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Market Orientation, Funding, and Strategic Alliances in Enhancing Technology Commercialization Capabilities: A Systematic Literature Review

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Abstract

Technology commercialization capability (TCC) is essential for universities and non-profit Technology Transfer Offices (TTOs) seeking to transform research outputs into marketable innovations. Although prior studies have examined market orientation, funding, and strategic alliances separately, limited research integrates these constructs within a unified framework. This study addresses this gap through a PRISMA-based systematic literature review of 72 peer-reviewed articles published between 2010 and 2025, sourced from Scopus, Web of Science, and Science Direct. The findings identify three interrelated antecedents of TCC. Market orientation enhances opportunity recognition by aligning research with industry and societal needs. Funding provides financial continuity for patenting, prototyping, and validation activities, particularly in bridging the "valley of death." Strategic alliances facilitate access to complementary expertise, networks, and commercialization channels through collaborative governance mechanisms. Drawing on the Resource-Based View, Dynamic Capabilities Theory, and Open Innovation Theory, the review develops an integrated conceptual framework explaining how sensing, seizing, and reconfiguring capabilities jointly strengthen commercialization performance. The study contributes by extending dynamic capability logic to non-profit and university contexts. It offers strategic guidance for policymakers and TTO managers to design integrated commercialization ecosystems that enhance the impact of innovation and long-term competitiveness.

Keywords: Technology Commercialization Capability, Market Orientation, Funding, Strategic Alliances, Dynamic Capabilities, Open Innovation, Systematic Literature Review

Introduction

In the evolving landscape of the knowledge economy, it has become a central driver of competitiveness and national innovation performance regarding the ability of organizations to transform research outputs into marketable technologies. This process, often termed as technology commercialization, involves converting research outcomes into goods, services,

or processes that deliver measurable social and economic impact (Siegel & Wright, 2015). Within universities and public research organizations, Technology Transfer Offices (TTOs) serve as dynamic intermediaries that achieve intellectual property, licensing, and industry collaboration (Markman et al., 2008). Yet, numerous non-profit or academic TTOs still look determined walls, including inadequate resources, poor connection to market needs, and disjointed collaboration frameworks that hinder effective commercialization efforts (Borras et al., 2024).

The literature identifies market orientation (MO) as a significant factor of commercialization effectiveness. Market orientation encompasses a system approach to gather, disseminate, and respond to market intelligence to satisfy the needs of its stakeholders (Narver & Slater, 1990). In technology transfer settings, MO relates to improved capacity or recognizing commercial opportunities, aligns research objectives with market demands, and accelerates the adoption of new technologies (Talke & Hultink, 2010; Cirjevskis, 2019). Universities and research institutions executing market-oriented strategies tend to produce innovations that are more relevant to market needs and establish higher licensing and start-up formation rates (Hamilton, 2018). Therefore, MO is increasingly viewed as a both cultural and strategic asset that empowers TTOs to navigate the uncertain terrain linking academic research and market application (Wang, 2024).

Alongside MO, funding also plays an important role in enhancing commercialization efficiency. Adequate and timely financial resources ensure the endurance of R&D activities, supports intellectual property protection, and facilitates prototype development and validation (Markman et al., 2005). Conversely, funding limitations can disrupt project execution, limited patenting, and lost partnership prospects (Govindaraju & Prasad, 2025). In non-profit and academic settings, where commercialization efforts count on seriously on public or institutional budgets, diversified funding streams from government grants, industry-linked research funds, or venture corporations can substantially strengthen these efforts (Wang et al., 2024). Effective funding mechanisms not only contributes monetary support but also enhance credibility to potential investors and industry partners (Chukumba & Jensen, 2005).

Equally important are strategic alliances (SA) that foster partnership across universities, industry, and government. Strategic alliances enable knowledge sharing, mitigate technological uncertainties, and provide access to complementary resources such as distribution networks or manufacturing expertise (Naqshbandi,2018). In the context of open innovation, alliances empower universities and firms to co-develop and co-commercialize technologies, quickening time-to-market and enlightening innovation success rates (Chesbrough, 2019). For TTOs, forming strategic partnerships are important to bridge gaps in capabilities, particularly in marketing, finance, and intellectual property management and to reinforce the long-term viability of regional innovation ecosystems (Cunningham & Link, 2021).

Despite extensive research on the contributions of market orientation, funding, and strategic alliances relate to enhance technology commercialization capabilities (TCC), particularly within the non-profit or academic TTO area (Zhou et al., 2021). Existing studies emphasize on firm-level commercialization in the private sector, neglecting the specific conditions, mission

objectives, and regulatory frameworks defining public research organizations (Bekkers & Freitas, 2008). Consequently, a systematic integration of these dimensions is needed to clarify how internal orientations and external collaborations jointly build the dynamic capabilities required for effective technology commercialization.

The purpose of this study to synthesize and integrate existing empirical and conceptual examine to explain how market orientation, funding, and strategic alliances collectively influence technology commercialization capability. Employing a PRISMA-based Systematic Literature Review (SLR) approach, this research systematically identifies, screens, and assess peer-reviewed literature published between 2010 and 2025 from major academic databases, including Scopus, Web of Science, and ScienceDirect. The review is guided by three research questions:

1. How does market orientation contribute to the development of technology commercialization capability?
2. What role does funding play in strengthening commercialization outcomes?
3. How do strategic alliances enable or moderate commercialization success within TTOs and related institutions?

By drawing insights from the Resource-Based View (RBV), Dynamic Capabilities Theory (DCT), and Open Innovation Theory (OIT). Together, this research explains how organizations combine internal resources and leverage external networks to transform research knowledge into market impact (Barney, 1991; Teece, 2018; Chesbrough, 2019). Practically, the findings offer guidance to policymakers, university leaders, and innovation managers on designing holistic approaches that align market intelligence, financial structures, and collaborative partnerships. By unifying these perspectives, this study advances understanding of how non-profit and university-based TTOs can evolve from research-driven entities into market-responsive innovation catalysts, reinforcing their role within national and regional innovation ecosystems.

Methodology

Systematic Review Approach

This study employs a Systematic Literature Review (SLR) guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework (Page et al., 2021). The PRISMA method provides a transparent, replicable procedure for identifying, screening, and synthesizing empirical and conceptual literature on market orientation, funding, strategic alliances, and technology commercialization capability (TCC). A qualitative thematic synthesis was applied to identify recurring constructs, relationships, and theoretical underpinnings within the selected body of research (Tranfield, Denyer, & Smart, 2003).

Search Strategy and Databases

A comprehensive search was conducted across three major databases Scopus, Web of Science, and ScienceDirect as they collectively represent the most extensive repositories of peer-reviewed business, innovation, and management research (Kitchenham & Charters, 2007). The search covered publications between January 2010 and June 2025 to capture both foundational and emerging trends in open innovation and technology transfer.

The Boolean search string used across databases was structured as follows:

("technology commercialization" OR "technology transfer" OR "innovation commercialization") AND ("market orientation" OR "market-driven" OR "customer orientation") AND ("funding" OR "financial support" OR "research grants" OR "investment") AND ("strategic alliance" OR "collaboration" OR "partnership" OR "network")
The search was restricted to English-language journal articles, peer-reviewed publications, and open-access conference papers available in full text. Grey literature such as theses, dissertations, or reports was excluded to maintain the academic rigor expected by MDPI journals.

Inclusion and Exclusion Criteria
Table 1
Inclusion and Exclusion Criteria

Inclusion	Exclusion
Explicitly examine at least one of the constructs market orientation, funding, or strategic alliances in relation to technology commercialization or innovation performance.	Focused solely on product innovation without commercialization outcomes.
Present empirical, conceptual, or mixed-method analysis.	Discussed alliances or funding unrelated to technology transfer or research institutions.
Be published in reputable, peer-reviewed outlets indexed in Scopus or Web of Science	Were purely theoretical without applied context or lacked methodological transparency.

Two independent reviewers performed the selection process. Titles and abstracts were screened first, followed by full-text evaluation of shortlisted studies to confirm their fit with the research questions (Denyer & Tranfield, 2009).
Screening and Selection Process

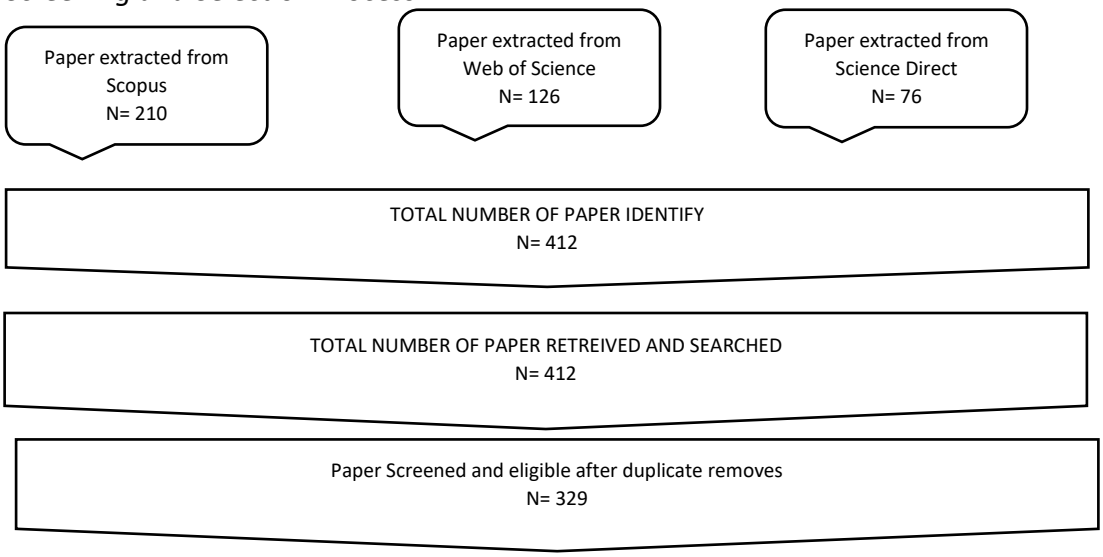


Figure 1 The procedure for selecting the eligible papers.

The screening process followed three stages: identification, screening, and eligibility, as prescribed by PRISMA. Initial searches yielded 412 records across the three databases. After removing duplicates, 329 unique articles remained for title and abstract screening.
During the screening stage, studies were excluded if they focused solely on product innovation without commercialization outcomes, examined funding or alliances unrelated to

technology transfer, or lacked methodological transparency. Full-text assessment was then conducted to ensure alignment with the research questions.

The final selection resulted in 72 studies retained for synthesis. Although the final number of studies may appear limited, this reflects the maturity and fragmentation of the research domain. Prior systematic reviews in comparable emerging fields have similarly reviewed fewer than 50 studies, suggesting that the number of included articles is methodologically acceptable and sufficient for thematic synthesis.

Quality Assessment and Data Extraction

Quality appraisal was carried out using adapted criteria from the Joanna Briggs Institute (JBI) and CASP checklists to evaluate methodological rigor and theoretical consistency (Lockwood et al., 2015). Each study was rated on clarity of objectives, methodological transparency, theoretical grounding, and contribution to commercialization literature. Data extraction involved recording bibliographic details, research design, theoretical frameworks, geographic context, and key findings relevant to the three antecedents of TCC.

Data Synthesis and Thematic Coding

The selected studies were analyzed through an inductive thematic coding process (Braun & Clarke, 2006). Codes were first assigned to statements related to market orientation, funding, and alliances, then clustered into higher-order categories such as market intelligence integration, financial continuity, and collaborative learning. This process yielded three primary themes and several sub-themes that form the foundation for the discussion presented in the next section.

Results and Thematic Analysis

Following the systematic screening and quality appraisal process, 72 studies were retained for synthesis. The thematic analysis revealed three overarching themes that collectively underpin technology commercialization capability: market orientation, funding, and strategic alliances. These themes do not operate independently but function as interrelated mechanisms shaping organisational capability development.

Market Orientation and Technology Commercialization

Market orientation (MO) has been identified as a crucial antecedent for the technology commercialization. The reviewed studies illustrate that MO facilitates the alignment of research outcomes with user needs, mitigates market uncertainties, and accelerate technology diffusion (Narver & Slater, 1990; Kohli & Jaworski, 1990). In university and TTO settings, MO is expressed through proactive collaborations with industry partners, competitive market analysis, and ongoing stakeholder feedback (Shykhnenko,2024). These practices foster a culture of responsiveness that links academic research agendas with industry demand (Jeong & Lee, 2015).

Research indicates that universities with strong MO framework are more likely to produce patents, license technologies, and establish start-ups (Baker & Sinkula, 2009; Wang, 2024). Additionally, TTOs that adopt a market-oriented approach often develop internal learning systems that capture and disseminate market intelligence throughout their departments, strengthening institutional agility (Harris, 2001). However, cultural, and structural barriers

such as academic reward systems emphasizing publication over commercialization often impede the comprehensive integration of MO in non-profit sectors (Siegel & Wright, 2015). Thus, it is evident that embedding MO into academic governance and incentive mechanisms is essential for converting research excellence into commercial success.

Funding and Resource Mobilization

Funding availability is recognized the second major factor of TCC. Many of the studies reviewed support the notion that adequate, diversified, and consistent financial resources are fundamental to maintaining the commercialization process (Markman et al., 2005; Lockett & Wright, 2005). Financial support facilitates key activities such as patent acquisitions, prototype testing, and proof-of-concept development stages often referred to as the "valley of death" in innovation literature (Wessner, 2005). Research indicates that government grants serve as a primary source of funding for non-profit TTOs; however, dependence on a singular funding creates vulnerability to shift in policy and administrative bottlenecks (Rasmussen & Borup, 2019).

Moreover, hybrid financing models combining public financial support, industrial contracts, and venture capital to improve project continuity and commercialization success rates (Grimaldi et al., 2011). The availability of funding not only act as a necessary financial resource but also serves as a strategic signal that can attract external partnership and validate the technology's viability to potential investors (Sharma et al., 2025). Moreover, well-funded TTOs often exhibit stronger internal management capabilities, allowing for better coordination of interdisciplinary teams and more effective oversight of intellectual property assets (Subrahmanya et al., 2019). Conversely, limited resources can stifle risk-taking initiatives and constrains long-term strategic planning, ultimately diminishing the chances of a successful market lunch. This synthesis underscores that financial capital functions both a tangible asset and a relational catalyst that bolsters organizational credibility and capability accumulation (Sharma et al., 2025).

Strategic Alliances and Collaborative Networks

The third key theme identifies strategic alliances (SA) as important relational frameworks for enhancing TCC. Alliances foster knowledge sharing, joint development, and co-development among universities, firms, and public agencies (Hagedoorn, 2002; Ankrah & Al-Tabbaa, 2015). Within open-innovation ecosystems, such collaborations enable organizations to access complementary assets, ranging from technical know-how to market intelligence (Chesbrough, 2019). Numerous studies suggest that alliances involving cross-sector partners such as industry-academia consortia or public–private partnerships are particularly effective at closing the gap between invention and commercialization (Cunningham & Link, 2021).

Successful alliances are often built on foundations of trust, shared governance, and strategic alignment among partners (Santoro & Chakrabarti, 2002). For example, TTOs that maintain long-term partnerships report higher rates of technology licensing and start-up creation than those relying on ad-hoc collaborations (Bruneel et al., 2010). In developing nations, these alliances also act as capacity-building platforms that expose researchers to entrepreneurial method and market insights (Borras et al., 2024). However, challenges such as poor coordination or imbalanced power relations can compromise the effectiveness of these alliances, leading to knowledge leakage or conflicting objectives (Inkpen & Tsang, 2005). The

evidence indicates that strategic alliances transform isolated research efforts into collaborative innovation systems, thus significantly enhancing ability to commercialize technology effectively.

Cross-Theme Integration

The analysis of the three themes reveals strong interdependencies among market orientation, funding, and strategic alliances. Market orientation plays a vital role in identifying research opportunities; funding provides the resources to develop and validate those technologies; and alliances offer access to complementary capabilities for commercialization (Zhou et al., 2021). The interplay of these factors aligns closely with the Dynamic Capabilities Theory, where sensing (MO), seizing (funding), and reconfiguring (alliances) jointly enhance organizational agility (Teece, 2018). Collectively, these mechanisms form the foundation of a capability-based model of technology commercialization, as elaborated in the next section.

Conceptual Framework and Theoretical Integration

The synthesis of the reviewed literature reveals that market orientation, funding, and strategic alliances collectively form the foundation of technology commercialization capability (TCC). These elements operate as complementary drivers within an integrated system of innovation management. To provide a cohesive understanding, the relationships among these constructs are framed using three theoretical perspectives: the Resource-Based View (RBV), Dynamic Capabilities Theory (DCT), and Open Innovation Theory (OIT). Together, these frameworks explain how organizations leverage internal and external resources to transform knowledge into marketable innovations.

Resource-Based View (RBV)

According to the RBV, firms achieve sustainable competitive advantage through the acquisition and effective deployment of valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). Within the realm of non-profit organizations and TTOs, such resources include market intelligence, financial capital, and collaborative networks. Market orientation serves as a knowledge-based resource that directs decision-making processes and reduces environmental uncertainty (Hult, Ketchen, & Slater, 2005). Funding represents a tangible resource that enables R&D investment while also enabling effective risk management measure (Markman et al., 2005), while strategic alliances act as relational assets, that extend the organization's access to external knowledge and technological capabilities (Das & Teng, 2000).

When effectively integrated, they create a synergistic portfolio that enhances TCC by improving the organization's capacity to identify, develop, and bring innovations to market. However, as RBV emphasizes the importance of possessing these resources, it is less effective in explaining how they are adapted and leveraged in dynamic environments, it provides limited explanation for how these resources are continuously adapted in dynamic environments a gap addressed by Dynamic Capabilities Theory.

Dynamic Capabilities Theory (DCT)

Dynamic Capabilities Theory extends RBV by emphasizing a firm's ability to identify opportunities, seize resources, and reconfigure competencies in response to changes in the environment (Teece, 2018). In the context of TTOs, market orientation serves as a sensing

mechanism that detects technological and commercial opportunities through environmental analysis and stakeholder engagement (Narver & Slater, 1990). Funding acts as the seizing capability, enabling organizations to capitalize on these financial resources necessary to act upon these opportunities. Strategic alliances represent the reconfiguring capability, allowing organization organizations to reshape both internal and external assets to exploit market opportunities (Eisenhardt & Martin, 2000).

The integration of these three capabilities creates a dynamic system of learning and adaptation. For example, a TTO that senses emerging market needs (MO) can secure appropriate funds (funding) and reconfigure collaborative networks (alliances) to accelerate commercialization. Empirical studies have demonstrated that organizations these dynamic processes achieve faster technology transfer, improved licensing outcomes, and greater innovation resilience (Teece, Peteraf, & Leih, 2016; Wang & Ahmed, 2007). Thus, the DCT perspective clarifies how market orientation, funding, and alliances interact as dynamic, co-evolving processes rather than isolated factors.

Open Innovation Theory (OIT)

While RBV and DCT emphasize internal resource management and adaptive learning, the Open Innovation Theory highlights the importance of external collaboration in technology commercialization (Chesbrough, 2019). OIT asserts that organizations must extend beyond relying solely on internal R&D but must leverage external sources of knowledge and partnerships to drive innovation (Huizingh, 2011). In this context, strategic alliances serve as a fundamental mechanism open innovation, allowing universities and non-profit TTOs to share risks, jointly develop products, and collaboratively create market solutions with industry partners (Ankrah & Al-Tabbaa, 2015).

Market orientation plays a pivotal role in facilitating open innovation by guiding external collaborations towards opportunities that are aligned with market demand, ensuring that partnerships yield commercially relevant outcomes (Lichtenthaler, 2011). Funding mechanisms, particularly public–private grants, further institutionalize open innovation practices by encouraging cross-sector cooperation and knowledge diffusion (Perkmann et al., 2013). By integrating these concepts within OIT, therefore explains how TTOs transition from linear, internally focused innovation processes to network-based, collaborative commercialization models.

Integrated Conceptual Framework

The conceptual framework developed from this synthesis (see Figure 1 description below) positions market orientation, funding, and strategic alliances as interdependent antecedents that jointly enhance technology commercialization capability.

Market orientation enables opportunity recognition through continuous environmental scanning and user feedback.

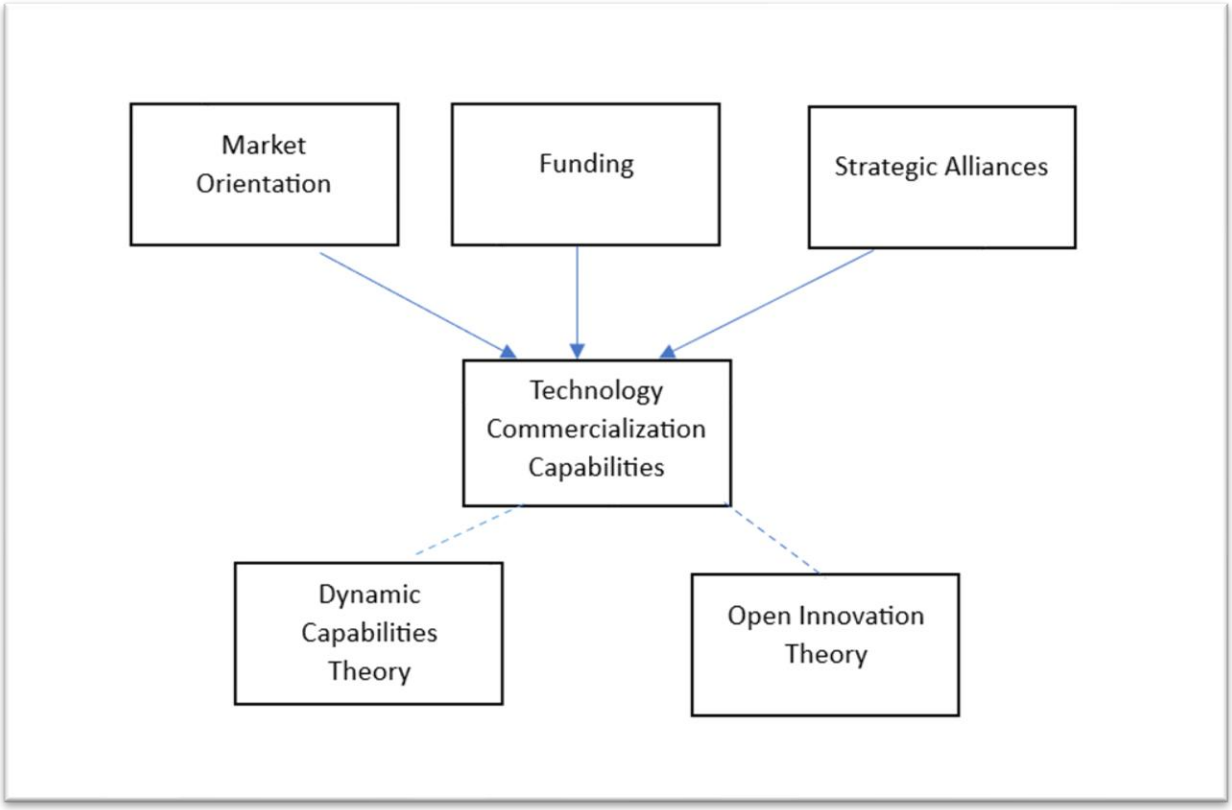
Funding provides the necessary financial infrastructure for developing, protecting, and scaling innovations.

Strategic alliances serve as relational conduits for accessing external expertise and market channels.

Together, these antecedents reinforce TCC by enabling organizations to sense opportunities, mobilize resources, and execute commercialization strategies effectively. The framework

aligns with DCT's triad of sensing–seizing–reconfiguring capabilities (Teece, 2018) and embeds open innovation principles that promote external collaboration and knowledge exchange.

Figure 1. Conceptual Framework Linking Market Orientation, Funding, and Strategic Alliances to Technology Commercialization Capability.



This integrative model contributes to the ongoing discourse in technology management by demonstrating how multiple internal and external factors converge to shape organizational capabilities. It provides a conceptual foundation for empirical testing and comparative analysis across different institutional settings, particularly within emerging economies and non-profit research ecosystems.

Discussion and Implications

The findings of this review reinforce that technology commercialization capability (TCC) is not derived from a single determinant but rather from a systemic interaction between market orientation, funding, and strategic alliances. These factors jointly shape how organizations, particularly university-based and non-profit Technology Transfer Offices (TTOs), acquire and reconfigure resources to transform research into viable market innovations. The synthesis contributes to the discourse on open innovation and capability building by demonstrating how internal orientation and external collaboration converge within an integrative framework.

Theoretical Implications

From a theoretical standpoint, this review advances understanding of how the three antecedents of TCC interact under the Resource-Based View (RBV) and Dynamic Capabilities

Theory (DCT). Market orientation represents a knowledge-based resource that guides organizational sensing behavior, while funding provides the tangible capital required for seizing opportunities, and strategic alliances embody relational capabilities that facilitate reconfiguration of resources (Barney, 1991; Teece, 2018). The integration of these constructs illustrates a capability bundle that reinforces organizational agility and commercialization readiness.

This perspective extends previous research, which often examined market orientation or funding in isolation, by highlighting their synergistic influence when combined with collaborative mechanisms (Hult et al., 2005; Perkmann et al., 2013). Moreover, the framework responds to calls for contextualized applications of DCT within non-profit and academic institutions (Teece et al., 2016). In doing so, it bridges the conceptual gap between open innovation theory and dynamic capabilities, showing that universities must balance internal knowledge generation with external partnership networks to achieve sustained commercialization outcomes (Chesbrough, 2019; Wang & Ahmed, 2007).

An additional theoretical contribution lies in the identification of relational capital as a mediating construct linking alliances and commercialization performance. Several reviewed studies emphasized that successful partnerships rely on trust, shared vision, and governance mechanisms that support mutual learning (Santoro & Chakrabarti, 2002; Inkpen & Tsang, 2005). The framework therefore suggests that the evolution of TCC depends not only on tangible resources and orientation but also on the quality of social interactions that underpin knowledge transfer.

Managerial and Policy Implications

For practitioners and policymakers, the synthesis provides actionable insights into strengthening the commercialization performance of non-profit and university TTOs. First, developing a market-driven culture should be prioritized through training, incentive structures, and leadership engagement. Encouraging academic staff and project managers to understand market dynamics and customer needs can align research projects with societal and industrial relevance (Siegel & Wright, 2015). Embedding market orientation into the institutional strategy ensures that commercialization is viewed not as an ancillary activity but as an integral mission component.

Second, financial sustainability remains a critical enabler. Institutions should diversify funding portfolios by combining public grants, industry contracts, and venture-linked investment schemes. Governments can play a catalytic role by introducing performance-based funding that rewards successful commercialization outcomes (Rasmussen & Borup, 2019). Similarly, industry partners can be incentivized through tax credits or co-funding programs to engage in collaborative R&D. The evidence suggests that financial models designed to share risk and reward are more effective in sustaining commercialization momentum than short-term project grants (Clarysse et al., 2011).

Third, strategic alliances should be structured with clear governance mechanisms and mutual objectives. Universities and TTOs should cultivate long-term relationships with industry partners rather than transactional engagements. Establishing joint innovation centers, technology clusters, or incubators can institutionalize collaboration and facilitate knowledge

co-creation (Cunningham & Link, 2021). Policymakers should also strengthen legal and administrative frameworks to reduce barriers to intellectual property sharing and cross-sector collaboration, particularly in emerging economies where institutional trust is still developing (Zhou et al., 2021).

At the managerial level, leaders of TTOs must act as boundary spanners who translate scientific knowledge into commercial language, manage alliances strategically, and balance academic and business imperatives (O'Kane et al., 2020). Building interdisciplinary teams that integrate technical, legal, and marketing expertise can improve decision-making across the commercialization pipeline. The establishment of key performance indicators (KPIs) that measure not only revenue generation but also knowledge diffusion, start-up formation, and social impact align TTO activities with broader national innovation goals.

Implications for Future Research

The findings of this review open several directions for future research. First, more quantitative and longitudinal studies are needed to empirically validate the integrated framework proposed here, especially in the context of developing economies and public research institutions. Future scholars may also explore the moderating role of entrepreneurial orientation among project managers, as risk-taking and proactiveness could strengthen the link between market orientation and commercialization outcomes (Baker & Sinkula, 2009). Second, comparative studies between public and private TTOs could reveal contextual variations in funding mechanisms and partnership governance. Finally, the intersection of digital transformation and TCC such as the use of artificial intelligence, digital twins, and online licensing platforms represents a promising area of inquiry within open innovation ecosystems (Huizingh, 2011).

In summary, the review underscores that building robust technology commercialization capability requires a holistic strategy that combines market insight, financial strength, and collaborative synergy. Institutions that successfully integrate these dimensions can accelerate innovation diffusion, enhance national competitiveness, and contribute meaningfully to sustainable economic development.

Conclusion and Future Research Directions

This systematic literature review (SLR) provides an integrated understanding of how market orientation, funding, and strategic alliances jointly enhance technology commercialization capability (TCC) in university-based and non-profit innovation environments. Using the PRISMA framework, the study synthesized seventy-two peer-reviewed articles published between 2010 and 2025, identifying critical patterns that explain how internal orientations and external collaborations coalesce to drive successful commercialization outcomes.

The review concludes that market orientation serves as a strategic compass that aligns research and innovation with societal and industrial needs, enabling organizations to sense opportunities in rapidly evolving markets. Funding functions as both a resource enabler and a legitimacy signal that sustains the development and validation of technologies through the commercialization pipeline. Meanwhile, strategic alliances act as collaborative mechanisms that provide access to complementary assets, facilitate knowledge sharing, and foster trust-based networks essential for scaling innovations.

When these three elements interact, they form a capability system that embodies the principles of the Resource-Based View (RBV), Dynamic Capabilities Theory (DCT), and Open Innovation Theory (OIT). Market orientation reflects the organization's ability to sense market shifts, funding enables the seizing of opportunities through resource mobilization, and alliances support the reconfiguration of internal and external assets for sustained innovation (Teece, 2018; Chesbrough, 2019). Collectively, these mechanisms transform static resources into dynamic capabilities, strengthening institutional agility and long-term competitiveness.

From a managerial and policy perspective, the findings suggest that institutions must embed commercialization within their strategic and operational frameworks. Leaders should cultivate a culture of market responsiveness, invest in diversified funding structures, and establish long-term alliances that extend beyond transactional relationships. National innovation systems should also design policies that integrate academic research with industry needs through co-funding, tax incentives, and collaborative research programs. These measures can accelerate knowledge diffusion and reduce the "valley of death" that often separates research from commercialization (Wessner, 2005).

Despite the insights generated, this review acknowledges several limitations. The analysis focused exclusively on English-language, peer-reviewed sources indexed in major databases, which may exclude region-specific or grey literature that could offer additional perspectives. Furthermore, while this review identifies interrelationships among constructs, empirical testing of these interactions remains limited. Future research should employ quantitative models, such as structural equation modeling (SEM) or partial least squares (PLS), to validate the causal relationships proposed in the conceptual framework. Longitudinal and cross-national comparative studies could also enhance understanding of how contextual factors such as institutional maturity, regulatory environments, and entrepreneurial culture affect the evolution of TCC.

Another promising avenue for future inquiry involves exploring the role of digital transformation and entrepreneurial orientation as moderating or mediating variables. As digital tools, data analytics, and artificial intelligence become integral to knowledge transfer, future studies could examine how these technologies reshape collaboration and resource utilization within TTOs (Huizingh, 2011). Likewise, the entrepreneurial orientation of project managers and research leaders may amplify the effect of market orientation and alliances on commercialization performance, particularly in emerging innovation systems (Baker & Sinkula, 2009).

In conclusion, this review contributes a holistic framework that integrates market, financial, and relational dimensions of technology commercialization capability. By bridging insights from open innovation, resource-based, and dynamic capability theories, it provides a foundation for future empirical exploration and managerial practice. As global innovation ecosystems continue to evolve, understanding how non-profit and university-based institutions harness market orientation, funding, and strategic alliances will remain essential for sustaining technological advancement, societal progress, and economic resilience.

Theoretical and Contextual Contributions

This study makes several theoretical and contextual contributions to the technology commercialization literature. Theoretically, it advances existing knowledge by integrating market orientation, funding, and strategic alliances within a unified capability-based framework grounded in the Resource-Based View, Dynamic Capabilities Theory, and Open Innovation Theory. While prior studies have predominantly examined these constructs independently, this review demonstrates their interdependent and co-evolving nature in shaping technology commercialization capability. By conceptualizing market orientation as a sensing mechanism, funding as a seizing capability, and strategic alliances as a reconfiguring process, the study extends the application of Dynamic Capabilities Theory to non-profit and university-based Technology Transfer Offices (TTOs), a context that remains under-theorized in commercialization research.

Contextually, this review contributes by synthesizing evidence relevant to academic and public research institutions, which operate under distinct institutional logics, governance structures, and funding constraints compared to private firms. The framework therefore responds to calls for more contextualized commercialization research beyond the corporate setting, particularly within emerging innovation ecosystems. By highlighting how internal orientations and external collaborations jointly shape commercialization capability in non-profit environments, this study refines understanding of innovation management within knowledge-intensive institutions and provides a conceptual foundation for future empirical validation.

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