

Intellectual Property, Innovation and Technology Commercialisation: A Systematic Literature Review of Contemporary Research

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Abstract

Intellectual property (IP) has traditionally been understood as a legal mechanism for protecting inventions, creative works, brands, designs and other forms of intangible capital. Contemporary innovation systems, however, increasingly position intellectual property as a strategic instrument for knowledge creation, technology commercialisation, inter-organisational collaboration and competitive advantage. This systematic literature review examines the evolving relationship between intellectual property, innovation and technology commercialisation, with particular attention to the ways in which firms, universities and other knowledge-producing organisations employ intellectual property rights to appropriate, exchange and commercialise knowledge. The review synthesises literature across intellectual property management, innovation strategy, technology transfer, open innovation and knowledge-based approaches.

Following a structured review protocol informed by the principles of PRISMA 2020, the study develops a thematic synthesis of the existing literature. For demonstration purposes, the article uses an illustrative screening corpus to show how a systematic review may be reported in a journal publication. The synthesis identifies five dominant themes: intellectual property protection and innovation incentives; strategic IP management and value appropriation; university technology transfer and commercialisation; intellectual property in open and collaborative innovation; and emerging challenges associated with digital technologies, artificial intelligence and knowledge diffusion. The review indicates that the relationship between IP protection and innovation is neither linear nor uniform. Strong protection may support investment in certain technological sectors, while excessive exclusivity can restrict cumulative innovation, knowledge diffusion and collaborative experimentation. Similarly, patent counts, licensing revenues and numbers of spin-offs provide useful but incomplete measures of technology-transfer performance.

The review proposes an integrated framework in which IP strategy operates through four interconnected mechanisms: protection, appropriation, exchange and diffusion. The framework highlights the importance of contextual factors including technological characteristics, organisational capabilities, institutional environments

and market conditions. The study concludes by identifying directions for future research concerning artificial intelligence-generated inventions, platform economies, patent thickets, standard-essential patents, university–industry collaboration and alternative models of knowledge governance.

Keywords: intellectual property; innovation; patents; technology transfer; technology commercialisation; open innovation; intellectual property management; systematic literature review; knowledge economy.

1. Introduction

Intellectual property occupies a distinctive position within modern innovation systems. Unlike physical assets, intellectual assets can frequently be reproduced, transferred and recombined at comparatively low marginal cost. The economic challenge associated with intangible knowledge is therefore not merely its creation but also its governance, appropriation, exchange and diffusion. Intellectual property rights provide institutional mechanisms through which selected forms of knowledge can receive legally enforceable protection, thereby potentially enabling innovators to obtain economic returns from investments in research, development and creative activity.

The relationship between intellectual property and innovation has nevertheless remained theoretically and empirically complex. Conventional economic reasoning suggests that intellectual property protection can encourage innovation by reducing the risk that competitors will appropriate the fruits of costly research and development. Patents, for example, can provide temporary exclusionary rights in exchange for disclosure of technical information. Copyright can protect original expression, while trademarks can support the differentiation and reputation of products and services. Trade secrets may allow firms to preserve commercially valuable information without public disclosure.

Yet intellectual property can also create constraints. Exclusive rights may increase the cost of accessing technologies, restrict follow-on research and contribute to fragmented ownership of complementary technologies. These tensions become particularly significant in industries characterised by cumulative innovation, rapid technological change and complex networks of complementary rights.

The contemporary innovation environment has further transformed the strategic role of IP. Firms increasingly participate in ecosystems rather than developing technologies entirely within organisational boundaries. Universities collaborate with businesses, start-ups license technologies from established corporations, and firms participate in standards-development organisations and open innovation networks. Under such circumstances, intellectual property is not simply a defensive legal instrument. It can function as a bargaining asset, a mechanism for attracting

investment, a means of structuring collaboration and an instrument for accessing external knowledge.

Research on university technology transfer illustrates this transition particularly clearly. Technology transfer offices have historically been evaluated through indicators such as patents, licences and spin-offs. However, research has questioned whether these indicators adequately capture the broader social and economic utilisation of university knowledge. A systematic review of IP management in technology transfer offices found that the literature had often concentrated excessively on appropriation through patenting rather than on the wider utilisation of research results.

The increasing speed of technological diffusion further complicates the picture. The World Intellectual Property Organization's recent analysis emphasises that technology diffusion depends not only on invention but also on information flows, absorptive capacity, technological characteristics and supportive policy and intellectual property frameworks. This suggests that innovation policy must consider both the creation of technological knowledge and its subsequent adoption.

Against this background, the present article systematically reviews literature examining the intersection of intellectual property, innovation and technology commercialisation. Rather than treating IP protection as an isolated legal variable, the review conceptualises IP as part of a broader innovation-management system.

The review addresses four principal research questions:

RQ1: How does existing literature conceptualise the relationship between intellectual property protection and innovation?

RQ2: What strategic functions does intellectual property perform in technology commercialisation?

RQ3: How does IP management influence university technology transfer and open innovation?

RQ4: What emerging research gaps arise from digitalisation, artificial intelligence and increasingly collaborative innovation systems?

The article contributes to the literature by integrating research streams that are frequently examined separately. It also proposes a conceptual framework distinguishing four principal functions of intellectual property: **protection, appropriation, exchange and diffusion.**

2. Conceptual Background

2.1 Intellectual Property as an Innovation Institution

Intellectual property rights are fundamentally institutional mechanisms for allocating legally enforceable rights over particular forms of intangible subject matter. Their economic significance arises from the ability to influence the conditions under which knowledge is used by different actors.

The patent system provides a particularly important example. A patent can give its holder an exclusionary right for a defined period while requiring disclosure of information concerning the invention. This creates a potential exchange between private incentives and public disclosure. The effectiveness of this exchange, however, depends upon patent quality, enforcement costs, market structure and the technological characteristics of the invention.

The innovation literature therefore generally rejects an overly simplistic assumption that more IP protection necessarily produces more innovation. The relationship is conditional. The appropriate level and form of protection can vary according to industry, firm size, technological complexity and the speed of technological development.

For example, firms in industries characterised by substantial research and development expenditure may rely heavily on patents to protect inventions. In other sectors, secrecy, lead-time advantages, branding or complementary assets may be more important than formal IP rights.

Table 1. Principal Forms of Intellectual Property and Their Strategic Functions

IP form	Principal matter	subject	Typical function	strategic Potential	limitation
Patents	Technical inventions		Protection, licensing, investment attraction	Disclosure and enforcement costs	
Copyright	Original works	expressive	Commercial exploitation creative control	Difficulties and surrounding digital copying	
Trademarks	Signs identifying goods/services		Brand differentiation and reputation	Requires continued commercial use	
Trade secrets	Confidential commercially valuable information		Protection without public disclosure	Protection may be lost through disclosure	
Industrial designs	Product appearance		Product differentiation	Limited scope of protection	
Geographical indications	Products with origin	associated geographical	Collective reputation and differentiation	Dependence on institutional enforcement	

The strategic importance of IP therefore extends beyond legal protection. IP portfolios may influence negotiations, corporate valuation, financing decisions and strategic alliances.

2.2 Innovation and Appropriation

Innovation involves uncertainty. Organisations invest resources before knowing whether a particular research project will produce commercially valuable results. The possibility that competitors may imitate successful outcomes can reduce expected returns on investment.

Appropriability theory addresses this problem by examining how firms capture economic value from innovation. Patents are one appropriability mechanism, but they are not the only one. Lead time, complementary manufacturing capabilities, marketing resources, secrecy and customer relationships can also determine who captures value.

This distinction between **innovation creation** and **innovation appropriation** is fundamental. A company may possess a technically superior invention but fail to commercialise it because it lacks manufacturing, distribution or marketing capabilities. Conversely, a firm may capture substantial value from technology developed elsewhere because it possesses superior complementary assets.

Intellectual property can consequently be understood as one component of a larger commercialisation architecture.

3. Methodology

3.1 Review Design

This study adopts a systematic literature review approach. Systematic reviews are intended to provide transparent and structured syntheses of existing research and can help identify patterns, gaps and future research priorities. PRISMA 2020 provides updated guidance concerning identification, selection and reporting of literature in systematic reviews.

For purposes of this **sample journal article**, the search and screening figures reported below are illustrative. They demonstrate the format and methodological presentation expected in a systematic literature review and should not be interpreted as reporting a completed empirical database search.

The review was designed around the following conceptual combination:

Intellectual property + innovation + commercialisation + technology transfer + open innovation

3.2 Search Strategy

A hypothetical search strategy was developed using combinations of keywords including:

- “intellectual property”;
- “IP management”;
- “patent strategy”;
- “innovation”;

- “technology commercialisation”;
- “technology transfer”;
- “university technology transfer”;
- “open innovation”;
- “knowledge appropriation”; and
- “intellectual property strategy”.

The illustrative search was structured around multidisciplinary academic databases commonly used for research in management, economics, law and innovation studies.

Table 2. Illustrative Search Strategy

Search component	Illustrative terms
IP	“intellectual property” OR patent* OR trademark* OR copyright
Innovation	innovation OR “R&D” OR invention
Commercialisation	commerciali* OR licensing OR exploitation
Technology transfer	“technology transfer” OR “knowledge transfer”
Collaboration	“open innovation” OR collaboration OR alliance
Strategic dimension	strategy OR management OR appropriation

Boolean operators were used to combine the search components. Duplicate records were removed before title and abstract screening.

3.3 Inclusion and Exclusion Criteria

Studies were considered eligible where they addressed a substantive relationship between intellectual property and innovation, commercialisation, technology transfer or knowledge exchange.

Table 3. Inclusion and Exclusion Criteria

Criterion	Inclusion	Exclusion
Subject	IP and innovation-related research	Studies unrelated to IP
Publication	Peer-reviewed academic research and major institutional reports	Informal commentary
Language	English	Non-English material
Relevance	Innovation, commercialisation, transfer or IP strategy	Purely technical patent prosecution studies
Research type	Conceptual and empirical research	Non-substantive material
Time	Primarily contemporary literature, with seminal earlier studies retained	Duplicate publications

3.4 Illustrative Screening Process

The hypothetical screening process began with 1,184 records. After removal of duplicates, 936 records remained for title and abstract screening. Of these, 713 were excluded because they did not substantially address the relationship between IP and innovation. The remaining 223 articles were assessed against the eligibility criteria, resulting in an illustrative final corpus of 97 studies.

Table 4. Illustrative Literature Screening

Screening stage	Records
Initial records identified	1,184
Duplicate records removed	248
Records screened	936
Records excluded after title/abstract review	713
Full texts assessed	223
Full texts excluded	126
Illustrative studies included	97

These figures are included solely to demonstrate a sample systematic-review presentation and should be replaced by actual search results before any real research publication.

3.5 Data Extraction and Thematic Analysis

For each included study, the review framework considered publication year, geographical context, theoretical foundation, research methodology, IP mechanism, innovation outcome and principal findings.

The studies were subsequently organised through thematic synthesis. Five dominant themes emerged:

1. IP protection and innovation incentives;
2. strategic IP management and value appropriation;
3. university technology transfer;
4. IP and open innovation; and
5. digital technologies and emerging IP challenges.

4. Findings

4.1 Intellectual Property Protection and Innovation Incentives

The first major theme concerns the traditional relationship between IP protection and innovation incentives. The central proposition is that intellectual property can increase expected returns from innovative investment by providing some degree of exclusivity.

Patents are particularly relevant where research and development is expensive, imitation is relatively easy and commercial returns depend upon technological differentiation. In these settings, patent protection can contribute to firms' willingness to invest in uncertain research programmes.

However, the relationship is not universal. The effectiveness of patents depends on the ability of firms to enforce rights and the economic significance of the underlying invention. Small firms may find patenting expensive, while firms operating in rapidly changing technological environments may obtain greater benefits from speed to market than from formal exclusion.

The literature therefore suggests that the value of IP protection should be considered in relation to firm-level strategy.

Table 5. Relationship Between IP Protection and Innovation

Dimension	Potential positive effect	Potential negative effect
Investment	Increases expected returns	Raises transaction and enforcement costs
Disclosure	Makes technical information publicly available	May reveal strategic information
Competition	Protects differentiation	May reduce short-term competition
Licensing	Creates transferable assets	Can generate bargaining conflicts
R&D	Encourages investment	Can restrict follow-on research
Financing	Supports valuation and investment narratives	Uncertain patent value can create valuation problems

The literature consequently supports a contingent rather than deterministic interpretation. IP protection can encourage innovation under particular institutional and technological conditions, but it does not independently guarantee innovation.

4.2 Strategic Intellectual Property Management

A second major theme concerns the transformation of IP from a legal compliance function into a strategic management function.

Traditional IP management frequently focused on registration, prosecution and enforcement. Contemporary scholarship increasingly considers questions such as:

- Which technologies should be patented?
- Which knowledge should remain secret?
- Which rights should be licensed?
- When should firms participate in patent pools?
- Which technologies should be made available to external partners?
- How should IP be used during mergers, acquisitions and strategic alliances?

These questions reflect the concept of the **strategic IP portfolio**.

A portfolio approach recognises that individual patents may have limited value when considered independently but can acquire strategic importance when combined with complementary patents, know-how, standards, brands and organisational capabilities.

This is particularly relevant in technology-intensive industries. Companies may use patents defensively to discourage litigation, offensively to negotiate licences, or strategically to gain bargaining power within technological ecosystems.

Table 6. Strategic Roles of Intellectual Property

IP role	Description	Strategic objective
Defensive	Prevents competitors from obtaining exclusionary positions	Freedom to operate
Offensive	Used to challenge or negotiate with competitors	Market leverage
Licensing	Allows external exploitation	Revenue generation
Signalling	Communicates technological capability	Investment attraction
Collaborative	Facilitates technology exchange	Partnership development
Blocking	Restricts competing technological trajectories	Competitive positioning

The literature increasingly indicates that patent counts alone are insufficient measures of IP performance. A firm with fewer patents may possess a more strategically valuable portfolio than a firm with thousands of low-value patents.

4.3 University Technology Transfer

Universities represent an important institutional setting for IP management because they simultaneously pursue knowledge creation, education and social impact.

The growth of university technology-transfer offices has been accompanied by increased attention to patents, licensing and spin-off creation. The underlying assumption is that discoveries generated through publicly supported research can produce broader economic and social benefits when transferred into commercial or practical applications.

However, technology transfer is more complex than patenting.

A university may produce a scientifically important discovery that has no immediate commercial application. Conversely, a relatively modest technological invention may generate substantial economic value when combined with an entrepreneur's market knowledge and complementary assets.

Research examining IP management in university technology transfer has criticised an overly narrow focus on appropriation through patenting and has argued for greater emphasis on utilisation of research results.

Table 7. University Technology-Transfer Mechanisms

Mechanism	Primary function	Typical outcome
Patent licensing	Transfer protected technology	Royalty/licensing income
Spin-off creation	Create new ventures	Commercialisation and employment
Research collaboration	Joint knowledge creation	Joint IP and publications
Consultancy	Transfer expertise	Contractual knowledge transfer
Open dissemination	Broad knowledge diffusion	Scientific/social impact
Incubation	Support entrepreneurial development	Start-up formation

The review suggests that university technology-transfer performance should therefore be evaluated through a multidimensional framework.

Potential indicators include:

1. licensing income;
2. number and quality of patents;
3. start-up survival;
4. technology adoption;
5. industry partnerships;
6. social impact;
7. knowledge diffusion; and
8. contribution to regional innovation ecosystems.

4.4 Intellectual Property and Open Innovation

Open innovation has challenged the assumption that valuable innovation must remain within organisational boundaries.

In open innovation environments, firms deliberately combine internal and external knowledge. Intellectual property becomes both an asset to be protected and an instrument through which knowledge can be exchanged.

This creates an apparent paradox. Firms need sufficient protection to prevent uncontrolled appropriation, but excessive protection can reduce the ability to collaborate.

Open innovation therefore requires **selective openness**.

A firm may protect core technologies while licensing peripheral technologies. It may disclose selected patents to encourage ecosystem development while maintaining trade secrets surrounding manufacturing processes. It may also acquire external technologies while licensing internally developed technologies to third parties.

Table 8. IP Governance in Open Innovation

Strategy	Degree of openness	Primary purpose
Full proprietary protection	Low	Maximum exclusion
Selective licensing	Moderate	Controlled exploitation
Cross-licensing	Moderate/high	Access to complementary technologies
Patent pooling	High within pool	Reduce transaction costs
Open licensing	High	Accelerate diffusion
Public-domain release	Very high	Maximise adoption

The literature therefore supports a move away from the binary distinction between “proprietary” and “open” innovation. In practice, organisations operate across a spectrum of openness.

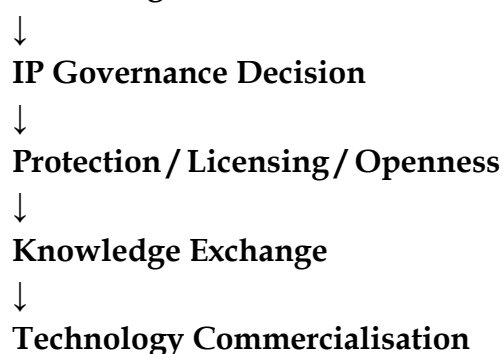
4.5 Intellectual Property and Technology Diffusion

The fifth theme concerns the relationship between IP and the diffusion of innovation. Innovation generates economic value only when technological knowledge is translated into products, services, organisational processes or social applications. A patented invention that remains unused may have limited practical impact.

Recent global evidence emphasises the importance of technology diffusion. WIPO's World Intellectual Property Report 2026 identifies technology characteristics, information flows, absorptive capacity and supportive policy and IP frameworks as important factors affecting how quickly and widely technologies spread.

This observation is particularly significant for developing and emerging economies. Access to technology depends not simply upon legal rights but also upon infrastructure, human capital, financing, institutional capacity and organisational capabilities.

Figure 1. Conceptual Relationship Between IP and Innovation Diffusion Knowledge Creation





Technology Adoption



Economic and Social Impact

This sequence demonstrates that intellectual property should not be treated as the final objective of innovation policy. Instead, IP constitutes an intermediate governance mechanism connecting knowledge creation with utilisation.

5. Emerging Challenges

5.1 Artificial Intelligence and Intellectual Property

Artificial intelligence presents several challenges to established IP frameworks.

Generative AI systems can produce text, images, software, music and other forms of output. This raises questions regarding authorship, ownership, training data, infringement, licensing and the protectability of machine-generated outputs.

At the same time, AI can transform the innovation process itself. Researchers increasingly use AI to identify technological opportunities, analyse patent landscapes and accelerate experimentation.

This creates a dual relationship between AI and IP. AI is simultaneously an object of IP regulation and a tool that changes how IP is created and managed.

Future research should examine whether traditional IP categories remain sufficiently adaptable to AI-assisted innovation.

5.2 Patent Thickets and Fragmented Ownership

Another emerging challenge is the accumulation of overlapping patent rights.

In complex technological fields, a single product may incorporate numerous inventions owned by different entities. Firms may consequently require multiple licences before commercialising a product.

Such fragmentation can increase transaction costs and create strategic uncertainty. Cross-licensing and patent pools have emerged as mechanisms for addressing these challenges, but their effectiveness varies across industries.

The literature therefore needs further research into the relationship between patent concentration, technological complexity and innovation performance.

5.3 Standard-Essential Patents

Standard-essential patents create a particularly important intersection between IP rights and market infrastructure.

Technologies incorporated into technical standards can become essential to interoperability. Patent holders may therefore possess significant bargaining power.

Standard-setting organisations frequently attempt to address this issue through licensing principles such as fair, reasonable and non-discriminatory terms.

Nevertheless, disputes concerning licensing rates and negotiation procedures remain significant.

This field illustrates the broader point that IP rights operate within institutional ecosystems rather than in isolation.

6. Synthesis of the Literature

The review identifies four fundamental functions of intellectual property within contemporary innovation systems.

Table 9. Four Functions of Intellectual Property

Function	Central question	Primary mechanism
Protection	How can knowledge be safeguarded?	Exclusionary rights/confidentiality
Appropriation	How can innovators capture value?	Licensing, exclusivity, complementary assets
Exchange	How can knowledge move between organisations?	Licensing, alliances, cross-licensing
Diffusion	How can innovation reach users?	Commercialisation, open licensing, technology transfer

These functions should not be viewed independently.

Protection can facilitate appropriation. Appropriation can create incentives for exchange. Exchange can support diffusion. Diffusion can generate new knowledge that contributes to subsequent innovation.

This produces a cyclical innovation system rather than a linear process.

6.1 Proposed Integrated Framework

Based on the literature synthesis, this article proposes the **Protection–Appropriation–Exchange–Diffusion (PAED) Framework**.

Figure 2. PAED Framework

PROTECTION

Legal and strategic protection of knowledge

↓

APPROPRIATION

Capture of economic value

↓

EXCHANGE

Licensing, collaboration and knowledge transfer

↓

DIFFUSION

Adoption and utilisation



NEW KNOWLEDGE

Feedback into innovation



The framework is moderated by four contextual conditions:

Technological characteristics – complexity, cumulative innovation and technological life cycles.

Organisational capabilities – R&D capacity, absorptive capacity, managerial expertise and complementary assets.

Institutional environment – legal enforcement, regulatory frameworks and technology-transfer institutions.

Market conditions – competition, demand, investment and industry structure.

The framework explains why identical IP strategies can produce different outcomes in different environments.

7. Discussion

The literature demonstrates that the economic significance of intellectual property cannot be reduced to the number of patents registered or legal rights held. Instead, IP should be understood as part of a broader architecture of innovation governance.

First, the review suggests that **IP protection is context dependent**. Strong patent protection may be particularly valuable where R&D investments are large and imitation is relatively easy. However, in cumulative innovation environments, overly broad protection may create barriers for subsequent innovators.

Second, **IP management is increasingly strategic**. Firms use IP portfolios not merely to prevent copying but also to attract investment, facilitate alliances, negotiate licences and influence technological ecosystems.

Third, **technology transfer requires more than patent ownership**. Universities and research organisations must possess the capabilities necessary to identify commercially valuable research, connect researchers with external users and support commercialisation.

Fourth, **open innovation changes the function of IP**. Instead of viewing openness and protection as mutually exclusive, organisations can strategically combine proprietary and open approaches.

Finally, **diffusion is becoming an increasingly important policy objective**. Recent evidence from WIPO indicates that technological advances can spread rapidly but that gaps in access, use and capabilities remain. Consequently, innovation systems need to consider both invention and adoption.

8. Theoretical Implications

The review has several theoretical implications.

First, the findings support an integration of the **resource-based view** and **knowledge-based view** of the firm. IP can constitute a valuable strategic resource, but its value depends on complementary knowledge and organisational capabilities.

Second, the findings are consistent with **appropriability theory**, which emphasises the mechanisms through which innovators capture value from innovation. IP is one mechanism among several.

Third, the review reinforces the importance of **open innovation theory**. Knowledge increasingly moves across organisational boundaries, meaning that firms must manage both inbound and outbound knowledge flows.

Fourth, the PAED framework contributes a process perspective by connecting legal protection with downstream commercialisation and diffusion.

9. Managerial Implications

Managers should avoid treating intellectual property as exclusively a legal department responsibility. Strategic IP decisions should involve research and development, finance, marketing, corporate strategy and business-development functions.

Before seeking protection, organisations should assess the commercial importance of the underlying technology, the probability of imitation, the cost of enforcement and the availability of alternative appropriability mechanisms.

Managers should also distinguish between **valuable IP** and **large IP portfolios**. A portfolio containing a smaller number of strategically important rights may provide greater competitive value than a substantially larger collection of low-value rights.

For organisations engaged in open innovation, contractual clarity is particularly important. Agreements should specify ownership, licensing rights, publication rights, confidentiality obligations, improvement rights and rights concerning jointly developed technologies.

Universities should similarly broaden their understanding of technology transfer. Patents and licensing income remain relevant but should be complemented by measures of technology utilisation, industry engagement, start-up performance and societal impact.

10. Policy Implications

The findings have implications for policymakers.

Intellectual property systems should balance incentives for invention with the broader objective of knowledge diffusion. Stronger rights are not automatically equivalent to stronger innovation systems.

Policy should therefore consider:

1. accessibility of IP institutions;
2. affordability of patenting and enforcement;
3. support for technology-transfer organisations;
4. incentives for university-industry collaboration;
5. mechanisms addressing fragmented patent ownership;
6. support for small and medium-sized enterprises;
7. appropriate governance of AI-generated innovation; and
8. investment in absorptive capacity and technological infrastructure.

The last factor is particularly important because legal access to technology does not guarantee effective use. WIPO's recent work on technology diffusion similarly emphasises the role of human and institutional capabilities alongside IP frameworks.

11. Research Gaps and Future Research Agenda

The literature review reveals several areas requiring further investigation.

Table 10. Future Research Agenda

Research area	Key unanswered question	Suggested methodology
AI and IP	How should ownership of AI-assisted inventions be determined?	Legal analysis and empirical research
University IP	Do patents accurately measure technology-transfer performance?	Longitudinal studies
Open innovation	What level of IP protection maximises collaborative innovation?	Comparative empirical studies
SMEs	How do resource constraints affect IP strategy?	Survey and case-study research
Patent thickets	Do fragmented rights reduce innovation?	Patent-network analysis
Technology diffusion	Which IP policies accelerate adoption?	Cross-country panel studies
Licensing	What determines successful technology licensing?	Transaction-level research
Sustainability	Can IP governance accelerate green technology diffusion?	Mixed-method research

Future research should increasingly employ interdisciplinary approaches. Intellectual property is simultaneously a legal, economic, managerial and technological institution. Studies confined to a single disciplinary perspective may therefore fail to capture its full impact.

Longitudinal research is especially valuable because the consequences of IP strategies may become visible only several years after the original decision. Similarly, comparative research across jurisdictions could identify how differences in enforcement, institutional quality and innovation policy influence outcomes.

12. Limitations

This review has several limitations.

First, the article focuses primarily on the relationship between intellectual property, innovation and commercialisation. It does not provide a comprehensive review of every branch of intellectual property law.

Second, the literature is multidisciplinary, creating differences in terminology, theoretical assumptions and research methods. This makes direct comparison between studies difficult.

Third, much of the empirical literature focuses on patents because patent data are comparatively accessible. Consequently, trade secrets, copyright, trademarks and informal appropriability mechanisms may receive less attention than their economic importance warrants.

Fourth, the quantitative screening figures presented in the methodology are **illustrative**, as this article is intended as a sample publication for a journal website rather than as a report of an actual completed systematic search. A genuine scholarly publication using this manuscript would need to replace the illustrative screening statistics with reproducible database searches and verified inclusion decisions.

Finally, the rapidly changing nature of AI and digital technologies means that conclusions concerning emerging IP issues should be periodically revisited.

13. Conclusion

This systematic literature-based article examined the relationship between intellectual property, innovation and technology commercialisation. The review demonstrates that IP performs substantially broader functions than simple legal protection. Contemporary organisations employ intellectual property to protect knowledge, appropriate economic value, facilitate exchange and influence the diffusion of technology.

The relationship between IP and innovation is consequently neither linear nor universal. Protection can encourage investment by improving appropriability, but excessive exclusivity can also create barriers to follow-on innovation and knowledge diffusion. The consequences depend on technological characteristics, organisational capabilities, institutional conditions and market structures.

University technology transfer provides a particularly important illustration. Patenting and licensing can support commercialisation, but successful technology transfer also requires entrepreneurial capabilities, external networks and

complementary assets. Existing research has therefore increasingly questioned the adequacy of patent counts and licensing revenues as stand-alone measures of performance.

The rise of open innovation further demonstrates the changing role of IP. Organisations increasingly need to determine not only what knowledge to protect but also what knowledge to exchange, license or make openly available. Effective IP strategy therefore requires a balance between exclusion and access.

The proposed Protection–Appropriation–Exchange–Diffusion framework provides a conceptual basis for integrating these different perspectives. Under this framework, IP protection represents the starting point rather than the endpoint of the innovation process. Protected knowledge can support value appropriation, which can facilitate exchange through licensing and collaboration, which in turn can support diffusion and adoption.

The broader policy challenge is therefore to develop intellectual property systems capable of supporting both **invention and diffusion**. Recent evidence concerning global technology diffusion reinforces the importance of institutional capacity, information flows and absorptive capabilities alongside IP protection.

Future research should extend this framework to artificial intelligence, green technologies, digital platforms, standard-essential patents, university–industry ecosystems and emerging models of open and distributed innovation. Such research can contribute to a more nuanced understanding of how intellectual property can simultaneously encourage invention, facilitate commercialisation and promote socially valuable technological diffusion.

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