

Bridging Gaps in Technology Commercialization:

The Critical Role of Innovation Intermediaries in Corporate-Startup Open Innovation

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Abstract:

Innovation intermediaries have expanded their roles significantly from traditional knowledge brokers to enablers of technology co-development and innovation ecosystem builders. Amid increasing corporate-startup collaborations, the specific functions and strategies of these innovation intermediaries are not well-understood. This paper investigates the enhanced role of these intermediaries in facilitating open innovation (OI), particularly between corporates and startups for technology commercialization. We conduct an exploratory case study on the Australian Sports Technologies Network, which connects sports technology startups with large organizations like sporting clubs, companies, research institutions, and investors, thereby advancing technology commercialization. Drawing on five cases, we uncover the pivotal role of innovation intermediaries in bridging startups with established firms. Our findings reveal four key bridging mechanisms—socio-technical, socio-cognitive, socio-relational, and socio-regulatory—used by intermediaries to create effective OI pathways. These mechanisms facilitate robust collaboration between startups and corporations that significantly boosts technology innovation and commercial outcomes. The findings emphasize how innovation intermediaries customize strategies to align startup innovations with corporate goals, enhancing commercial success. Their agility in crafting tailored OI frameworks benefits both startups and corporations, driving technological advancement and commercialization through effective OI utilization.

Introduction and Theoretical Background

Innovation intermediaries, traditionally viewed as facilitators of collaboration among parties in the innovation process (Chesbrough, 2006; Howells, 2006), have now expanded their roles. They have moved beyond mere knowledge brokering to actively enable technology co-development through crowdsourcing (Lauritzen, 2017; Randhawa et al., 2017, 2018) and fostering innovation ecosystems (Randhawa et al., 2022). This enhanced role accentuates connections among individuals, firms, and institutions, facilitating open innovation (OI) and co-creation of new value propositions centred around emerging digital technologies such as IoT and AI, spanning across firms, industries, and broader ecosystems (Kivimaa et al., 2019).

Concurrently, as new modes of OI emerge, particularly between corporations and startups, the specific role of innovation intermediaries in these dynamics are not yet fully understood. There has been a marked increase in both academic and practical interest in corporate-start-up collaborations, accompanied by a significant rise in the number and influence of innovation intermediaries. These intermediaries are nurturing a new breed of OI by providing structured environments that connect (technology) startups with established companies, research institutions, mentors, and investors (Pauwels et al., 2016; Kohler, 2016; Shankar & Shepherd, 2019; Kurpjuweit & Wagner, 2020).

While recent entrepreneurship research has examined the nature and impact of accelerators (Pauwels et al., 2016; Cohen et al., 2019), the emerging category of innovation intermediaries facilitating corporate-start-up collaboration, and those specifically focused on technology commercialization, remains largely unexplored (Kohler, 2016; Shankar & Shepherd, 2019). Unlike traditional accelerators, OI enabled through these corporate-focused innovation intermediaries bring together a distinct set of stakeholders and align different objectives (Kohler, 2016). Despite their importance, the mechanisms through which these intermediaries link startups with corporate, investment and institutional actors to facilitate technology adoption and commercialization through OI remain under-studied.

To address this research gap, we pose the question: “What role do innovation intermediaries play in fostering OI between corporates and startups for technology commercialization?” Our research involves an exploratory case study of the Australian Sports Technologies Network (ASTN), an innovation intermediary that facilitates the development, commercialization, and global scaling of sports technologies, by connecting sports technology startups, sporting organizations such as clubs and associations, sports companies, research institutions and investors. This study examines five cases illustrating ASTN’s pivotal role as a conduit linking startups with large organizations to enhance the technology commercialization process and outcomes.

Our research advances the fields of OI and entrepreneurship by unveiling the complex roles of innovation intermediaries in facilitating technology commercialization between corporations and startups. Extending beyond traditional intermediary roles of inter-firm brokerage (Howells, 2006), our study shows these entities as integral to creating a collaborative multi-stakeholder ecosystem. Specifically, we identify four crucial bridging mechanisms—socio-technical, socio-cognitive, socio-relational, and socio-regulatory—that these intermediaries use to develop new OI pathways, enabling effective collaboration between established organizations and startups for enhanced technology innovation and commercialization.

Our study highlights that innovation intermediaries actively shape OI, employing varied strategies to enhance partnerships between startups and corporations to foster technology commercialization. By tailoring strategies—such as insourcing ideas, external creation, corporate venturing, and incubation—these intermediaries align startup innovations with corporate strategies, improving the likelihood of commercial success (Weiblen and Chesbrough, 2015). Our findings emphasize the vital role of agility and adaptability of these entities allow them to create OI pathways attuned to market needs. Both corporations and

startups benefit from this arrangement: corporations access customized OI frameworks, and startups receive critical resources and mentorship, enabling effective utilization of OI for technological advancement and commercialization.

Methods and Findings

We utilize an exploratory case study approach focusing on the Australian Sports Technologies Network (ASTN), an innovation intermediary dedicated to the development, commercialization, and global expansion of sports technologies. ASTN achieves this by linking sports technology startups with key stakeholders such as sporting organizations, sports companies, research institutions, and investors. ASTN is different to traditional accelerators. It operates as a not-for-profit, unlike commercial accelerator models. ASTN does not take equity in startups in exchange for participation in its programs. Instead of selecting specific winners, ASTN focuses on enhancing the overall capacity and capability of the industry, embodying the principle that 'a rising tide lifts all boats'.

In the following, we outline five illustrative cases that demonstrate the crucial role played by ASTN in bridging startups with larger organizations to improve both the process and outcomes of technology commercialization. Based on these, we identify and outline four critical bridging mechanisms—socio-technical, socio-cognitive, socio-relational, and socio-regulatory—utilized by intermediaries to develop new OI pathways that enable and enhance collaboration between established organizations and startups for effective technology innovation and commercialization (Table 1 and Figure 1).

Case 1: Pitch to the Urban Strikers

In the "Pitch to the Urban Strikers" initiative, a collaboration between the Urban Strikers cricket team and ASTN, exemplifies a dynamic approach to open innovation between tech startups and large organizations. This OI program was designed to identify and promote emerging sports technology startups, offering them the opportunity to pitch their solutions to the Urban Striker's executive teams.

Engagement Process:

Startups were invited to tackle Urban Strikers' challenges like enhancing game experiences and boosting digital assets. Before the project, Strikers and ASTN protected 'background IP' and set licensing terms for new IP. The engagement began with ASTN workshops that crafted a problem statement, which launched a global startup call, resulting in a curated

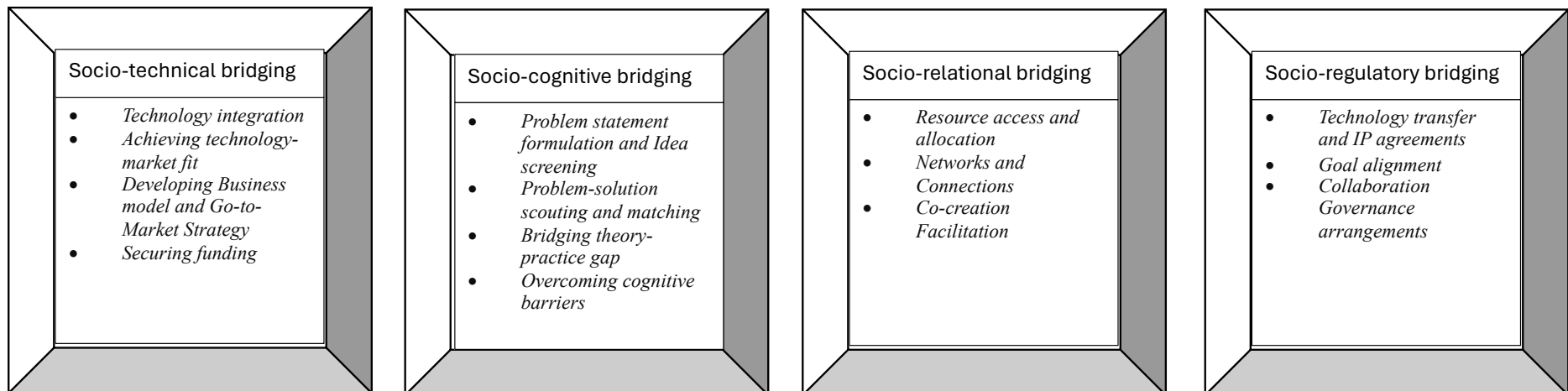
Table 1: Overview of case findings

	Urban Strikers	Pro League Innovators Hub	Global Tech/ DT Labs	Athletic Inc	Sports Institute Development Centre
	Melbourne Renegades	National Basketball League (Smartform Architecture)	(NTT/Twin Labs)	Zena Sports	Victorian Institute of Sport
Overview of OI	<ul style="list-style-type: none"> Urban Strikers crowdsource tech startup innovations via ASTN 	<ul style="list-style-type: none"> Commercializing sports industry technology advancements 	<ul style="list-style-type: none"> Developed digital twin technology via ASTN's Australian expertise. 	<ul style="list-style-type: none"> Athletic Inc and university developed a vest for female athletes. 	<ul style="list-style-type: none"> OI Challenge for wheelchair athlete tech, launched by Sports Institute Development Centre and ASTN.
Engagement Process	<ul style="list-style-type: none"> Targeted enhancements in game experiences and digital assets. Established terms for background and new IP protection and licensing. Workshops, global startup call, and shortlisting. Pitching competition to choose promising startup for pilot project. Platform for startups to showcase innovations and explore commercial partnerships. 	<ul style="list-style-type: none"> ASTN acts as an innovation intermediary, facilitating collaboration. Integration of advanced tech - AI, 5G, OTT, and IoT into sports infrastructure Insourcing and screening from 759 companies for suitable technologies. Technologies chosen to boost fan experiences and operational efficiency at venues. 	<ul style="list-style-type: none"> Created to commercialize digital twin technology in sports and events. Collaborated with international sports tournament for a digital simulation enhancing fan experience. Involvement of Global Tech technologists in ASTN's OI Masterclasses fostered idea to extend technology beyond Global Tech. 	<ul style="list-style-type: none"> Addressed higher risk of breast and rib injuries in contact sports. Facilitated startup and university collaboration. Partnership crucial for validating vest's protective capabilities Vest significantly reduces upper torso impact. 	<ul style="list-style-type: none">
Role of Innovation Intermediary					
Socio-technical bridging	<ul style="list-style-type: none"> Proof of Concept and Pilot Project Implementation: Transitioning successful pitches into operational integrations. 	<ul style="list-style-type: none"> Technology integration: Ensured startups' solutions could integrate with existing Pro League infrastructure. 	<ul style="list-style-type: none"> Assessing Market Fit and Commercial Viability: Insight via ASTN workshops and networks. 	<ul style="list-style-type: none"> Go-to-market strategy: Refined through ASTN's Accelerator Program. Early-stage funding: Facilitated by ASTN 	

				for initial development and market entry.	
Socio-cognitive bridging	<ul style="list-style-type: none"> • Problem-Solution Matching: Aligning Urban Strikers' needs with startup solutions through clear problem statements. • Dealing with internal tensions: Managing resistance within Urban Strikers, particularly from legal and marketing departments. 	<ul style="list-style-type: none"> • Scouting and Selection: Matched Pro League with promising startups from an extensive database. • Workshop Facilitation: Helped develop scenarios and align startup technologies with Pro League needs. • Idea Screening: ASTN guided partners through smart-stadium technology landscapes. 	<ul style="list-style-type: none"> • Overcoming the fear of looking foolish: Strategic planning and resource management support from ASTN. • Facilitating Learning: Provided through OI Masterclasses and startup courses to bridge theory and practical application. 		<ul style="list-style-type: none"> • Problem Formulation: ASTN articulated wheelchair athletes' tech needs. • Scouting and Matching: Identified and matched suitable researcher and disability sector company.
Socio-relational bridging	<ul style="list-style-type: none"> • Resource access and allocation: Providing startups with tools, funding, mentorship, and networks via ASTN. 		<ul style="list-style-type: none"> • Industry connections and networking: Access to industry and venture capital contacts via ASTN. 	<ul style="list-style-type: none"> • Facilitating Academic Partnerships: ASTN enabled Athletic Inc's engagement with university expertise. 	<ul style="list-style-type: none"> • Co-creation Facilitation: Guided collaboration and prototype development.
Socio-regulatory bridging	<ul style="list-style-type: none"> • Goal alignment: Aligning strategic objectives between startups and Urban Strikers 	<ul style="list-style-type: none"> • Collaboration Governance arrangements: help develop incentives and controls 	<ul style="list-style-type: none"> • Technology transfer: Guidance on IP rights and technology transfer from ASTN. 	<ul style="list-style-type: none"> • Technology transfer: Guidance on IP rights and technology transfer from ASTN. 	<ul style="list-style-type: none"> • Goal alignment: Aligning goals between partners • Collaboration Governance arrangements: facilitating communication to set clear expectations to manage partnerships.
Benefits of collaboration	<ul style="list-style-type: none"> • Entry into sports industry and access to new markets. • Broader resources and strategic mentorship through ASTN network • Credibility boost for startups by partnering with Urban Striker • Adoption of startup technologies enhances fan 	<ul style="list-style-type: none"> • Entry into the sports industry and potential contracts with Pro League. • Access to funding, mentorship, and strategic partnerships. • Enhanced credibility and exposure through association with well-known sports entities. 	<ul style="list-style-type: none"> • Global Tech solidified innovation leadership via DT Labs spinout. • Accessed new markets without compromising core operations. • Improved reputation through association with cutting-edge technology. 	<ul style="list-style-type: none"> • Partnership with reputable university boosted vest credibility. • Key for Athletic Inc's product development. • Accelerated go-to-market strategies and funding opportunities. • Demonstrated practical relevance of research for university 	<ul style="list-style-type: none"> • Access to sports and disability sectors, validation, and exposure. • Boosted market appeal through collaboration. • Reduced product development and testing costs by using Centre's resources. • Access to technologies for wheelchair athletes.

	<p>engagement and operational efficiency</p> <ul style="list-style-type: none"> • tech adoption keeps Urban Strikers agile and competitive. • Technological advancement and stronger competitive positioning for both startups and Urban Strikers 	<ul style="list-style-type: none"> • Discovery of innovative technological solutions enhancing fan experiences and operations. • More economical than in-house solution development. • Leverages external innovations for efficiency and market adaptability. • Taps into advanced technologies not available internally. 	<ul style="list-style-type: none"> • Demonstrated commitment to technological advancement. • Secured funding and established a strong client and partner network. • Provided knowledge crucial for scaling and commercializing technology. • Reduced time to market and strengthened market position. 	<ul style="list-style-type: none"> • Improved university reputation notably in sports technology research through innovative product development. 	<ul style="list-style-type: none"> • Fresh perspectives and improved public image as sports science innovator. • Enhanced stakeholder engagement due to innovative contributions.
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Figure 1: Innovation intermediary's bridging mechanisms



shortlist. A pitching competition determined the selection, leading to a pilot project with the winning startup. This initiative not only provided a platform for startups to showcase their innovations but also forged potential commercial partnerships in the cricket industry.

Role of ASTN as an Intermediary:

ASTN played a crucial role as an intermediary in this OI program through an array of activities. These include:

- *Problem-Solution Matching:* ASTN facilitated the alignment of real industry problems with innovative solutions by understanding the needs of the Urban Strikers and identifying startups that can meet these needs. They assisted Urban Strikers in formulating clear problem statements and streamlined the engagement process between the startups and the corporate team.
- *Proof of Concept and Pilot Project Implementation:* Following successful pitches, ASTN supported the integration of the startup's solutions into the Urban Striker's operations, turning pilot projects into launch customers.
- *Resource access and allocation:* Through ASTN's resource mobilization, startups could access broader tools and resources, including funding, mentorship, and networks.
- *Dealing with internal tensions:* ASTN helped the Strikers' project team manage internal tensions from departments like legal and marketing when dealing with the risks of "an unproven minimum viable product" (Chesbrough, 2020).

Benefits of Collaboration:

This OI program yielded substantial benefits for both parties. Startups gained invaluable entry into the sports industry, allowing them access to new markets. Through the network provided by ASTN, startups accessed broader resources, including strategic mentorship, which facilitated their growth and scalability. Additionally, working with a renowned entity like the Urban Strikers lent startups significant commercial validation, establishing them as credible and reliable partners.

On the other hand, the Urban Strikers have capitalized on this collaboration by gaining access to cutting-edge technologies introduced by startups. This infusion of new tech solution significantly enhanced fan engagement and operational efficiency. Moreover, the ability to quickly adopt these innovative solutions outside of traditional procurement processes, allows Urban Strikers to maintain a competitive edge, staying agile in a rapidly evolving industry. This symbiotic relationship enabled by ASTN has not only fostered technological advancement but also strengthened the competitive positioning of both the startups and the Urban Strikers in the sports sector.

Case 2: Pro League Innovators Hub

The Pro League Innovators Hub is an OI initiative aimed at commercializing technological advancements in the sports industry spearheaded by ASTN acting as an innovation intermediary, to aid collaboration of a large sporting organisation with various technology startups and an architectural firm.

Engagement Process:

The Pro League Innovators Hub was designed to integrate cutting-edge technologies such as AI, 5G, OTT (Over The Top content), and IoT (Internet of Things) into sports infrastructure. ASTN played a pivotal role by insourcing and screening potential technologies from a comprehensive database of 759 companies. This process involved meticulous selection based on specific elements of the sports technology stack crucial for enhancing fan experiences and operational efficiency at sporting venues.

Role of ASTN as an Intermediary:

ASTN's involvement was multifaceted, focusing on the following key activities:

- *Idea Screening:* ASTN facilitated the screening process, helping project partners understand the landscape of smart-stadium technologies.
- *Workshop Facilitation:* ASTN assisted in developing scenarios and providing innovative ideas during workshops, ensuring that startups' technologies aligned with the needs and vision of the Pro League, aiding the development of mutual understanding.

- *Scouting and Selection:* Leveraging its extensive database, ASTN matched the Pro League with startups that offered the most promising technological innovations suitable for sports environments.
- *Technology integration:* ASTN provided technical expertise to ensure that startups' solutions could be integrated into existing infrastructure at Pro League

Benefits of Collaboration:

The OI collaboration between startups and the Pro League has delivered significant benefits for both entities. For startups, the partnership provides the ability to be seen, potential market access, entry into the sports industry and the potential to secure contracts with a major industry player like the Pro League. Additionally, startups gain access to ASTN's extensive network, which includes funding opportunities, mentorship, and strategic partnerships, further enhancing their resource base. The association with renowned entities in the sports sector also offers startups increased credibility and exposure, bolstering their commercial validation.

On the other hand, the Pro League benefits from unearthing innovative technological solutions provided by startups, which they otherwise might not easily discover and have the potential to significantly enhance fan experience and streamline operations. OI is more cost-effective than developing solutions in-house, and also brings in added benefits of external expertise and innovation. Furthermore, by leveraging external startups, it taps into advanced tech solutions that might not have been accessible internally, enhancing the efficiency and effectiveness of the innovation process, also allowing it to quickly adapt to market trends and remain at the forefront of the sports industry.

Case 3: Global Tech Spins Out DT Labs

Global Tech, a leading global telecommunications company, leveraged its international sports tournament sponsorship to develop a sophisticated digital twinning capability, primarily driven by Australian-based expertise within the ASTN network. This innovation led to the spinout of DT Labs, a startup focused on commercializing digital twin technology across various sporting and event industries.

Engagement Process:

Initially, Global Tech collaborated with an international sports tournament to create a digital simulation or replica of the sport ('digital twin'), enhancing the fan experience by providing in-depth data, analytics and operational insights. The development involved Global Tech technologists who participated in ASTN's OI Masterclasses and startup courses, fostering the idea to extend the technology beyond its internal use at Global Tech.

Role of ASTN as an Innovation Intermediary:

ASTN played a critical intermediary role in the successful spinout of DT Labs by:

- *Facilitating Learning:* Through OI Masterclasses and startup courses, ASTN provided the necessary knowledge and industry expertise to align understandings. It also assisted in bridging the gap between theoretical knowledge and practical commercial application, enabling the spinout to navigate the complex landscape of sports technology commercialization.
- *Industry connections and networking:* ASTN's network included introductions to industry connections and the venture capital community, essential for securing funding and strategic partnerships for DT Labs.
- *Overcoming the fear of looking foolish:* Global Tech faced challenges in dedicating resources to explore new commercial avenues while maintaining its core business functions owing to the "fear of looking foolish". ASTN's support in strategic planning and guidance in resource management was crucial.
- *Assessing Market Fit and Commercial Viability:* Identifying the market fit and commercial viability of digital twins outside the specific context of the tournament required deep technological and market insights, which were facilitated through ASTN's workshops and networks.

- *Technology transfer:* Translating a corporate innovation into a standalone product required careful navigation of IP rights and technology transfer issues, areas where ASTN provided guidance and expertise.

Benefits of Collaboration:

This outbound OI facilitated by ASTN has yielded significant benefits. Global Tech, through the spinout of DT Labs, reinforced its position as a leader in innovation within the telecommunications and sports technology sectors. This strategic move enabled Global Tech to tap into new revenue streams without compromising its core operations and significantly enhanced its brand image. Associating with state-of-the-art technology and actively supporting startup spinouts underlined Global Tech's reputation as an innovator, showcasing its commitment to pushing the boundaries of technology and market possibilities.

Engagements orchestrated by ASTN were crucial in securing necessary funding and establishing a robust network of potential clients and partners. Participation in ASTN programs provided Global Tech with strategic insights essential for scaling and effectively commercializing technology, thereby ensuring market readiness of their products. This not only reduced the time to market but also fortified their competitive edge.

Case 4: Athletic Inc – Academic Partnership

Athletic Inc, a sportstech company, collaborated with a local University to develop a game-changing protective vest for female athletes, addressing the higher risk of breast and rib injuries in contact sports. This startup-large research institution collaboration was of ASTN's sector engagement with universities and serving as a crucial innovation intermediary.

Engagement Process:

Recognizing the need for better protective gear for female athletes, Athletic Inc founders engaged with the University for product development and testing. This partnership was instrumental in validating the protective capabilities of the Athletic Inc vest, which was proven to significantly reduce impact across the upper torso.

Role of ASTN as an Innovation Intermediary:

ASTN's intermediary role was multifaceted as outlined below:

- *Facilitating Academic Partnerships:* ASTN provided vital introductions, helping Athletic Inc to engage with the University to leverage their expertise in sports research.
- *Go-to-market strategy:* Through its Accelerator Program, ASTN assisted Athletic Inc in refining their go-to-market strategy, ensuring the product met both consumer needs and market standards.
- *Early-stage funding:* ASTN was instrumental in facilitating early-stage funding opportunities, providing Athlete Inc with the financial resources needed for initial product development and market entry.

Benefits of collaboration:

The collaboration between Athletic Inc and the University, facilitated by ASTN, delivered substantial benefits to both parties. For Athletic Inc, the partnership enhanced the credibility of their vest by associating with a reputable academic institution. Additionally, working with the University granted Athletic Inc access to specialized knowledge and state-of-the-art testing facilities, which were instrumental for product development. ASTN's support in crafting go-to-market strategies and providing funding opportunities significantly accelerated the commercialization process.

On the other hand, the University benefited from applying its research in a real-world setting, which not only demonstrated the practical relevance of its work but also enhanced its reputation. The development of an innovative product addressing significant health concerns in sports notably improved the university's standing in sports technology research.

Case 5: Sports Institute Development Centre Challenge for Adaptive Athletics.

The Sports Institute Development Centre in collaboration with the ASTN, launched an OI challenge to develop technologies supporting wheelchair athletes. This initiative exemplifies the effective use of OI as a pathway for technology commercialization, leveraging the unique position of ASTN as an intermediary to bridge gaps between startups, researchers, and sporting organizations.

Engagement Process:

The challenge began as a pitching competition aimed at identifying solutions to effectively monitor the day-to-day loads of wheelchair athletes, a significantly underserved area in sports technology. The competition evolved into a co-creation activity involving the Sports Institute Development Centre, a researcher, and a company from the disability sector, facilitated by ASTN's structured innovation pathways.

Role of ASTN as an Innovation Intermediary:

ASTN played a crucial role in facilitating connections that drive innovation in many ways:

- *Problem Formulation:* ASTN helped the Sports Institute Development Centre articulate the specific technological needs and challenges faced by wheelchair athletes, ensuring that the solutions developed were both relevant and innovative
- *Scouting and Matching:* Leveraging its extensive network, ASTN identified and matched a researcher and a company from the disability sector that could potentially co-create a suitable solution
- *Co-creation Facilitation:* ASTN facilitated the collaboration between Sports Institute Development Centre, the researcher, and the company, and continues to guide the process from idea generation to prototype development.

Benefits of collaboration:

The collaboration between tech startups and the Sports Institute Development Centre provided startups with access to new markets in the sports and disability sectors, validation, and exposure, while enhancing their credibility and market appeal; it also allowed startups to utilize the Centre's resources, reducing the costs and time associated with product development and testing.

Simultaneously, the Sports Institute Development Centre gained access to cutting-edge technologies tailored to wheelchair athletes, enhanced its R&D through fresh perspectives, and

bolstered its public image as an innovator in sports science and athlete support, thereby strengthening stakeholder engagement.

Discussion and Contribution

In this section, we aggregate the insights from our cross-case analysis on the crucial role of the innovation intermediary in the corporate-startup OI process for technology commercialization. From this analysis, we delineate four essential bridging mechanisms—socio-technical, socio-cognitive, socio-relational, and socio-regulatory—employed by intermediaries to create new OI pathways (Figure 1). These mechanisms facilitate collaboration between established organizations and startups, thereby driving effective technology innovation and commercialization.

Innovation intermediary's bridging mechanisms

Socio-technical bridging

Socio-technical bridging mechanisms bring together niche technologies, ideas and markets, to develop new socio-technical solutions or trajectories. This involves facilitating in: (1) Technology integration, (2) Achieving technology-market fit (3) Developing Business model and Go-to-Market Strategy, and (4) Securing funding, which we describe below.

1. *Technology integration*: Integrating new technologies into existing systems can be complex. Intermediaries help by providing technical expertise and ensuring that startups' solutions were compatible with the incumbent's existing infrastructure.
2. *Achieving technology-market fit*: Balancing market fit and technical feasibility of the solution demands extensive reconfiguration of the technology and market infrastructure, which can be facilitated by the intermediaries
3. *Developing Business model and Go-to-Market Strategy*: Participation in the intermediaries' workshops and networks is instrumental in refining the go-to-market strategy, ensuring that products not only met consumer needs and market standards but were also economically viable.

4. *Securing funding*: Intermediaries play a crucial role in securing funding opportunities, equipping startups with the essential financial resources required for initial technology and product development, and market entry.

Overall, socio-technical bridges fundamentally shift prevailing socio-technical configurations through modifications to existing technological, material, operational and economic dimensions.

Socio-cognitive bridging

Socio-cognitive bridging facilitates sharing, processing and translating technical and industry knowledge, overcoming proven corporate cognitive barriers such as the ‘fear of looking foolish’ (Bez & Chesbrough, 2021), and bridging the cognitive gaps between startups and large organizations to ensure shared understandings and smoother collaboration. These involve: (1) Problem statement formulation and Idea screening (Needs translation) (2) Problem-solution scouting and matching (Shared problem-solution understanding between partners) (3) Bridging theory-practice gap, and (4) Overcoming the ‘fear of looking foolish’.

1. *Problem statement formulation and Idea screening*: Startups and corporates often operate at different speeds and scales, and belong to different thought worlds and cultures, leading to cognitive barriers to collaboration. Intermediaries help overcome cognitive challenge by translating needs and expectations into a common language through problem statement formulation and idea screening.
2. *Problem-solution scouting and matching*: Intermediaries bridge cognitive differences and facilitating shared understanding through sophisticated problem-solution scouting and matching processes.
3. *Bridging theory-practice gap*: Intermediaries also bridge the cognitive gap between theoretical knowledge and practical commercial application, enabling partners to navigate the complex landscape of technology commercialization.

4. *Overcoming cognitive barriers*: Intermediaries provide support and strategic guidance that helps large incumbents overcome cognitive barriers and resistance to exploring external ideas, mitigating fears of looking foolish (Bez & Chesbrough, 2021). They also assist in managing internal tensions arising within departments like legal, marketing, or quality control ('corporate antidotes', Engel (ed), 2022) when dealing with risks from "an unproven minimum viable product" (Chesbrough, 2020).

In summary, socio-cognitive bridges aid sense-making and sense-giving and address cognitive differences to foster a trust-based relationship.

Socio-relational bridging

Socio-relational bridging facilitates the coordination of people, resources, capabilities, and knowledge through a range of activities including, (1) Resource access and allocation (2) Networks and Connections, and (3) Co-creation facilitation, as described below.

1. *Resource access and allocation*: Startups often lack resources to scale up quickly, and needing to work with corporates, also worry about meeting the resource demands of a large organization. Intermediaries support resource mobilization and provided access to necessary tools and resources to ensure that startups can scale their solutions. Furthermore, collaborating with large organizations also allowed startups access specialized technical and financial knowledge and resources, crucial for technology and product development.
2. *Networks and Connections*: Companies, especially startups, often need broader industry connections. Leveraging the networking platforms and introductions provided by intermediaries help companies locate and engage with external partners.
3. *Co-creation Facilitation*: Intermediaries facilitate the relationships between all parties guiding the process from idea generation to commercial launch. These may sometimes also include political activities such as building coalitions to negotiate change by bringing in supporters from the dominant regime.

Overall, socio-relational activities facilitate resource mobilization as well as partner engagement to enable prosocial actions and deeper social interactions.

Socio-regulatory bridging:

Socio-regulatory bridging mechanisms capture structures and activities that enable partners to engage in goal regulation and alignment, including (1) Technology transfer and IP agreements, (2) Goal alignment, and (3) Collaboration governance arrangements, as we outline below.

1. *Technology transfer and IP agreements:* Protecting intellectual property while fostering collaboration is a common challenge. Startups are concerned about IP rights, and corporate innovation into a standalone product also necessitates meticulous handling of technology transfer and IP issues. To address this, intermediaries facilitate expert advice and aids in negotiating fair agreements for all parties involved.
2. *Goal alignment:* The disparity in goals between startups and large organizations can hinder collaboration. Intermediaries bridge this gap by aligning strategic objectives.
3. *Collaboration Governance arrangements:* Intermediaries help establish robust governance by facilitating communication to set clear expectations and develop incentives and controls to manage partnerships.

In sum, socio-regulatory bridges help protect all partner interests, and define the collaboration scope and objectives, ensuring partners are aligned in their expectations and contributions.

Contribution and implications

Our research makes significant contributions to the fields of OI and entrepreneurship by unpacking the nuanced roles of innovation intermediaries in advancing technology commercialization within the framework of corporate-startup OI. Moving beyond traditional roles of innovation intermediaries (Chesbrough, 2006; Howells, 2006), our findings portray these OI intermediaries as more than mere connectors or brokers. They shape a multi-stakeholder ecosystem for collaboration, co-creation, and co-innovation. Specifically, we identify four key bridging mechanisms – socio-technical, socio-cognitive, socio-relational and socio-regulatory – deployed by innovation intermediaries to forge new OI pathways for technology innovation and commercialisation by facilitating collaboration between established organizations and startups.

We reveal that innovation intermediaries have evolved into dynamic facilitators and drivers of OI, employing diverse strategic approaches to bolster startup-corporate collaborations. They effectively tailor various modes of corporate-startup OI – insourcing of ideas, initiating external creation, corporate venturing and corporate incubation – for technology commercialization, to not only promote new venture creation, but also align with the broader strategic goals of corporations (Weiblen and Chesbrough, 2015). Our findings highlight the critical role of agility and adaptability in the intermediation process, leading to customized OI pathways that are more attuned to market demands and have improved prospects for commercial success.

Our research delineates the distinctions between the innovation intermediaries we study and traditional corporate accelerators in their structure, objectives, and methods of engagement with stakeholders, exploring how these differences redefine their roles within the innovation ecosystem (Pauwels et al., 2016; Shankhar & Shepherd, 2019). Acknowledging the evolved role of innovation intermediaries enables both corporations and startups to fully leverage these specialized entities to accelerate their technology innovation efforts. For corporations, engaging with intermediaries offers access to customized OI frameworks that align with their strategic goals. For startups, innovation intermediaries act as growth platforms, facilitating connections with corporations and other key actors, offering critical industry insights, specialized technology expertise, and market access. By providing resources, mentorship, and strategic guidance, intermediaries actively facilitate OI between corporates and startups, advancing the technology commercialization process. These insights equip both corporate practitioners and startups with a valuable framework to effectively utilize OI intermediaries as dynamic facilitators of technology commercialization.

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