 2020).

4.2 Practical and Policy Implications for Higher Education Institutions

In response to calls for explicit guidance on institutional governance, this framework provides clear implications for university administrators, technology transfer offices (TTOs), and policymakers. To unlock the latent commercial potential of university research, higher education institutions must align their organisational settings and regulations with the relational nature of tacit knowledge.

Universities seeking to strengthen science-based innovation must move beyond traditional, artefact-centric intellectual property regimes that rely solely on patents and licenses to capture value (Perkmann et al., 2013). Instead, they need to implement relational, capability-building policies. This requires shifting from a purely transactional logic to a governance model that accommodates the individual and experiential nature of uncoded knowledge (Lee, 2020).

Specifically, institutional policies should focus on three interrelated contextual areas:

Clarifying knowledge governance: Reducing ownership ambiguity by establishing clearer, more flexible frameworks regarding how individual experiential knowledge is recognised and protected alongside formal institutional IP (Lee, 2020).

Supporting sustained collaboration: Funding and incentivising long-term relational structures, such as communities of practice and joint university-industry labs, which are essential for driving the continuous socialisation and internalisation of complex scientific insights (Ankrah & AL-Tabbaa, 2015; Ganguly et al., 2019).

Institutional Leadership and Context: Aligning university leadership styles to foster an organisational climate that explicitly acknowledges the open science mission, thereby mitigating researchers' ethical concerns regarding commodification and conflicts of interest (Bozeman et al., 2015; Kumar, 2010).

5. Conclusion

This paper has developed and integrated a conceptual framework to explore how tacit knowledge shapes the commercialisation of university research, with particular attention to the roles of relational dynamics and ethical tensions. Rather than viewing knowledge as a clearly defined, codifiable asset transferred in a linear transaction, this study underscores the tacit emerges, takes shape, and is absorbed through iterative, relationship-based processes across organisational boundaries. By synthesising the conversion modes of the SECI model (Nonaka, 1994) with the multidimensional view of absorptive capacity (Zahra & George, 2002), the framework provides a process-oriented understanding of research commercialisation that extends beyond traditional, artefact-centric outputs such as patents and publications.

Furthermore, the model highlights that ethical and ownership tensions are not merely contextual friction points but serve as active structural boundaries. Ambiguities surrounding the ownership of uncoded knowledge and the rigid institutional framing of research outcomes directly shape researchers' willingness to engage in open, relational knowledge exchange.

As a purely conceptual study, this paper is not without limitations. The tacit nature of the phenomenon under investigation means that key aspects of knowledge conversion and internalisation remain inherently difficult to observe and measure. Because the primary objective of this article was to establish a theoretical synthesis and formulate testable propositions, the framework currently lacks direct empirical verification within specific institutions, sector-specific, or national innovation systems.

Future research is therefore required to extend, refine, and validate the proposed framework across different institutional settings. Empirical scholars can utilise the four propositions formulated in this study as a foundation for rigorous fieldwork. Specifically, qualitative, interpretive research designs, such as longitudinal case studies of university-industry project teams, could be deployed to track how socialisation and externalisation modes fluctuate under different university IP regulations. Alternatively, future studies could develop quantitative instruments to measure and assess the statistical impact of relational university governance versus artefact-centric governance on the realised absorptive capacity of industrial partners. Ultimately, unlocking the full commercial potential of university research requires recognising the tacit, relational, and ethically embedded nature of knowledge, and shifting the paradigm of commercialisation toward a socially situated, context-dependent process.

Ethics Declaration: This study is a purely conceptual and theoretical analysis based on the synthesis of existing published literature. It did not involve any empirical research, human participants, or the collection of primary observational or professional data. Consequently, formal ethical approval was not required for this study.

AI Declaration: AI-based tools (e.g., Grammarly, ChatGPT, Gemini) were utilised to support language editing, structural reorganisation, and the reframing of the manuscript from a previous empirical study to a conceptual paper based on reviewer feedback. While the AI assisted in restructuring the existing text, improving clarity, and aligning the presentation of the theoretical propositions, all structural changes and suggestions were critically reviewed, verified, and finalised by the author. The core theoretical integration, final arguments, and ultimate intellectual contributions remain solely the responsibility of the author.

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