29 / 2025 ISSN: 2465-175

prospettiveinORGANIZZAZIONE

RIVISTA DELL'ASSOCIAZIONE ITALIANA DI ORGANIZZAZIONE AZIENDALE

Special Issue

Innovation and Organizational Ecosystems:

Navigating Tensions and Shaping the Future of Innovation

https://prospettiveinorganizzazione.assioa.it/

PROSPETTIVE IN ORGANIZZAZIONE
RIVISTA TRIMESTRALE DI ORGANIZZAZIONE AZIENDALE

ISSN 2465-175

Editore
ASSIOA - Associazione Italiana di Organizzazione Aziendale
Università Cattolica del Sacro Cuore
Largo A. Gemelli, 1 -20123 Milano info@assioa.it

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Introduction to Special Issue

Networked Innovation: Ecosystems, Tensions, and Collaborative Futures

a cura di Francesco Bolici[1] e Lorenzo Mercurio[2]

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In recent decades, network-based perspectives have become increasingly influential in understanding how actors—whether individuals, organizations, or institutions—coordinate and co-create innovations in rapidly changing environments (Haythornthwaite, 1996; Carayannis & Campbell, 2009; Bolici et al., 2022). Digital innovation, in particular, has significantly altered how ecosystems emerge and operate, introducing new opportunities as well as critical tensions (Nachira et al., 2007; Senyo et al., 2019; Eloundou et al., 2023). These tensions span multiple dimensions: privacy versus data-driven efficiency (Stahl & Wright, 2018); generative AI's transformative potential versus concerns for ethics and responsible adoption (Eloundou et al., 2023); technological reshaping of healthcare systems versus the need for inclusive patient-centered approaches (Illario et al., 2022); and the strategic rethinking of industrial operations in pursuit of sustainability (Riesener et al., 2019; Yung et al., 2023). Against this backdrop, the "Triple Helix" model and its various evolutions (Quadruple and Quintuple Helix) underscore the need for collaboration among academia, industry, government, and civil society to address these emerging complexities (Leydesdorff & Etzkowitz, 1998; Carayannis & Campbell, 2009; Carayannis et al., 2012). Embracing such ecosystemic thinking is vital to promoting innovation that is not only economically viable but also socially and ethically sound.

This Special Issue stems from the awareness that organizations today operate under multi-actor, multi-level influences, where ecosystemic structures—dynamic networks of interconnected actors—shape how knowledge is created, shared, and applied (Chang & West, 2006; Cuel et al., 2021). The call for papers emphasized several core themes. Among them are: the impact of innovative technologies on organizations, helix models of innovation and their extension to emerging technologies, patient-centric and one-health perspectives in healthcare, the growing role of AI and data governance in shaping knowledge flows, policymaker engagement in facilitating innovation ecosystems, approaches to industrial sustainability, and open innovation challenges for SMEs (Khan & Arshad, 2019; Radziwon & Bogers, 2019). Ultimately, this issue seeks to unveil the theoretical and empirical contours of tensions arising from advanced digital innovation and to present paths for their resolution.

The articles featured here collectively address these challenges and opportunities while grouping into thematic areas that showcase both the breadth of ecosystemic perspectives and the shared challenges across different domains. A first set of contributions underscores the crucial importance of *data governance and the orchestration of collaborative networks*.

In this vein, **Kazemargi et al. (2025)** examine data governance within emergent digital ecosystems and propose ways for organizations to navigate distributed data sources and blockchain-based certification, while **Carollo et al. (2025)** investigate organizational dynamics and tensions in innovation ecosystems, highlighting issues of trust, collaboration, and asymmetries in how innovation is distributed among stakeholders. **Ceci et al. (2025)**, moreover, explore multicultural networks and their role in shaping innovation ecosystems. Through an ethnographic study of a Dutch innovation hub, they show how cultural diversity catalyzes creativity and tacit knowledge exchange, even as it sometimes slows the execution of complex projects and large-scale initiatives.

Next, two studies delve into *sustainability, ethics, and social responsibility* as key elements of ecosystem design. **Colombi et al. (2025)** shed light on an ecosystemic approach to Corporate Social Responsibility (CSR), illustrating how collaborative networks and dynamic capabilities embed social and ethical values into a banking institution's operations. **Varone et al. (2025a)** complement this perspective with a focus on industrial sustainability in the naval and aerospace sectors, showing how circular business models and partnerships among public authorities, firms, and academia can remove obstacles to greener production processes.
Meanwhile, *AI-driven transformation* emerges as a powerful force in reshaping both societal practices and policy frameworks. **Orlando et al. (2025)** address how assistive AI-based technologies expand human capabilities, yet simultaneously demand careful consideration of ethical and inclusivity principles to avoid reinforcing "abilist" standards. **Varone et al. (2025b)** further broadens this lens, proposing a governance framework for emerging AI ecosystems in which public institutions become co-designers, coordinators, and technology-transfer promoters, rather than mere regulators.
A final strand of contributions explores the *organizational and societal implications* of these transformative processes. **Rodighiero et al. (2025)** focus on collaborative spaces—such as coworking and makerspaces—as innovation intermediaries that unify diverse actors, supporting new ventures, knowledge flows, and open innovation, particularly for smaller or less-resourced players. **Pernice et al. (2025)**, in turn, examine the tensions induced by digital transformation in healthcare, ranging from tecnostress among practitioners to changing requirements for patient advocacy groups, and discuss what managerial and policy measures can ensure these digital shifts enhance well-being rather than undermine it.

Taken together, these contributions underscore the fundamental importance of multi-actor collaborations, institutional orchestration, and inclusive design in harnessing the potential of advanced digital technologies. They point to the necessity of robust governance frameworks, knowledge-sharing mechanisms, and strategic policymaking to address tensions—such as data privacy versus utility, or efficiency gains versus ethical concerns. At the same time, they demonstrate the promise of collaborative, network-centric approaches capable of aligning diverse stakeholder interests for shared, sustainable outcomes. We hope this Special Issue serves as a platform for ongoing dialogue, research, and innovation in organizing complex ecosystems at the frontier of technological and social transformation.

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Dinamiche organizzative e tensioni emergenti negli ecosistemi per l'innovazione: spunti dal caso del consorzio Intellimech[1]

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Abstract

Partendo dal caso del consorzio Intellimech, questo articolo analizza le dinamiche organizzative che portano alla creazione di un ecosistema per l'innovazione e identifica le tensioni principali che ne caratterizzano il funzionamento. Tali tensioni suggeriscono alcuni aspetti chiave da considerare nella progettazione e gestione di queste forme organizzative emergenti.

Introduzione

Gli ecosistemi per l'innovazione sono sempre più centrali nei dibattiti sulla competitività dei sistemi economici. Con ecosistemi per l'innovazione si intendono quei contesti in cui gli attori esplorano possibilità e creano opportunità per lo sviluppo di prodotti e servizi, attraverso un assetto istituzionale e organizzativo che abilita l'implementazione di attività di ricerca e sviluppo (Auschra et al., 2019). Così intesti, gli ecosistemi comprendono reti, comunità e cluster di organizzazioni che si uniscono per affrontare sfide e opportunità condivise attraverso processi congiunti di creazione di valore (Adner, 2017). L'idea centrale è legata al concetto di innovazione aperta (Chesbrough e Bogers, 2014) e alle crescenti difficoltà per qualsiasi organizzazione di gestire autonomamente e in modo profittevole il processo innovativo (McGahan et al., 2021; Radziwon e Bogers, 2019). Attraverso l'innovazione aperta, diverse organizzazioni contribuiscono con le loro competenze distintive alla produzione di conoscenza comune. Gli ecosistemi possono quindi migliorare il potenziale di collaborazione e scambio tra organizzazioni localizzate nello stesso territorio (o su piattaforme digitali), con l'intento di raggiungere sinergie attraverso l'integrazione di risorse sviluppate da attori con storie, identità e competenze differenti. Gli ecosistemi, quindi, facilitano la complementarità delle risorse, il trasferimento tecnologico e la creazione di nuove conoscenze. Possono incoraggiare lo sviluppo dell'apprendimento e dell'innovazione tra aziende di diversi settori, spesso in collaborazione con istituzioni come governi locali, università, centri di ricerca e associazioni di imprese.

Gli ecosistemi si sviluppano e acquisiscono legittimità attraverso processi di azione collettiva (Thomas e Ritala, 2022), ossia quando un gruppo di organizzazioni eterogenee sviluppa una proposta di valore condivisa e capace di indirizzare gli sforzi comuni verso l'innovazione aperta. Da un punto di vista organizzativo, ciò implica la necessità di coordinare una molteplicità di interessi, anche attraverso processi di negoziazione integrativa capaci di coinvolgere gli attori nella risoluzione creativa e collaborativa dei problemi.

L'obiettivo di questo articolo è riscostruire le dinamiche organizzative che portano alla creazione di un ecosistema per l'innovazione, identificare alcune tensioni fondamentali che ne caratterizzano il funzionamento e suggerire alcune soluzioni e modalità di gestione di queste tensioni. Tale obiettivo è perseguito attraverso la ricostruzione e l'analisi del caso di Intellimech, il consorzio per

[1] Questo articolo sviluppa e integra alcune idee contenute in un recente contributo degli autori sull'evoluzione strategica delle associazioni datoriali (Sheldon et al., 2024).

l'innovazione tecnologica e digitale nel settore della meccatronica situato all'interno del parco tecnologico Kilometro Rosso Innovation District a Bergamo.

Il consorzio Intellimech, assieme alle attuali 54 aziende ed enti consorziati, e alle ulteriori realtà e istituzioni che collaborano con esso (quali, ad esempio, l'Università degli Studi di Bergamo, l'Istituto Italiano di Tecnologia di Genova, Regione Lombardia, varie scuole professionali e Istituti Tecnici Superiori del territorio), rappresenta un caso di successo di creazione e sviluppo di un ecosistema su base prevalentemente territoriale (anche se con connessioni a livello nazionale e internazionale) volto all'innovazione tecnologica e digitale in un settore, quello della meccatronica, altamente dinamico e competitivo, che richiede un'innovazione continua al fine di controllare sistemi e processi con un grado sempre maggiore di automazione e integrazione. La ricostruzione è basata sull'analisi della documentazione rilevante prodotta dal e sul consorzio (e disponibile in gran parte online) e su interviste effettuate tra il 2021 e il 2022 sia con il personale di Confindustria Bergamo e del consorzio Intellimech, sia con aziende socie e non socie del consorzio.

Breve storia della costituzione ed evoluzione del consorzio Intellimech

Nel 2007 Confindustria Bergamo, con il supporto della Camera di Commercio locale, ha istituito il consorzio Intellimech, al fine di realizzare ricerca e sviluppo pre-competitiva nel campo della meccatronica. Questa iniziativa rispondeva e risponde tuttora a una realtà locale caratterizzata perlopiù da piccole e medie aziende, con un'alta percentuale di aziende operanti nel settore metalmeccanico (il 39% di tutte le aziende; il 44% se si considera il numero totale dei dipendenti).

Inoltre, molte delle aziende manufatturiere operanti al di fuori del settore metalmeccanico erano e sono utilizzatrici di meccatronica, e dunque fortemente interessate agli sviluppi del settore.

Alla fondazione del consorzio hanno contribuito originalmente otto aziende. Le difficoltà iniziali nella relazione tra questi soggetti erano rappresentate dal fatto che, insistendo in un territorio circoscritto e svolgendo lavorazioni di tipo simile, queste aziende erano tra loro concorrenti (dirette o potenziali). Si trattava quindi di un classico scenario di "coopetizione", sbilanciato però verso la competizione. Inizialmente erano infatti molti i dubbi e gli ostacoli espressi dagli uffici legali di queste aziende, relativi principalmente ai rischi legati alla condivisione della conoscenza e ai diritti di proprietà intellettuale derivanti dalla collaborazione in Intellimech. Tuttavia, l'associazione confindustriale locale, forte del capitale sociale pregresso e del suo ruolo istituzionale, è riuscita a superare queste barriere incrementando la fiducia delle aziende nella cooperazione e, soprattutto, si è fatta garante di una serie di accordi e regole sui principali temi potenzialmente conflittuali, che sono stati successivamente formalizzati nello Statuto e nel Regolamento del consorzio. Questi hanno inteso regolare aspetti quali le condizioni e i requisiti per aderire e lasciare Intellimech, così come i termini in base ai quali gli associati possono usufruire delle risorse e dei prodotti della ricerca del consorzio, includendo anche meccanismi, regole e organi associativi per risolvere eventuali conflitti emergenti tra le aziende socie e tra i soci e il consorzio.

Dopo la sua fondazione e la definizione della principale cornice normativa, il successivo passaggio importante è avvenuto nel 2013, quando il consorzio si è ufficialmente qualificato come istituto di ricerca al fine di poter accedere al finanziamento pubblico in quest'ambito. Questa trasformazione ha goduto di un consenso maggiore in quanto, da una parte, il numero di aziende era cresciuto, rendendo quindi meno salienti le conflittualità tra singoli partecipanti, e, dall'altra, gli anni di cooperazione attiva e aperta su numerosi progetti di innovazione avevano contribuito a ridurre i timori iniziali e a generare fiducia tra i soci.

A livello territoriale, si è progressivamente diffuso un ampio consenso intorno a Intellimech, sia tra i soci di Confindustria Bergamo, sia tra le aziende non associate e le aziende non operanti nel settore della meccatronica. Ciò riflette una percezione comune rispetto alle esternalità positive che questa iniziativa porta al territorio, come ad esempio la diffusione di cultura imprenditoriale orientata all'innovazione e l'aumento della forza lavoro qualificata. Inoltre, come detto, la grande maggioranza

delle aziende del territorio sono piccole e medie imprese manifatturiere che, direttamente o indirettamente, beneficiano dei progressi nella meccatronica e che difficilmente riuscirebbero a sfruttare altrimenti i vantaggi dell'innovazione tecnologica.

È pur vero che molte aziende attualmente associate a Intellimech rimangono concorrenti diretti sul mercato dei prodotti, e alcune hanno mantenuto una certa riluttanza a condividere informazioni sui loro progetti di innovazione con gli altri associati. In particolare, questo si è manifestato durante iniziative quali le visite aziendali di gruppo o i "pomeriggi Intellimech", incontri principalmente destinati alla generazione e condivisione di idee. Tuttavia, nel tempo, grazie alle attività organizzate da Intellimech, sempre più aziende associate hanno sviluppato fiducia reciproca, permettendo loro di sentirsi più libere di "aprire le porte" agli altri soci e di scambiare idee ed esperienze. Questo fa sì che le attività del consorzio siano oggi ben consolidate e in continua espansione, come testimoniato anche dal numero di aziende consorziate, cresciuto progressivamente negli anni.

Funzionamento, principali attività e governo del consorzio Intellimech

I risultati di ricerca, sotto forma di articoli scientifici, note, report di ricerca, casi d'uso, istruzioni e altri materiali divulgativi (quali video e presentazioni power point) riguardanti applicazioni relative alla meccatronica, costituiscono allo stesso tempo le risorse a disposizione di Intellimech e i suoi principali prodotti. I "progetti comuni" di ricerca e sviluppo sono condivisi tra tutte le aziende socie e la loro selezione segue una procedura ben definita. Ogni anno a ottobre, all'inizio del ciclo annuale di attività del consorzio, il comitato scientifico (composto da quattro professori di diverse università, più un esperto di innovazione che fa parte del Consiglio di amministrazione o è designato da esso) propone dieci argomenti di ricerca considerati di frontiera nel campo della meccatronica. Da novembre a gennaio, lo staff del consorzio consulta ogni associato su base individuale. A ogni azienda viene chiesto di valutare i temi proposti assegnando a ciascuno un punteggio da 1 a 10, in base alla rilevanza per l'azienda e alle proprie priorità. La scelta finale di tre o quattro temi su cui concentrare l'attività annuale di ricerca di Intellimech tiene conto sia del punteggio complessivo raggiunto da ogni progetto, sia del livello medio di interesse espresso dagli associati.

Il personale di Intellimech, comprendente tredici ricercatori e due impiegati amministrativi, è responsabile della realizzazione dei progetti, nonché della comunicazione delle informazioni relative ai progressi della ricerca e agli output intermedi attraverso vari canali, quali gli incontri denominati "Pomeriggi Intellimech", il periodico "Smartnews" e una sezione dedicata del sito accessibile solamente ai soci. Oltre ai progetti comuni, il consorzio realizza "progetti speciali" che rispondono a interessi condivisi e iniziative congiunte tra sottogruppi di membri del consorzio, i quali pagano un contributo extra per parteciparvi al fine di ottenere progetti e risultati personalizzati. Il consorzio vende infine output di progetto più routinari e meno strategici anche ad aziende esterne non consorziate.

I risultati di Intellimech non si limitano all'impatto della sua attività di ricerca e sviluppo in ambito di meccatronica. Il consorzio ha infatti sviluppato collaborazioni con una serie di attori aziendali e istituzionali a livello locale, regionale e nazionale. Sono attive collaborazioni con il Comune di Bergamo, scuole tecniche e professionali locali, l'Università di Bergamo e altre università, la Regione Lombardia, l'Istituto Italiano di Tecnologia (IIT) di Genova e la Confindustria nazionale. Inoltre, Intellimech è uno dei membri fondatori dell'Associazione Fabbrica Intelligente Lombardia (AFIL), che la Regione Lombardia ha ufficialmente riconosciuto nel 2014 come cluster tecnologico regionale per la produzione manufatturiera avanzata. Questo ecosistema allargato rende il consorzio punto di riferimento centrale per le aziende associate, per le loro esigenze di ricerca, per la risoluzione di problemi, per i rapporti con le amministrazioni pubbliche e per l'accesso a finanziamenti.

Confindustria Bergamo ha stabilito e continua a influenzare questo ecosistema di innovazione come suo attore chiave, assumendo quindi il ruolo di "orchestratore", secondo la dizione utilizzata da vari studiosi (ad esempio Thomas e Ritala, 2022 e Paquin e Howard-Grenville, 2013; per un'analisi

del ruolo delle associazioni imprenditoriali negli ecosistemi per l'innovazione si veda Sheldon et al., 2024). Lo fa in conformità con le regole vigenti, espresse nello Statuto e nel Regolamento, che conferiscono l'autorità di governance al Consiglio di amministrazione del consorzio, sostenuto dall'Assemblea generale. Bisogna ricordare che Confindustria Bergamo ha inizialmente coordinato le relazioni e gli scambi tra i membri fondatori per definire tali regole in uso. Inoltre, continua a farlo in relazione alle attività ordinarie e straordinarie attuali del consorzio. Un esempio è stata la decisione di stabilire un laboratorio congiunto con l'Istituto Italiano di Tecnologia di Genova. Inoltre, Confindustria Bergamo designa il Presidente del Consiglio di amministrazione di Intellimech e agisce come principale decisore politico, producendo decisioni collettive e ulteriori regolamenti e accordi di dettaglio. Ha anche responsabilità di governance per il personale di Intellimech, i gestori della conoscenza e delle risorse del consorzio e i vari altri attori privati e istituzionali che vi collaborano in maniera complementare. L'associazione confindustriale locale ha promosso nel tempo processi di partecipazione attiva e continua per i membri del consorzio, sia per selezionare i "progetti comuni", sia per partecipare a bandi pubblici. Dal punto di vista degli output, oltre all'innovazione tecnologica in ambito di meccatronica (ad esempio, attraverso lo sviluppo di algoritmi, manuali e istruzioni, casi d'uso, configurazione di telecamere e bracci robotici, ed altre applicazioni), gli impatti dell'ecosistema si sostanziano in numerose esternalità positive: la creazione di capitale sociale tra i soci del consorzio e vari attori istituzionali; lo sviluppo delle competenze e dell'occupabilità dei lavoratori, soprattutto dei giovani, attraverso la collaborazione a iniziative formative rivolte alle aziende, alle scuole tecniche e professionali e agli studenti universitari; il supporto alle imprese per la partecipazione a bandi pubblici e ad altre opportunità di finanziamento; la collaborazione con centri di ricerca e università nazionali e internazionali che pongono Intellimech e il suo territorio di riferimento al centro di un ecosistema per l'innovazione con notevoli impatti su scala locale, ma con rilevanza e connessioni su scala internazionale.

Tensioni emergenti dal caso di Intellimech

Il caso del consorzio Intellimech si presta a una lettura complessivamente positiva sia per quanto riguarda la sua evoluzione, sia per i risultati ottenuti nel corso del tempo, risultando esemplificativo di una tendenza più generale relativa allo sviluppo di ecosistemi territoriali che producono impatti positivi sulle comunità locali e sul territorio più in generale. Questi non riguardano necessariamente ecosistemi per l'innovazione tecnologia, come nel caso di Intellimech. Come ulteriori esempi si vedano la costituzione di un ecosistema per l'istruzione e la formazione professionale nell'alta valle dell'Arve, Francia (Culpepper, 2000) o il caso dei parchi ecologico-industriali olandesi per il riciclo di materiali e il risparmio di energia e coordinati anche in questo caso da associazioni datoriali (Heeres et al., 2004). Tuttavia, dal caso Intellimech, come pure dagli altri casi citati, emergono alcune tensioni fondamentali che caratterizzano la costituzione e il funzionamento degli ecosistemi per l'innovazione che è bene tenere presenti, non tanto perché costituiscano barriere insormontabili, ma piuttosto perché sono dei vincoli reali che possono spiegare il comportamento di alcuni attori entro un ecosistema.

Ancora una volta il caso di Intellimech verrà usato con funzione illustrativa.

Innovazione a beneficio di pochi VS Innovazione a beneficio di molti

All'inizio della storia di Intellimech emerge chiaramente come ci fosse scarsa propensione verso la condivisione della conoscenza e dei diritti di proprietà intellettuale derivanti dalle collaborazioni entro il consorzio, tra aziende concorrenti. È pur vero che nella maggioranza dei casi questa diffidenza è stata superata, lasciando tuttavia ai soci la possibilità di impegnarsi variabilmente nei "progetti comuni" o nei "progetti speciali", questi ultimi caratterizzati da una minore apertura e condivisione e da una maggiore personalizzazione. Si è usata inoltre una sensibilità discrezionale verso quelle aziende associate meno propense alla partecipazione ai momenti di condivisione. Bisogna inoltre

notare che, a parte alcune pubblicazioni a carattere divulgativo e giornalistico, i risultati dell'attività di ricerca del consorzio restano puramente appannaggio dei soci e sono conservati nell'archivio digitale e nella biblioteca di Intellimech. Piuttosto che di innovazione chiusa e di innovazione aperta intese in senso stretto, sarebbe più corretto parlare quindi di diversi gradi di apertura e chiusura. D'altra parte, è evidente che più ci si avvicina al polo dell'innovazione chiusa e tradizionale, più ristretto è il numero dei beneficiari del processo, mentre avvicinandosi al polo dell'innovazione aperta è più facile avere impatti positivi non solamente sulle aziende consorziate, che partecipano quindi direttamente alla creazione di conoscenza e innovazione, ma anche su altri attori del territorio e dell'ecosistema più ampio, superando quindi i confini stessi dell'innovazione aperta.

Affiliazione e fiducia esclusive VS Affiliazione e fiducia multiple

Il grado di apertura e chiusura dei soci e dei processi di innovazione attivati è strutturalmente legato al tipo di relazioni inter- e intra-organizzative instauratesi a vari livelli nel corso del tempo. Nel caso di due (o più) aziende legate da una partnership, ad esempio un contratto di fornitura di lunga durata o un investimento comune, è più facile collaborare attivamente a un progetto condiviso entro il consorzio, o che un'azienda induca l'altra (o le altre) ad associarsi. D'altra parte, anche la partecipazione a network, l'affiliazione ad altri gruppi o associazioni influenzano le relazioni tra i membri del consorzio e con i non soci. Nel corso del nostro studio ci siamo spesso chiesti cosa spinge un'azienda ad associarsi a Confindustria Bergamo e ad Intellimech, piuttosto che solo a Intellimech? Inoltre, le aziende associate a Confindustria Bergamo ma non ad Intellimech, magari perché non appartenenti al settore meccatronico, come giustificano l'impegno nel consorzio da parte dell'associazione datoriale, e l'impiego ingente di fondi, tempo e altre risorse associative a favore di un sottogruppo di aziende del territorio, in alcuni casi neanche associate alla Confindustria locale? Queste domande spingono a interrogarsi sull'effetto di affiliazioni e relazioni di fiducia variabili e multiple esistenti all'interno di un ecosistema, oltre che sugli eventuali comportamenti "leali" piuttosto che opportunistici intrapresi da alcuni attori.

Attori influenti e relazioni di potere asimmetriche VS Partecipazione e decisioni collettive

Dal punto di vista formale, a differenza delle burocrazie, i network non sono strutture gerarchiche e tutti i nodi possano essere considerati formalmente eguali. Tuttavia, spesso accade che i network presentino alcuni attori "focali" che per posizione, centralità e/o disponibilità di risorse risultano maggiormente influenti di altri attori che risultano più periferici. Guardando alla varietà della base associativa di Intellimech, dove sono presenti molte PMI, tipiche del territorio bergamasco, ma anche alcuni grandi gruppi multinazionali con svariate migliaia di dipendenti e di milioni di fatturato, risulta evidente che alcuni attori possono risultare maggiormente influenti rispetto ad altri sulle decisioni in materia di sviluppo tecnologico. Negli anni '70, i ricercatori della scuola di Aston, in Inghilterra, hanno verificato come siano le grandi aziende e le loro scelte strategiche a guidare l'innovazione tecnologica, mentre le piccole aziende devono perlopiù adattare le loro strategie, strutture e culture allo sviluppo tecnologico in corso. È legittimo pensare che queste dinamiche si riflettano almeno in parte anche all'interno degli ecosistemi che presentano caratteristiche simili al caso che abbiamo analizzato. Discorso a parte merita la posizione di Confindustria Bergamo, la quale si configura come primus inter pares all'interno del consorzio, mantenendo l'autorità formale su alcune decisioni strategiche quali la designazione del presidente del board. Pur promuovendo quindi processi decisionali partecipativi e deliberativi, caratterizzati da una certa democraticità e parità tra i decisori (ad esempio la scelta annuale dei progetti "comuni"), alcuni attori sono di fatto capaci di influenzare maggiormente la presa di decisioni collettive.

Conclusione e implicazioni

Il consorzio Intellimech, promosso e sviluppato da Confindustria Bergamo come suo attore principale, rappresenta un caso di successo di creazione e sviluppo di un ecosistema su base territoriale per l'innovazione tecnologica e digitale nel settore della meccatronica. Tuttavia, il caso esaminato ci ha anche permesso di evidenziare come, da un punto di vista organizzativo, la gestione di un ecosistema per l'innovazione sia ricca sfide e criticità da risolvere. Le reti, le aggregazioni di imprese e gli ecosistemi sono forme organizzative ad altissimo potenziale, ma sono molto più complesse della somma delle complessità che ciascuna singola impresa porta con sé. Le tensioni che abbiamo evidenziato ci aiutano a capire il comportamento degli attori e le dinamiche intra- e inter-organizzative che avvengono negli ecosistemi, e suggeriscono alcuni aspetti chiave da considerare nella progettazione e gestione di queste nuove forme organizzative.

In primo luogo, l'assetto organizzativo risulta essere una variabile determinante; deve essere chiaro e definito nelle regole di funzionamento e nel processo decisionale, e prevedere organi deputati alla composizione degli interessi. In secondo luogo, è essenziale costruire costantemente occasioni e iniziative per sviluppare e alimentare la fiducia tra gli attori, attraverso scambi e collaborazioni continue, su progetti applicati, anche con il supporto di attori istituzionali. Fiducia, cultura della collaborazione e qualità delle relazioni non si improvvisano, e l'ecosistema deve esserne il fattore abilitante. Infine, la presenza di un'organizzazione leader (nel nostro caso l'associazione datoriale locale) che funge da orchestratore e facilitatore, in quanto superiore agli interessi di parte, è un elemento altrettanto determinante sia per garantire la stabilità del sistema in termini di governance, sia per favorire la creazione di rapporti di fiducia tra gli attori.

Nel quadro fortemente competitivo dell'economia globale attuale, caratterizzato da un tasso di sviluppo tecnologico e di intensità della conoscenza elevati, la gestione competente di queste dinamiche e tensioni organizzative rappresenta un elemento fondamentale per configurare ecosistemi locali per l'innovazione in grado di assicurare la sostenibilità e il benessere dei territori e dei sistemi economici di cui fanno parte. Da questa prospettiva, il sistema italiano è avvantaggiato rispetto ad altre realtà perché può contare sulla (e a partire dalla) gloriosa esperienza dei distretti industriali che tanto hanno contribuito (e, in molti casi, contribuisco tutt'ora) allo sviluppo del nostro sistema economico. È fondamentale però che l'iniziativa e l'esperienza imprenditoriale, così come gli interventi pubblici di politica industriale, non si concentrino esclusivamente sulla dimensione tecnica e tecnologica dei processi di innovazione e del funzionamento degli ecosistemi, ma investano in modo significativo anche nello sviluppo delle competenze organizzative necessarie per gestire e superare le tensioni che abbiamo evidenziato e che inevitabilmente caratterizzano i processi di aggregazione tra organizzazioni.

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Multicultural Networks in Innovation Ecosystems

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Abstract

This ethnographic study explores multicultural networks (MNs) within Dutch innovation ecosystems (IEs). It shows that MNs enhance creativity, problem-solving, and market opportunities through tacit knowledge exchange, though diversity can slow execution in complex projects. MNs also attract global talent and investment, key for driving innovation in IEs.

Keywords: Multicultural Networks, Innovation Ecosystems, Diversity, Interactional Model of Cultural Diversity

Introduction

In the past, Multicultural Networks (MNs) have acted as a catalyst for innovation, birthing remarkable advancements and creations that have shaped history. The flourishing of the Islamic Golden Age can be found during the medieval period, particularly in cities like Baghdad, Cordoba, and Cairo. In this era, scholars, scientists, and artists from diverse backgrounds, including Arabs, Persians, Jews, and Christians, converged in vibrant cultural hubs where they engaged in a rich exchange of ideas, drawing upon the wisdom of ancient civilizations such as Greece, Persia, and India, as well as incorporating their unique perspectives. Similarly, the role of MNs in team performance has been a topic of interest in recent organizational research. Studies have shown that network centralization and performance are influenced by cultural diversity within teams (Tröster et al., 2014). To this aim, international organizations are pushing for states to adopt more multicultural models, reflecting a shift towards inclusivity and diversity (Kymlicka, 2009). In general, there is a large consensus that diversity has performance advantages over homogenous work structures (Cox et al., 1991), even if managing this inclusive process can be considered a challenging task due to the nature of MNs. In the domain of Innovation Ecosystems (IEs) a massive body of materials investigates the nature of networks across different organizations (Yaghmaie & Vanhaverbeke, 2020), the importance of analyzing network communities (Xu et al., 2020), and the network portfolio composition that allows the identification of the fruitful relationships that enhance the innovation process (Panetti et al., 2020). IEs involve dynamic collaborative networks focused on innovation (Smorodinskaya et al., 2017) and the networking behavior of firms is linked to their innovative capacity through benefits like risk sharing, accessing new markets/technologies, and exchanging knowledge (Pittaway et al., 2004). In this context, several authors have identified the IEs as a valuable solution to provide an important option for firms to harness external partners for value creation as part of an open innovation strategy (Vanhaverbeke & Cloodt, 2006; West et al., 2014; Bogers et al., 2017). In the IE research area, the debate has mainly addressed IEs configurations (Adner, 2017; Hannah & Eisenhardt, 2018; Jacobides et al., 2018), how they can represent a suitable scenario to develop open innovation strategies (Chesbrough, Kim & Agogino, 2014) and how different settings (e.g., collaboration, competition, and coopetition) change the dynamics of such interactions between the diverse actors and within the ecosystem itself (Jiang et al., 2020; Smorodinskaya et al., 2017; Bacon et al., 2020). However, rather less attention has been paid to how MNs affect the IEs both at the organizational and ecosystem level. This emerging gap seems to be in contrast with today's globalized world, where innovation is increasingly recognized as a key driver of economic growth,

competitiveness, and societal progress. Moreover, investigating MNs in IEs can represent a crucial step in fostering collaborative networks. In this vein, within the IEs, which comprise diverse actors such as businesses, universities, research institutions, startups, and government agencies, form the foundation for generating and diffusing new ideas, technologies, and solutions, the role of MNs and diversity should gain prominence due to their potential to stimulate creativity, foster collaboration, and drive innovation.

For these reasons, our research question is as follows:

How do multicultural networks affect the Innovation ecosystem's performance?

From a theoretical point of view, this paper aims to bridge two massive bodies of research that can provide relevant contributions to both fields in the complex interplay that multicultural network has on performance and their organizations. On the practical side, the results will be insightful for innovation managers to foster collaboration mechanisms aiming at including and valorizing cultural differences of MNs in the innovation processes.

Theoretical Framework

The theoretical framework on which this paper is built on, for a detailed understanding of the role of multicultural networks in IEs, draws on the interactional model of cultural diversity proposed (IMCD) provided by Cox (1994). The IMCD model (Fig.1) proposes that the impact of diversity on organizational outcomes is a complex interaction of individual and their environment. From an epistemological and theoretical point of view, the environment is conceived to include both intergroup and organizational forces. In our context, a core assumption lies in the fact the diversity climate is supposed to directly impact organizational performance that is determined by factors such as creativity, problem-solving, and intraorganizational communications. Indeed, several works reveal a positive relation between diversity in education and gender on the likelihood of introducing an innovation (Østergaard et al., 2011). Moreover, once an organization does everything possible to remove all kinds of discrimination, both obvious and subtle, it expects creativity to increase dramatically. To this aim, managing multicultural networks might represent a crucial task for innovation managers to foster collaborations within IEs. In this vein, the theoretical contribution of this work will be testing Cox's model, evaluating the role of MNs on organizational effectiveness, assessed under the lens of creativity, problem-solving, and intraorganizational relationships.

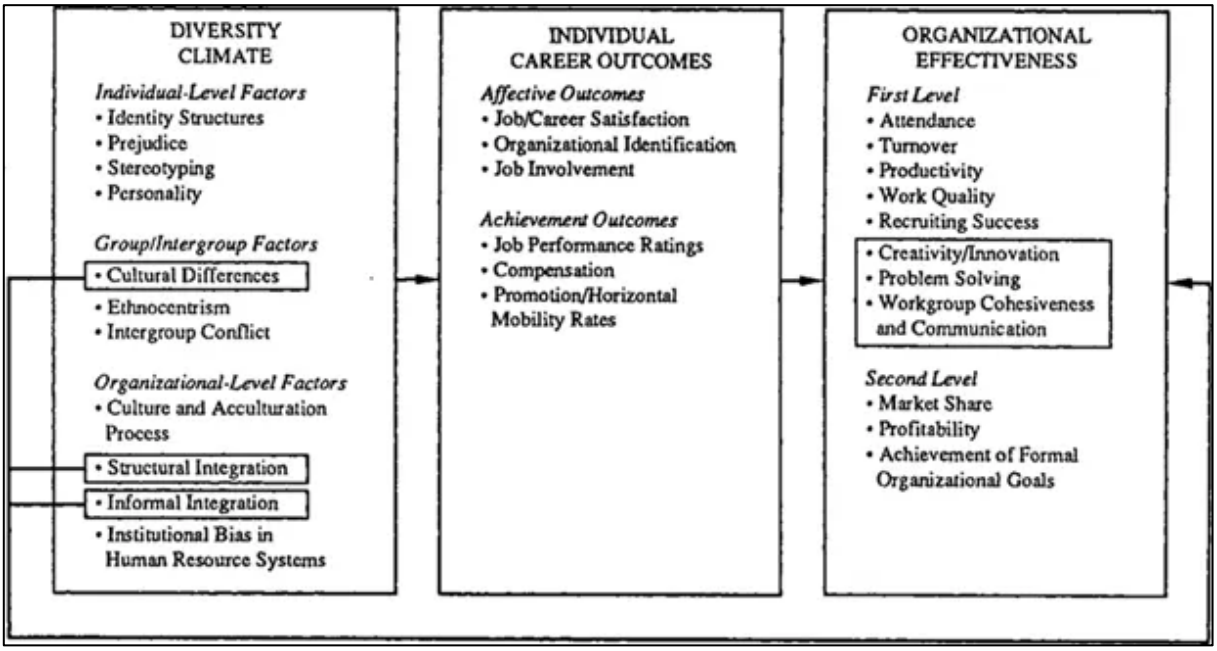

Figure 1: *The interactional model of cultural diversity (source: Cox, 1994)*

Methods

The paper employs a qualitative approach and presents a short-term ethnography study (7 months) in an IE located in the Dutch scenario. The case study represents an internationally leading institute where talent is educated and engineers, designers, and natural/social scientists jointly develop and valorize interdisciplinary metropolitan solutions. The IE works as a networking organization, initiating platforms with local and international partners, both private and public, and above all with citizens and users. We decided to choose this IE for three main reasons. First, its mission is to develop a deep understanding of the city – by "sensing" the city – to design solutions for its challenges and integrate these into the Dutch metropolitan area. To this aim, we could find different stakeholders with different educational backgrounds and born in different parts of the world. Secondly, the IEs perfectly embraces a quintuple helix innovation model (Carayannis et al., 2012) and the different components (and thus different MNs) may be dense in significance. Third, the IE was founded by different universities both at a national (Dutch) and international level and the municipality. In this vein, we imagined that the academic setting in which it is immersed may have strong implications on creativity, problem-solving, and intraorganizational communication with a practical focus derived by the necessity of tackling practical challenges for the "social goods".

The unit of analysis is the IE performance. There were four data sources: (1) direct observations in the IEs (e.g., participation in meetings, workshops, the start-up accelerator, and social events) (2) ten semi-structured interviews with employees with different nationalities (each selected for every component of the quintuple helix model) (3) secondary sources such as business records, its website, and emails. This data collection process seems to be consistent with the short ethnography: this rapid methodology is also characterized by research activities being undertaken in a shorter time frame (typically weeks and months rather than years), the multidisciplinary nature of teams, the use of mixed methods of data collection, and an emphasis on findings leading to applied interventions (Pink & Morgan, 2013). The semi-structured interviews were focused on a variety of topics, but they were mainly divided into three main sections: 1) the background of each candidate and the reasons behind the decision to work at this IE 2) the role and the tasks that they deliver daily 3) presentation of concrete examples in which they were facing difficulties and they had to find solutions to problems (e.g., situational interviews). The interviews were conducted in English, the interviewee's native language, recorded and later fully transcribed. Afterward, they were translated into English. Data triangulation has been employed: this technique involves the use of different sources of data to examine phenomena across settings and at different points in time (Denzin, 2017). Finally, a content analysis was realized: this technique makes replicable and valid inferences from data to their context (Krippendorff, 1989). Both descriptive and interpretive encoding was performed using the software for qualitative analysis MAXQDA 11. This approach was employed to explore the extent of Cox's theoretical framework. The analysis was first performed separately and then jointly by the authors to compare the results and guarantee intercoder reliability. In a qualitative study, intercoder reliability is particularly significant since words may have multiple meanings, may be open to interpretation, and may only be understood in the context of other words, which in a way makes them harder to work with than numbers (Miles & Huberman, 1994). The analysis was then shared and discussed with the other authors to identify new emerging patterns.

Findings

The empirical research we conducted on the role played by MNs within IEs reveals several key findings that will be briefly summarized in the next section, even if they represent just a minimal part of the massive body of materials (textual data, photos, videos and business records) that were collected during the ethnographies. To this aim, we intend to extend this work by presenting new contributions in the domain of IE deep diving the following insights.

Exchange of tacit knowledge

Multicultural Networks (MNs) are instrumental in facilitating the exchange of tacit knowledge, a sort of knowledge that is often deeply rooted in cultural norms, experiences, and unspoken practices. This exchange happens through informal interactions, shared experiences, and collaborative efforts within diverse teams.

"*I have the feeling that I can learn from new ways of approaching the work and that are unique, compared to the cultural settings I have always lived int. This gives me new perspective to exert my performance and new information to be more productive. I am not talking about something specific in terms of knowledge, but as I said in terms of approach, what I could get just looking at my colleague. I think it is meaningful for my personal growth*". [Interviewee 1].

This assumption is important in our study since from a clear understanding of the kind of knowledge that is exerted in a given context it is possible to facilitate knowledge transfer (Bacon et al., 2020) toward a more efficient knowledge network in IEs (Tang et al., 2020). Moreover, in testing Cox's interactional model, we found that diversity in MNs contributed to a rich pool of ideas, enhancing creativity and problem-solving. However, the study found that the influence of MNs on intraorganizational relationships was less pronounced, indicating that while diversity sparks innovation, it does not necessarily translate to stronger or more cohesive intraorganizational bonds, which is probably moderated by other factors. This seems to be consistent with Kochan et al. (2003), who state that diversity has complex effects on business performance, with organizational context and group processes moderating the relationship.

Creativity and exploitation of market opportunities

The observations showed that culturally diverse teams were positioned to navigate and exploit global market opportunities, thanks to their varied cultural fluencies and social capital. These teams can identify niche markets, understand diverse customer needs, and create products or services that resonate across different cultures based on their different experiences.

"*In my country we are used to deal with governments in this way [..]. I think we could try to benefit from this experience even if the role and the engagement of municipality is completely different. In my past experience in the Netherlands this approach led me to strengthen the relationships with key stakeholders to convince them to support us in the project we were carrying out*." [Interviewee 2].

However, the study highlighted a potential downside: the same diversity that fosters creativity can also slow down execution. This is because diverse teams often explore a broader range of solutions, leading to extended decision-making processes and a slower implementation of projects. Particularly in complex, large-scale initiatives like EU projects, this can result in delays, suggesting a need for balance between creative exploration and efficient execution. In this domain, while some researchers addressed which core competencies were needed to effectively tackle project execution and their diversity (Lampel, 2001), our findings suggest that the diversity in teams (in terms of MNs) can make this process slower.

Attractiveness of Innovation ecosystems

MNs play a crucial role in making Innovation Ecosystems more attractive. In this vein, MNs help create a welcoming environment that not only appeals to a global workforce but also attracts stakeholders who are looking for strategic partnerships. This diversity boosts the reputation of IEs, making them more appealing to international investors and collaborators. The study emphasizes that

supporting these multicultural networks is key to keeping IEs competitive on a global scale, especially in diverse and multicultural cities.

"*I decided to work here because of the multicultural settings of the ecosystem. I have the feeling that different communities are living this place in peace and the working team, their different expertise, make the work more challenging and innovative in complex contexts*." [Interviewee 3].

It is clear that nowadays different companies (and thus, IEs) need to rely on talent management practices that have a significant and positive impact on product, process, and marketing innovations (Ibrahim & AlOmari, 2020). However, in this domain, many cited authors likewise refer to the need for innovation and larger consistency regarding this concept (Reis et al., 2021) as the innovation itself attracts and retains talents (Alves et al., 2019) and it can be consistently affected by the inter and intra organizational relationships that populate the IE in terms of MNs.

Discussion and Conclusions

Our paper has shown that MNs play a crucial role in shaping the dynamics of IEs by facilitating the exchange of ideas, knowledge, and resources across cultural boundaries. This work is part of a bigger project that aims to continue contributing to the literature of IEs. Even if it can be considered a pilot study, this work can shed light on both theoretical and practical levels. Theoretically, our findings extend Cox's interactional model of cultural diversity by demonstrating that while diversity enhances creativity and market opportunity identification, it does not automatically translate into stronger intraorganizational relationships. On the practical side, three main findings are notable. First, MNs facilitate the exchange of tacit knowledge, which is deeply rooted in cultural norms and experiences. This knowledge exchange enriches creativity and enhances problem-solving capabilities within diverse teams. Secondly, it was shown that while MNs excel in fostering innovation and identifying global market opportunities, the same diversity that fuels these strengths can also slow down execution processes. This is particularly evident in large-scale, complex initiatives where decision-making becomes more extended due to the variety of approaches considered. Third, MNs significantly boost the attractiveness of IEs, making them more appealing to global talent, investors, and collaborators. This diverse environment is a key factor in maintaining the global competitiveness of IEs, especially in multicultural cities. However, it is crucial to manage these networks strategically to ensure that their contributions are efficiently integrated into the broader ecosystem. The implications for policymakers, organizations, and individuals (e.g., innovation managers within an IE) emphasize the importance of fostering MNs within IEs under the open innovation paradigm. As the global economy becomes increasingly interconnected, managing MNs will be essential for driving sustainable innovation and prosperity, even (and more importantly) in less globalized and multicultural settings. However, several limitations exist in the research. First, our findings cannot be properly generalized to each IEs, because of the different regional support that these entities receive, also considering the academic institutions that founded the IE. Second, given the sampling criteria of the study, the authors' data collection and interpretation may be vulnerable to criticism and prejudice. Third, the respondents' roles differ widely, and the propensity to create among different MNs may be influenced not only by their country of origin but also by their educational background. However, these limitations provide interesting opportunities for further research. We argue that future research might 1) focus on a quantitative study using a bigger amount of data 2) employ a multiple- case study approach analyzing different IEs in the Dutch scenario to challenge our result 3) conduct the analysis at a micro-level comparing teams' interactions.

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Ecosistemi di Innovazione, Capacità Dinamiche e Responsabilità Sociale d'Impresa: Il Caso della Banca di Credito Cooperativo di Napoli

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Abstract

Questo studio analizza l'approccio ecosistemico alla Responsabilità Sociale d'Impresa, esaminando il caso della Banca di Credito Cooperativo (BCC) di Napoli. L'adozione di un modello creditizio basato sul *rating umano* e le dinamiche collaborative intraprese con attori locali promuovono inclusione finanziaria e sostenibilità, evidenziando come innovazione ed etica possano generare valore condiviso per comunità e territori.

Introduzione

Negli ultimi anni, l'approccio ecosistemico si è affermato come una prospettiva cruciale per comprendere come attori diversi possano collaborare per promuovere sviluppo sociale e sostenibilità territoriale (Piantoni *et al.*, 2025). Gli ecosistemi di innovazione, caratterizzati da relazioni complesse e multilivello tra attori pubblici, privati e comunitari, offrono un quadro concettuale per analizzare le interazioni che generano valore condiviso (Mizzau & Montanari, 2016; Montanari, 2018). Gli ecosistemi di innovazione possono essere definiti come reti dinamiche di attori interconnessi, quali imprese, istituzioni, organizzazioni comunitarie e centri di ricerca, che collaborano per creare, diffondere e applicare innovazioni al fine di generare valore economico, sociale e ambientale (Autio & Thomas, 2014). Questa prospettiva è particolarmente rilevante per la Responsabilità Sociale d'Impresa (RSI, o *Corporate Social Responsibility* – CSR) (Fatima & Elbanna, 2023), dove la cooperazione tra molteplici attori può ampliare l'impatto sociale, superando le tradizionali attività filantropiche aziendali (Lin *et al.*, 2024).

La letteratura recente evidenzia una crescente attenzione per il legame tra RSI e performance finanziaria, sottolineando come le strategie di RSI non si limitino a generare benefici sociali, ma possano anche rafforzare la resilienza organizzativa e attrarre investimenti socialmente responsabili (Kabir & Chowdhury, 2023). In particolare, il settore bancario, grazie alla sua centralità nei sistemi economici, rappresenta un contesto privilegiato per esplorare questa relazione. Studi empirici sui mercati emergenti suggeriscono che la RSI può essere influenzata da variabili economiche come reddito netto, depositi totali e rendimento degli asset. Tuttavia, resta incerta la natura bidirezionale del rapporto tra RSI e performance finanziaria (Kabir & Chowdhury, 2023).

Parallelamente, emerge un interesse crescente per il ruolo degli ecosistemi di innovazione nell'amplificare l'efficacia delle strategie di RSI. Studi recenti evidenziano come un approccio basato sugli ecosistemi migliori la capacità delle organizzazioni di affrontare sfide sociali e ambientali, integrando la sostenibilità nelle loro pratiche operative (Mintah & Elmarzouky, 2024; Piantoni *et al.*, 2023). In questo contesto, la RSI non è più concepita come una risposta reattiva alle aspettative degli stakeholder, ma come un meccanismo di co-creazione del valore che richiede capacità dinamiche per gestire complessità e sinergie, consolidando il ruolo delle organizzazioni come attori chiave nello sviluppo sostenibile (Kabir & Chowdhury, 2023).

Questo studio esplora come le collaborazioni tra attori territoriali possano realizzare importanti sinergie e generare valore condiviso attraverso un approccio ecosistemico alla RSI (Kabir &

Chowdhury, 2023; Piantoni *et al.*, 2023, 2025). Gli attori territoriali, intesi come imprese, istituzioni pubbliche, organizzazioni della società civile e comunità locali che operano all'interno di un determinato contesto geografico, svolgono un ruolo chiave nell'attivare processi di sviluppo sostenibile e co-creazione di valore. L'analisi si concentra su un caso studio relativo a una rete di attori locali nel settore bancario, indagando come interazioni tra imprese, istituzioni e comunità possano contribuire allo sviluppo sociale e alla sostenibilità. Le domande di ricerca che guidano questo studio sono: (i) Come possono gli attori territoriali implementare strategie di RSI basate sugli ecosistemi? (ii) Quali capacità dinamiche sono necessarie per gestire strategie di questo tipo in contesti complessi?

Con questo lavoro, si intende contribuire alla letteratura sull'intersezione tra RSI ed ecosistemi di innovazione, evidenziando non solo il ruolo delle relazioni interorganizzative nella creazione di valore sociale, ma anche le tensioni tra le diverse priorità degli attori coinvolti. Inoltre, si intende offrire spunti pratici per manager e *policymaker* interessati a promuovere iniziative responsabili in ambiti locali, affrontando la complessità delle dinamiche ecosistemiche e le implicazioni economiche delle strategie di RSI.

L'approccio ecosistemico alla RSI: Teoria e dinamiche collaborative

L'approccio ecosistemico si è affermato come un modello teorico fondamentale per comprendere come attori eterogenei possano collaborare e contribuire alla creazione di valore condiviso, superando le limitazioni delle tradizionali strutture organizzative gerarchiche (Arena *et al.*, 2022; Montanari, 2018). Gli ecosistemi di innovazione, definiti come reti dinamiche e interdipendenti, offrono un contesto fertile per soluzioni innovative in grado di affrontare sfide sociali, economiche e ambientali (Oskam *et al.*, 2021). Tali ecosistemi integrano risorse, competenze e conoscenze di diversi attori, creando sinergie che amplificano l'impatto delle iniziative collettive e aumentano la resilienza delle organizzazioni (Montanari, 2023). Anche la RSI ha subito un'evoluzione significativa, passando da un approccio prevalentemente filantropico a una strategia integrata che mira alla sostenibilità e al valore condiviso (Kabir & Chowdhury, 2023). Questo cambio di paradigma riflette l'importanza crescente delle interazioni coordinate tra organizzazioni e stakeholder all'interno degli ecosistemi (Peloza & Falkenberg, 2009). La RSI non è più vista come un semplice obbligo morale o etico, ma come uno strumento strategico per catalizzare dinamiche innovative, aumentare la reputazione organizzativa e rispondere alle sfide globali e locali (de Oliveira *et al.*, 2023). Come evidenziato da Kabir e Chowdhury (2023), la RSI nel settore bancario rappresenta un esempio emblematico di queste dinamiche ecosistemiche. I risultati empirici suggeriscono che, sebbene la RSI sia spesso influenzata dalla performance finanziaria delle organizzazioni, il suo impatto va ben oltre il piano economico, contribuendo a migliorare la legittimità, la trasparenza e l'engagement con la comunità. Tali iniziative, integrate in un approccio ecosistemico, possono generare un "circolo virtuoso" in cui gli investimenti in RSI rafforzano il capitale sociale e attraggono investimenti socialmente responsabili.

L'adozione di strategie di RSI basate sull'ecosistema richiede capacità dinamiche specifiche, come descritto da Teece (2007): individuare opportunità e minacce (*sensing*), sviluppare strategie efficaci (*seizing*) e riallineare risorse e competenze per rispondere ai cambiamenti (*reconfiguring*). In un contesto ecosistemico, queste capacità si manifestano nella gestione delle relazioni interorganizzative, nella progettazione di governance collaborativa e nell'integrazione di risorse per co-creare valore (Lütjen *et al.*, 2019). Inoltre, come suggerito da Kabir e Chowdhury (2023), la RSI deve essere accompagnata da un monitoraggio continuo e da strategie adattative che bilancino gli obiettivi sociali con quelli economici, soprattutto in contesti caratterizzati da limitate risorse finanziarie. L'integrazione della RSI negli ecosistemi di innovazione rappresenta quindi una strategia cruciale per amplificare l'impatto sociale e ambientale delle organizzazioni. La collaborazione tra attori eterogenei permette di superare i limiti dei tradizionali approcci gerarchici, promuovendo una maggiore inclusione degli stakeholder e una più efficace allocazione delle risorse (Piantoni *et al.*,

2023, 2025). Questo approccio, inoltre, favorisce lo sviluppo di soluzioni innovative capaci di rispondere alle esigenze specifiche delle comunità locali, rafforzando la legittimità e la reputazione delle organizzazioni (Bhat, 2023). Di conseguenza, l'approccio ecosistemico alla RSI non solo arricchisce il dibattito teorico, ma fornisce strumenti pratici per affrontare la complessità delle sfide contemporanee e generare impatti sostenibili.

Metodologia

Il presente studio adotta un approccio qualitativo basato su un caso studio unico, focalizzato sulla Banca di Credito Cooperativo (BCC) di Napoli, con l'obiettivo di analizzare le pratiche di RSI e sostenibilità sociale nel contesto bancario, concentrandosi sull'innovativo sistema di valutazione del "*rating umano*" per l'accesso al credito.

Contesto: La BCC di Napoli e il rating umano

Secondo i dati forniti da Federcasse, al giugno 2024, il sistema delle BCC in Italia comprendeva 220 banche, con una presenza significativa di oltre 4.000 sportelli su tutto il territorio nazionale. A livello occupazionale, il sistema del Credito Cooperativo impiega oltre 36.000 persone, con un aumento del 2,6% nella componente femminile rispetto all'anno precedente. Le BCC si distinguono inoltre per la loro capacità di raccogliere fondi: la raccolta complessiva dalle famiglie e dalle imprese ha raggiunto quasi 200 miliardi di euro, con un aumento del 5,9% su base annua. Contestualmente, gli impieghi netti delle BCC ammontano a 136 miliardi di euro, dimostrando il loro impegno nel sostenere l'economia locale con finanziamenti mirati.

Sempre con riferimento all'ultimo aggiornamento, i finanziamenti netti erogati alle famiglie consumatrici dalle BCC ammontano a 58,2 miliardi di euro, con un aumento dell'1,4% su base annua, un dato che sottolinea il ruolo fondamentale delle BCC nel sostenere le famiglie italiane. Questi finanziamenti rappresentano oltre il 42% del totale dei crediti concessi dalle BCC, evidenziando l'importanza dell'inclusione finanziaria nel loro modello di business sostenibile.

Questi dati dimostrano come il sistema delle BCC, attraverso il forte legame con il territorio e le politiche di inclusione finanziaria, riesca a promuovere non solo lo sviluppo economico, ma anche la sostenibilità sociale, favorendo il benessere delle comunità locali e supportando famiglie e imprese in modo sostenibile. La *mission* si inserisce in un contesto più ampio di ecosistemi di innovazione, dove il ruolo delle istituzioni finanziarie è cruciale per catalizzare pratiche di RSI in grado di generare valore condiviso (Kabir & Chowdhury, 2023).

La BCC di Napoli, fondata nel 2006, rappresenta un esempio virtuoso di istituzione bancaria cooperativa orientata al benessere della comunità locale. Un elemento distintivo delle pratiche bancarie della BCC di Napoli è l'implementazione del modello del *rating umano*, ideato dal dott. Amedeo Manzo, presidente della BCC di Napoli e della Federazione delle Banche di Comunità Credito Cooperativo Campania Calabria. Questo approccio innovativo incarna i principi di RSI integrandoli in un sistema di valutazione del credito che supera i tradizionali parametri quantitativi. Il *rating umano* tenta di catturare la complessità umana e le potenzialità insite nei soggetti di credito, valutando dimensioni come la storia personale, l'etica del lavoro, l'impegno sociale, la responsabilità ambientale e altre caratteristiche che riflettono valori sostenibili. Tale approccio si allinea con le capacità dinamiche di *sensing*, *seizing* e *reconfiguring* descritte da Teece (2007), consentendo alla BCC di Napoli di individuare opportunità e adattarsi ai bisogni specifici della comunità locale.

In pratica, il *rating umano* fornisce una valutazione multidimensionale che integra la capacità di rimborso con il contributo potenziale del soggetto al benessere sociale ed economico. Questo metodo pone l'accento sull'ascolto attivo delle storie personali, sulla comprensione delle esigenze e sull'identificazione di capacità che vanno oltre i meri dati finanziari. L'adozione di criteri di valutazione etici e sociali permette alla banca di promuovere l'inclusione finanziaria e sostenere

individui e imprese che, pur non soddisfacendo i criteri tradizionali, dimostrano impegno verso obiettivi sociali e ambientali.
Il *rating umano* rappresenta un cambiamento significativo rispetto ai metodi convenzionali, segnalando un riconoscimento crescente dell'importanza dei principi etici nell'ambito creditizio. Questo approccio, radicato in un modello di governance collaborativa tipico degli ecosistemi di innovazione, consente di ampliare la base di clienti potenziali e, allo stesso tempo, di rafforzare la reputazione e la legittimità dell'organizzazione (Piantoni *et al.*, 2025). Inoltre, l'attenzione alle dimensioni qualitative del credito permette alla BCC di Napoli di rispondere in modo proattivo alle sfide locali, contribuendo a obiettivi di sviluppo sostenibile e giustizia sociale.
Attraverso la raccolta e l'interpretazione di informazioni non standardizzate, come interviste, analisi di progetti e valutazioni di reti sociali e professionali, il *rating umano* si configura come uno strumento capace di integrare RSI e innovazione in un unico sistema. Non solo espande le opportunità per il settore finanziario, ma dimostra anche come un approccio ecosistemico possa trasformare le dinamiche tradizionali di erogazione del credito, riaffermando il ruolo cruciale delle banche cooperative come motore di progresso sociale ed economico.

Raccolta e analisi dei dati

La raccolta dei dati è stata effettuata attraverso:

- Analisi documentale: sono stati esaminati documenti interni della BCC di Napoli, tra cui rapporti annuali, bilanci, materiali promozionali e documentazione relativa alle politiche di credito e alle iniziative di RSI. Particolare attenzione è stata dedicata all'analisi delle politiche che collegano il *rating umano* agli obiettivi di sostenibilità e inclusione sociale, in linea con i principi degli ecosistemi di innovazione.
- Interviste qualitative: sono state condotte alcune interviste semi-strutturate con i principali stakeholder della banca, inclusi dirigenti, dipendenti, membri della comunità e rappresentanti di istituzioni locali. Le interviste hanno esplorato il funzionamento del *rating umano*, le dinamiche di collaborazione tra gli attori locali e le pratiche di RSI implementate. Inoltre, è stato analizzato come queste dinamiche si inseriscano all'interno di un approccio ecosistemico alla co-creazione di valore.

I dati raccolti sono stati sottoposti a un'analisi tematica, finalizzata a identificare categorie e relazioni emergenti. In particolare, le informazioni qualitative sono state analizzate attraverso una codifica iterativa e un approccio *abductive coding*, per garantire un'interazione costante tra i dati empirici e i concetti teorici.
Per garantire la validità dei risultati, sono state adottate diverse strategie metodologiche:

- Triangolazione tra fonti documentali e interviste, per assicurare una visione completa e coerente delle pratiche analizzate.
- Revisione delle trascrizioni da parte degli intervistati, per rafforzare l'affidabilità delle informazioni raccolte e minimizzare eventuali interpretazioni errate.
- Confronto continuo con la letteratura esistente, che ha permesso di integrare i risultati empirici all'interno di un quadro teorico consolidato, in particolare collegando i dati alle capacità dinamiche e alla letteratura sugli ecosistemi di innovazione (Piantoni *et al.*, 2025; Teece, 2007).

Questa metodologia ha permesso di analizzare in modo approfondito il contributo della BCC di Napoli alla sostenibilità e all'inclusione finanziaria, offrendo al contempo spunti teorici e pratici per comprendere meglio l'applicazione dell'approccio ecosistemico alla RSI.

Risultati

L'analisi del caso studio della BCC di Napoli evidenzia come l'integrazione di pratiche di RSI con un approccio ecosistemico abbia avuto un impatto significativo sullo sviluppo sociale e sulla sostenibilità territoriale. I risultati sono stati organizzati attorno a tre temi principali emersi dall'analisi dei dati: il ruolo del *rating umano*, le dinamiche collaborative tra gli attori locali e gli impatti sociali ed economici.

Il modello del *rating umano*

Il *rating umano* della BCC di Napoli rappresenta un modello creditizio e una pratica innovativa che supera i criteri di valutazione creditizia tradizionali, allineandosi con le capacità dinamiche di *sensing* e *seizing* descritte nella letteratura sugli ecosistemi (Teece, 2007). Attraverso una valutazione qualitativa e multidimensionale, il *rating umano* considera elementi come la storia personale, l'etica del lavoro e l'impegno sociale dei richiedenti. Questo approccio ha permesso alla banca di:

- Favorire l'inclusione finanziaria di individui e imprese che, pur non soddisfacendo i criteri quantitativi tradizionali, dimostrano potenzialità significative e un forte impegno verso obiettivi sociali.
- Integrare la responsabilità sociale nelle decisioni di credito, promuovendo pratiche che riflettono i valori e gli obiettivi della banca.

I partecipanti intervistati hanno sottolineato come il *rating umano* abbia migliorato la percezione della banca come attore responsabile e inclusivo, rafforzandone la reputazione e la fiducia all'interno della comunità. Inoltre, questo approccio è stato riconosciuto come un elemento chiave per l'adattamento a contesti complessi e mutevoli, dimostrando la capacità della banca di innovare nel rispetto dei principi etici e sociali.

Dinamiche collaborative tra gli attori locali

Il modello operativo della BCC di Napoli evidenzia un forte legame con il territorio e una capacità unica di collaborare con una vasta rete di attori locali, tra cui enti pubblici, organizzazioni non profit e imprese. Queste collaborazioni hanno permesso di:

- Sviluppare progetti condivisi in ambiti quali l'inclusione finanziaria, il sostegno alle piccole imprese e la promozione di iniziative sociali.
- Rafforzare il capitale sociale del territorio, creando sinergie tra attori con obiettivi e risorse complementari.

Le dinamiche collaborative hanno dimostrato l'efficacia di un approccio ecosistemico alla RSI, evidenziando come la cooperazione tra molteplici attori possa ampliare l'impatto delle iniziative e generare valore condiviso. Questo risultato è in linea con la letteratura sugli ecosistemi di innovazione, che sottolinea il ruolo delle relazioni interorganizzative nella co-creazione di valore e nell'affrontare sfide complesse (Kabir & Chowdhury, 2023).

Impatto sociale ed economico

L'adozione del *rating umano* e l'implementazione di politiche di RSI basate sull'ecosistema hanno prodotto impatti tangibili sia sul piano sociale che economico. Tra i risultati principali si segnalano:

- Inclusione finanziaria: la banca ha facilitato l'accesso al credito per individui e imprese marginalizzati dai sistemi tradizionali, contribuendo al rafforzamento del tessuto economico locale e al miglioramento delle opportunità per le fasce vulnerabili.

- Sviluppo territoriale: le iniziative promosse dalla BCC di Napoli hanno generato benefici per la comunità, tra cui il sostegno a progetti sociali, culturali e ambientali, rafforzando la resilienza territoriale.
- Rafforzamento della fiducia: l'impegno della banca verso pratiche responsabili ha consolidato la sua posizione come leader etico e sostenibile nel settore bancario, creando un circolo virtuoso di legittimità e reputazione.

Questi risultati dimostrano come un approccio ecosistemico alla RSI, integrato da pratiche innovative come il *rating umano*, possa rappresentare un modello efficace per promuovere sviluppo sostenibile e benessere sociale. Inoltre, l'esperienza della BCC di Napoli evidenzia l'importanza di capacità dinamiche e governance collaborativa per affrontare le sfide del contesto locale, offrendo un esempio pratico e replicabile per altre istituzioni finanziarie e organizzazioni.

Discussione

I risultati di questo studio suggeriscono che l'adozione di un approccio ecosistemico alla RSI rappresenta una leva strategica per promuovere la sostenibilità sociale ed economica di un territorio.

Il caso della BCC di Napoli dimostra come l'implementazione del *rating umano* non solo soddisfi le esigenze di inclusione finanziaria dei clienti, ma contribuisca anche a un cambiamento strutturale nel modo in cui le istituzioni bancarie operano in contesti caratterizzati da complessità e vulnerabilità sociale. Uno degli aspetti centrali emersi è l'efficacia del *rating umano* nel superare le limitazioni dei criteri di valutazione creditizia tradizionali. Questo sistema integra considerazioni qualitative con parametri quantitativi, consentendo di includere individui e imprese spesso esclusi dal sistema creditizio convenzionale. Tale approccio rappresenta un'innovazione sociale che, all'interno di un ecosistema di innovazione, genera valore condiviso e contribuisce al benessere collettivo. Inoltre, questa pratica evidenzia come l'integrazione della RSI nelle attività operative possa trasformare i processi decisionali, rendendoli più inclusivi e orientati alla sostenibilità.

Le dinamiche collaborative tra gli attori locali rappresentano un altro elemento chiave. La capacità della BCC di Napoli di creare sinergie con enti pubblici, organizzazioni non profit e imprese private ha amplificato l'impatto delle sue iniziative, evidenziando l'importanza delle reti interorganizzative per il successo delle strategie di RSI. Tuttavia, lo studio ha anche messo in luce le sfide legate alla gestione di tali collaborazioni, tra cui il coordinamento delle risorse, la definizione di obiettivi condivisi e la costruzione di fiducia tra i diversi attori. Queste sfide sottolineano la necessità di una governance chiara e trasparente, supportata da una visione strategica comune.

Infine, il ruolo delle capacità dinamiche è risultato determinante nella gestione delle pratiche di RSI in contesti ecosistemici. La capacità di individuare opportunità emergenti (*sensing*), cogliere nuove sfide (*seizing*) e riallineare risorse organizzative (*reconfiguring*) ha consentito alla banca di adattarsi ai cambiamenti del contesto esterno e di promuovere innovazioni orientate al benessere della comunità locale. Queste capacità, oltre a garantire la resilienza dell'organizzazione, offrono un modello replicabile per altre istituzioni interessate a implementare approcci simili.

Implicazioni manageriali

I risultati di questo studio offrono preziosi spunti pratici per manager e *policymaker* interessati a promuovere strategie di RSI basate su un approccio ecosistemico.

In primo luogo, l'integrazione di criteri qualitativi nei processi decisionali, come dimostrato dal *rating umano*, rappresenta un'opportunità per ampliare l'accesso al credito e promuovere l'inclusione finanziaria. Questo approccio non solo risponde alle esigenze di categorie spesso escluse dai tradizionali sistemi creditizi, ma consolida anche la reputazione delle organizzazioni come attori responsabili e attenti al benessere sociale. Per i manager, ciò implica lo sviluppo di strumenti di valutazione innovativi e multidimensionali capaci di bilanciare obiettivi economici e sociali.

In secondo luogo, la creazione e la gestione di ecosistemi collaborativi sono fondamentali per amplificare l'impatto delle iniziative di RSI. La BCC di Napoli dimostra che una cooperazione efficace tra attori pubblici, privati e comunitari può generare valore condiviso e affrontare sfide complesse. Per i manager, ciò richiede l'investimento in competenze relazionali, una governance inclusiva e la promozione di una visione strategica condivisa che favorisca la condivisione di risorse e conoscenze. Un'altra implicazione cruciale riguarda lo sviluppo di capacità dinamiche. In un contesto di rapidi cambiamenti, i manager devono adottare un approccio flessibile e proattivo, promuovendo una cultura organizzativa orientata all'innovazione e alla sperimentazione. Questo include la capacità di monitorare il contesto esterno, identificare opportunità emergenti e riallineare le risorse per rispondere a nuove esigenze o sfide. Infine, l'integrazione della RSI nella strategia aziendale si traduce in benefici a lungo termine, sia in termini economici che di impatto sociale. Le organizzazioni che considerano la RSI una componente centrale del proprio modello di business rafforzano la loro legittimità e reputazione, migliorando al contempo la capacità di rispondere alle aspettative degli stakeholder. Una comunicazione trasparente e continua dei risultati ottenuti è essenziale per costruire fiducia e consolidare il supporto della comunità.

Il caso della BCC di Napoli evidenzia, inoltre, il ruolo trasformativo delle innovazioni sociali nel promuovere la sostenibilità. Soluzioni come il *rating umano* dimostrano che investire in pratiche responsabili non è solo eticamente corretto, ma rappresenta anche una strategia vincente per generare valore condiviso. I manager sono invitati a esplorare nuove idee e approcci per affrontare le sfide sociali e ambientali, riconoscendo il potenziale trasformativo delle innovazioni per il territorio e per l'organizzazione stessa.

Conclusioni

Questo studio ha analizzato come un approccio ecosistemico alla RSI possa generare valore condiviso attraverso la collaborazione tra attori locali, prendendo come esempio il caso della BCC di Napoli. L'adozione del *rating umano* si distingue come una pratica innovativa che integra criteri qualitativi nelle decisioni creditizie, superando i limiti dei metodi tradizionali e contribuendo all'inclusione finanziaria, alla sostenibilità sociale e al benessere collettivo.

I risultati evidenziano che strategie basate su modelli collaborativi e capacità dinamiche sono indispensabili per affrontare le sfide dei contesti territoriali caratterizzati da complessità e vulnerabilità. La co-creazione di valore, resa possibile dalla sinergia tra imprese, comunità e istituzioni, non solo soddisfa le esigenze locali ma rafforza la legittimità, la reputazione e la resilienza delle organizzazioni coinvolte. Questo studio sottolinea che la RSI, se integrata in un ecosistema di relazioni, non è un elemento accessorio, ma una leva strategica per promuovere cambiamenti sociali ed economici di lungo termine. Attraverso l'adozione di approcci ecosistemici, la RSI può trasformarsi in un motore di innovazione sociale, capace di affrontare sfide globali e locali in modo sostenibile e inclusivo. Per i manager, ciò implica un ripensamento delle pratiche aziendali e una maggiore attenzione alla governance collaborativa, promuovendo una visione territoriale orientata alla sostenibilità e alla responsabilità sociale.

Il caso della BCC di Napoli offre un modello replicabile e scalabile per altre organizzazioni, dimostrando come etica, innovazione e sostenibilità possano tradursi in risultati concreti e tangibili. La combinazione di strategie collaborative, capacità dinamiche e strumenti innovativi come il *rating umano* evidenzia il potenziale trasformativo della RSI nel rafforzare il capitale sociale e promuovere il progresso economico e ambientale.

Questa ricerca contribuisce al dibattito accademico sull'intersezione tra RSI ed ecosistemi di innovazione, offrendo implicazioni pratiche per manager e *policymaker*. In un'epoca in cui la sostenibilità è diventata una priorità globale, l'approccio ecosistemico si rivela una risposta efficace alle sfide contemporanee, mostrando che le organizzazioni non solo possono, ma devono essere protagoniste di un cambiamento positivo e sostenibile.

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Data Governance in Data Ecosystems: A Research Note

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Abstract
In an era where data drives corporate growth, strong governance frameworks are needed to manage data cooperation complexity and hazards. Distributed governance encourages creativity and reduces data cooperation hazards; however, it can suffer of scalability and sustainability. The literature is reviewed to ask crucial questions regarding data governance in such circumstances and offer a targeted research strategy.

Keywords: Data Ecosystem, Governance, Data Sources, Data Activities, Actors, Governance Mechanisms

Introduction

As data has become one of the most critical assets for securing a competitive advantage in today's business practices, organizations are increasingly integrating different data sources and technologies to obtain better insights (Davenport, 2006). This integration has given rise to data ecosystems where various "actors interact and collaborate to find, archive, publish, consume, or reuse data, fostering innovation, creating value, and supporting new businesses" (Oliveira et al., 2019). Despite these benefits, many data ecosystems fail to scale up or sustain over time (Jacobides et al., 2024). This highlights the crucial role of data governance and prompts essential questions regarding interorganizational coordination to optimize value creation while mitigating associated risks (Spagnoletti et al., 2024). The literature explores data governance from different perspectives. For instance, some studies delineate various decision domains and objectives (Abraham et al., 2019; Khatri & Brown, 2010), emphasizing the need to align data and IT structures. They also highlight the importance of elevating data governance from an organizational level to an ecosystem level (Abraham et al., 2019). Parmiggiani and Grisot (2020) advocate for a "*practice view*" of data governance, focusing on activities and decisions at the practice level. In this research note, we synthesize key aspects of data governance identified in previous studies and identify research gaps. This allows us to outline a new research agenda aimed at deepening our understanding of the interplay between data governance and data collaboration.

The structure of this paper is as follow. First, we present an overview of the two principal research streams in data governance, highlighting significant insights and discussing perceived gaps in each stream. Second, drawing from our literature review, we pinpoint three main focus areas that could guide future research. We conclude the paper by suggesting possible directions for further investigation.

Data Governance

Governance is allocating decision rights and designing mechanisms to follow those objectives within an organization (Tiwana et al., 2013). The growing body of literature on data governance can be categorized into two main research streams (Paparova et al., 2023; Parmiggiani & Grisot, 2020).

In the first research stream, data governance is generally referred to the protocols, rules, roles, and definitions that elicit an organization's norms or desirable behavior. Khatri and Brown (2010) through a framework derived from IT governance dives systematically into data principles, metadata and access control/fine-grain security models, and privacy/personal information protection services. They underline that data governance ensures the alignment of data operations with business strategy. More recently, Abraham et al. (2019) proposed a conceptual framework that focuses on various data sources, data decisions, and governance mechanisms. However, their approach primarily addresses data governance within the context of IT governance, concentrating on the organizational level. By focusing exclusively on organizational objectives, this framework leaves significant gaps in understanding data governance, especially when data is shared across multiple organizations, and in assessing the broader societal implications of data governance decisions. Therefore, a limitation of this research stream is its reliance on a top-down approach to data governance. This approach offers limited insights, particularly in decentralized settings where no central authority enforces top-down control, and coordination is necessary to standardize new practices (Spagnoletti et al, 2024). Only recently have further studies begun to highlight system-level pathways, focusing on the interaction between institutional functions and ecosystem actors (Abraham et al., 2019; Scholz et al., 2022).

Some scholars have also emphasized the need to shift the focus from the organizational to the ecosystem level (Davidson et al., 2023), especially as organizations increasingly capture and use data across their boundaries. In the second research stream, Information Systems scholars view data like digital artifacts with peculiar characteristics. They shift the focus away from viewing data solely as organizational assets, underling instead the distinctive characteristics of digital data (Abbasi et al., 2016; Jones, 2019; Kallinikos et al., 2013). Consequently, they differentiate between data governance and IT governance (Paparova et al., 2023; Parmiggiani & Grisot, 2020). For instance, Parmiggiani and Grisot (2020) describe the importance of bottom-up decisions (rather than top-down) and the role of actors who actually work with data for data governance at the level. Paparova et al. (2023) made a similar distinction showing the impact of the dynamics of data roles and responsibilities (i.e., "vertical" vs. "horizontal") when data are used for specific or different purposes at the inter-organizational levels. Although this research stream provides valuable insights, their focus remains limited to data-related practices of data science and rarely examine other practices around data.

A New Research Agenda for Data Governance in Data Ecosystems

Having described the two main research streams, we now move on to describing three focus areas that we believe are relevant to spark scholarly debate and guide future inquiries into the transformative potential of data governance in data ecosystems. The three focus areas are (i) the temporal dynamics of interorganizational coordination, (ii) the fluid boundaries of data outcomes, and (iii) the emerging data governance practices.

Temporal dynamics of interorganizational coordination

The existing literature emphasizes the importance of data governance at both organizational and inter-organizational levels (Abraham et al., 2019; Davidson et al., 2023). At the organizational level, data analysts, IT staff, and management, to name a few, handle data processing and decision-making (Abbasi et al., 2016). At the interorganizational level, data governance extends its focus beyond that and encompasses external actors, such as data regulators, data providers and data users (Spagnoletti et al., 2024). However, we know little about the coordination dynamics among actors within an

ecosystem. How do ecosystem actors align their governance practices to manage data effectively? How can the value and risks of data be balanced within data ecosystems?

Constantinides et al. (2018) underline that the same set of actors can have different incentives, which creates complexity in aligning their activities with goals and strategies. Such diverse interests and goals create ambiguity related to the roles and responsibilities of each organization. This creates challenges for decision-making authorities in ensuring compliance with established rules. Data flows across different organizations, sectors, and countries with diverse regulations and rules (see, for example, exacerbating tensions among actors). Having conflicting goals and interests, each actor's actions might jeopardize the security of others (Vial, 2023). This makes creating joint value a difficult task (Kazemargi et al., 2023; Spagnoletti et al., 2024).

Power relationships also play a significant role, as some actors may have more control over data. Given the varying interests of actors, effective data ecosystem governance must represent such interests and align value propositions with the ecosystem's perceived value. For instance, some data platforms (e.g., Amazon, Facebook, etc.) collect their users' generated data on a massive scale and use it for their own decision-making processes. Platform owners control how data is shared with third parties and nudge things towards creating monopolies, as content producers, advertisers, or technology companies become dependent on these platforms for access. They create a monopolistic scenario by acting as a data selling agent to other actors or firms. Thus, understanding and managing these diverse perspectives and power imbalances are essential for fostering data collaboration and maximizing the value generated from data. Therefore, studying how coordination mechanisms align the actions of ecosystem actors with heterogeneous interests and responsibilities has relevance (Spagnoletti et al., 2024). Unlike other digital ecosystems, there is a fluidity of roles among actors within data ecosystems. Actors might change their roles based on their needs and capabilities.

For example, a data user—initially using data for analysis or decision-making—might later become a data provider by sharing their data with others in the ecosystem. Additionally, in data ecosystems, an actor might choose to participate for a short time and then decide to withdraw from the ecosystem. For example, an organization might engage in the ecosystem to access a dataset for a project and then opt out once the project is completed. In addition, in a longitudinal study, Aaen et al. (2022) show that while data ecosystems grow and engage new actors, their objectives may diverge or conflict with the original objectives, leading to misalignment and consequently ecosystem failure. This shows that the involvement of actors is not static and might change over time (Spagnoletti et al., 2024). Putting all together, we believe that data governance needs to take into account the temporal dynamics of coordination within and between organizations. This means that data ecosystem governance necessitates ongoing adjustments to keep pace with structural and landscape changes.

The fluid boundaries of data outcomes

Information Systems scholars question assumptions about data (Jones, 2019) and underline the unique characteristics of data. Data are referential (Kallinikos et al., 2013; Yoo et al., 2010), non-rival (Krämer, 2020), and create social orders (Beynon-Davies, 2016). Data can be reused multiple times without data being consumed for different purposes (Constantiou & Kallinikos, 2015; Günther et al., 2022; Newell & Marabelli, 2015). Such characteristics of data also render the boundaries of data outcomes (like other digital artifacts) more porous and less stable (Briel & Recker, 2021; Nambisan, 2017). Models and AI systems that provide insights, offer recommendations, make predictions have fluid boundaries as features and value propositions might change (Nambisan, 2017). Although these characteristics of data provide new opportunities for innovation and collaboration among different actors, they introduce new challenges for data governance. While collected data can be reused for different and unintended data purposes, this can cause privacy issues (Zuboff, 2015). For instance, personal data can be combined and reused for AI systems (e.g., social scoring) leading not only to invade individual privacy but also to leading to social surveillance (Zuboff, 2015).

The fluid boundaries of data outcomes thus demand a reassessment of data governance by taking into account data reusability to ensure value generation for all engaged actors.

To address negative implications that arise from fluid boundaries of data outcomes, new forms of governance have emerged. These models offer an alternative to centralized data ecosystems by taking into account interests of a broader range of stakeholders (Micheli et al., 2020). These initiatives focus on decentralized data governance and empower data ecosystem' actors to retain control over their data (Möller et al., 2024).

Emerging data governance practices

The current literature distinguishes data governance from IT governance by taking into account the nature of data, and it focuses on data analytics often neglecting the whole spectrum of data-related practices. Therefore, we propose a broader examination of practices to better serve societal needs. The Data Value Chain (DVC) could offer valuable insights. DVC describes how data flows and is utilized to create value from its initial collection to analysis, dissemination, and its ultimate influence on decision-making processes (Watch, 2018).

Data-related practices are distributed throughout the data value chain. This means that every stage, from data creation and collection to storage, processing, analysis, and distribution, involves distinct activities managed by different stakeholders. Each phase requires specialized skills and technologies ensuring that data is effectively utilized and adds value at every step. Data-related practices influence data quality and ultimately decisions derived from data. Data quality is crucial for value creation, requiring organizations to define control points to ensure data reliability. Evaluating data quality necessitates definitions, standards, and rules that must be followed within a data ecosystem.

Also, given that infrastructure maintenance and service procurement practices can potentially influence value creation from data (see, for example, Chengalur-Smith et al., 2010), data governance should shift the focus from organizational efficiency to societal needs. The protection of data within and across information systems is central to effective data governance.

Second, data governance needs to ensure the interoperability of data across different infrastructures. This facilitates seamless data integration, which is crucial for harnessing the potential of diverse data sources and analytical tools, as the management and control of these technologies are distributed across various organizations. Third, ecosystem actors need to comply with and implement regulatory requirements (for instance Data Act) when designing their data services (Davidson et al., 2023). Regulations often require organizations to demonstrate how they protect user data and handle data in a manner that aligns with legal and ethical standards. For example, cloud service providers and AI tool developers must ensure that their systems are designed to comply with these regulations. Transparency regarding the design and compliance of data services enhances accountability.

Table 1- A new research agenda for governance in data ecosystems

Themes	Short Descriptions	Research Questions
Temporal dynamics of interorganizational coordination	The need for continuous adjustment in data governance strategies	How are tensions manifested in data ecosystems? What antecedents trigger the need for coordination? How does data governance structure influence the alignment of actors' actions? How do coordination mechanisms influence the sustainable growth of data ecosystems? What are the principles by which an organization can align its actions with other organizations? How can inter-organizational data strategies be sustained over time? How do actors contribute to data governance? Which incentive structure ensures the sustainable growth of data ecosystems? How do changes in regulatory policies impact the evolution of coordination mechanisms among organizations in data ecosystems?
The fluid boundaries of data outcomes	The need to address the negative implications posed by data outcomes boundaries	How do data outcomes challenge current data governance frameworks? How do data governance need to address the negative implications posed by fluid boundaries of data outcomes? How should data governance adapt to address AI risks? What implications does data governance have for data reusability?
Emergence of new data governance practices	The need of new data governance practices and their impact	How do data-related practices along the data value chain influence data quality? And to what extent? How do infrastructure maintenance and service procurement practices can be optimized to better serve societal needs? How do decisions about data infrastructures influence value generation?

Conclusions

In this research note, we emphasize the need for a comprehensive investigation into how actors and societal needs shape data governance, thereby stimulating further research into innovative governance frameworks that foster the responsible and sustainable growth of data ecosystems. We present three sets of non-exhaustive questions that encourage a deeper investigation into the broader implications of data governance.

In the first set, we suggest exploring how the temporal dynamics of interorganizational coordination play a role in shaping the success of data governance frameworks. As actors' roles within ecosystems change, coordination mechanisms must be continuously adjusted to align diverse interests and responsibilities. This is especially important as data flows across organizations, sectors, and even countries, each with its own regulations and governance structures. Future research must investigate how these dynamics can be managed effectively to foster both innovation and security.

In the second set, we suggest that the fluid boundaries of data outcomes present new challenges, particularly in terms of privacy, security, and reusability of data. Governance frameworks need to adapt to address the negative implications of fluid data outcomes, such as privacy breaches or misuse of personal data in AI systems. The emergence of decentralized governance models offers a potential solution by empowering actors to retain control over their data, but further investigation is needed to assess the long-term viability of these approaches.

Finally, emerging data governance practices must expand beyond data analytics to consider the entire spectrum of data-related activities throughout the value chain. This broader examination is crucial for ensuring that data governance frameworks are not only effective within organizations but also responsive to societal needs. As such, future research should focus on how data-related practices

influence data quality and value generation, and how infrastructure maintenance and service procurement practices can be optimized for societal benefit.

In conclusion, we call for innovative, responsive, and sustainable governance frameworks that address the complexities of modern data ecosystems. By focusing on interorganizational coordination, fluid data outcomes, and evolving governance practices, future research can significantly contribute to the development of frameworks that balance innovation with responsibility, thereby ensuring the long-term success of data ecosystems.

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Posthuman discourses and human work: the case of "AI based" technologies designed to support people with disabilities

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Abstract

The paper examines the organizational and managerial implications of artificial intelligence for the reintegration of people with disabilities into the workplace, with a legal focus on civil liability for damage caused to third parties by the assistive tool. It also examines the crossing of boundaries between man and machine, exploring the benefits and risks of AI-based technologies.

1. Introduction: Posthuman, Artificial Intelligence, and Organizational Studies

The integration of AI-based technologies in work contexts represents a crucial node in the debate on organizational studies and the focus on the specificities of the worker. In particular, these developments highlight how the possible adoption of AI to support people with disabilities should not be understood solely as a technological and/or legal issue, but also as an organizational challenge to overcome barriers to participation. In this regard, it is crucial to consider the organizational ecosystem in which new technologies operate and to understand the role of businesses, institutions, and communities in facilitating the accessibility and integration of AI-based solutions.

In recent years, the increasing adoption of AI-based technologies and the proliferation of digital ecosystems have profoundly changed the world of work. These developments are part of a broader technological revolution in which innovation has become the core of global economic dynamics, triggering significant changes in sectors such as finance, healthcare, and education (Berman, Cano-Kollmann, & Mudambi, 2022). Artificial intelligence technologies have shown tremendous potential to optimize human capabilities, enabling people with disabilities to actively participate in the workforce through the use of advanced assistive devices such as brain-computer interfaces (Metzger et al., 2023). These innovations are part of an innovation ecosystem that includes not only business and government, but also academia and civil society, according to the "quadruple helix" model (Carayannis & Campbell, 2009).

However, the integration of these technologies is not without its challenges. As Stahl and Wright (2018) point out, the implementation of artificial intelligence and big data raises important questions about compliance with existing liability laws for harm caused by "AI-based" assistive tools. In particular, the use of AI to enhance the communicative and cognitive abilities of persons with disabilities could risk fostering new forms of inequality if it is not ensured that such technologies are accessible to all and developed with respect for human dignity. Other criticisms relate to the criteria of "performance" and productivity that these technologies can promote, with the risk of applying ableist standards that ignore slowness and reflexivity as intrinsic communicative values.

Ultimately, the digital innovation ecosystem, which includes models such as the 'Triple Helix' (Leydesdorff, & Etzkowitz, 1998) and the 'Quintuple Helix' (Carayannis, Barth, & Campbell, 2012), represents not only an extraordinary opportunity to improve the employment inclusion of people with disabilities, but also an area of critical debate regarding equity, safety, and technological accessibility. The "triple helix" model emphasizes collaboration between academia, industry, and government to foster innovation and technological development. However, the integration of AI systems in the workplace requires a further level of interaction with civil society and the natural environment, leading to the configuration of the 'quintuple helix'.

A central issue in today's debate is the redefinition of subjectivity and work identity through sociomateriality. Gherardi (2024) points out how in today's work practices, the collaboration between human and non-human, as also described by Orlikowski (2007), continuously redefines the subjectivity of workers in increasingly post-human organizational environments. In these contexts, technologies become essential elements in the performance of work activities, fusing human and artificial capabilities into a single operational entity. This fusion process leads to the creation of new ways of understanding the human body and work identity, which are no longer seen as fixed or determined, but as fluid and open to continuous modification and adaptation. In fact, sociomateriality reflects the need to consider the worker as a dynamic hybrid of social, material, and technological factors, a concept that is particularly relevant when exploring AI-based assistive technologies.
In the context of this hybridized subjectivity, the integration of AI technologies into cognitive and organizational processes has recently become central. In the context of work practices invested by the posthuman, Gherardi (2024) again argues how AI-based assistive technologies can enable workers with disabilities to participate fully in working life, redefining not only work practices but also the criteria for inclusion. It is no longer a matter of compensating for a lack, but of enhancing existing capabilities. The AI-assisted worker thus becomes an example of post-human subjectivity, in which distinctions between human and artificial capabilities become increasingly irrelevant.
In the context of organizational studies, the integration of AI and new technologies redefines the concept of worker and efficiency. Traditional models of performance evaluation based solely on biological and cognitive abilities must be revised to account for the interactions that characterize the new work environment. Again, Gherardi (2024) examines how these dynamics are reshaping the role of the worker in relation to the technologies with which he or she interacts, emphasizing that the introduction of improved technologies must not lead to new forms of inequality.
This last section, which deals with the redefinition of the concept of worker and efficiency in relation to AI-based assistive technologies, is essential for understanding how the organizational changes envisaged need to be framed not only in a socio-material perspective but also within an appropriate legal framework. This raises crucial questions about whether such transformations should take place within the confines of pre-existing legislation or whether specific regulation is needed to protect the rights and needs of people with disabilities using these technologies and to ensure inclusion, safety, and justice. The section on law focuses exclusively on the analysis of the more controversial Italian legal landscape, since, as will be discussed below, an adequate proposal for a supranational directive on non-contractual civil liability for damage caused by AI already exists.

2. Case Study: BCIs and the Employment Integration of People with Disabilities

The evolution of brain-computer interfaces is radically transforming the way people with severe motor or sensory disabilities can interact with the world. One of the most promising developments in this field is the use of neuroprostheses to decode brain signals and allow those who have lost the ability to speak or express themselves in traditional ways to regain fluid communication. Consider a recent empirical study in which, thanks to the BCI interface, the participant is able in real time to control and animate a virtual avatar, which simulates facial expressions and speaks (Metzger et al., 2023).

2.1. Participant profile

The participant is a forty-seven-year-old woman who, as a result of a stroke that affected her brainstem, is tetraparetic, lacking the ability to move her upper limbs and vocalize sounds. Before the implantation of the neuroprosthesis, her only means of communication was a technological head-tracking device that allowed her to type and form sentences at approximately fourteen words per minute.

With the use of the neuroprosthesis, the participant was able to increase her rate of communication to seventy-eight words per minute, giving her greater fluency and immediacy. This increase in speed not only improved the quality of daily social interactions but could also have a significant impact on the workplace in the near future. In fact, the ability to communicate more fluently allows her to potentially be more involved, overcoming one of the main barriers that people with severe disabilities face in an organizational context: the slowness and difficulty of transferring information.

2.2. Avatar customisation

One of the most innovative aspects of the study concerns the use of a virtual avatar, which is 'controlled' by brain signals decoded by the neuroprosthesis. The participant was able to choose the appearance of her avatar from several predefined options. This avatar does not merely represent the patient, but reproduces facial expressions in real time, which are then synchronized with the words.

2.3. Critique of the Ableist Concept of Communicative Performance

A relevant point of criticism, which emerged in the Nature study, is the emphasis on speed as a parameter of success for neuroprosthesis. Raising the participant's communicative capacity from fourteen words per minute to seventy-eight may seem like significant progress, but this emphasis on speed reflects an ableist assumption about communicative 'performance'. The push to 'normalise' disabled communication, bringing it closer to neurotypical standards, raises ethical questions about how technology defines what is considered 'desirable' or 'acceptable' in communication. The attempt to conform the participant to a fast and fluid communication model may ignore the intrinsic value of slower communication, which might include deeper reflection or greater attention to detail.

2.4. The disabled person as a post-human subject?

In light of these considerations, can we perhaps define the person with disabilities who uses neuroprosthetics as a posthuman subject? According to Braidotti (2018), the posthuman subject is a relational entity that transcends traditional mind-body and nature-culture dichotomies and integrates technology as an essential part of one's existence. In the case of the participant, the neuroprosthesis is not simply an external device, but becomes an integral part of her body and identity.
The choice of avatar and the use of the neuroprosthesis allow the participant to expand her communicative capacities, transforming her into a subject that exists on the border between biology and technology.
Technology, according to Pianezzi, is understood as the second nature of the human being, "[...] *divorced from the ontological monism that requires the egalitarian view of being*" (Pianezzi, 2022, p. 165). In questioning the morality of certain organizational actions (in this example, the adoption of technology based on the use of AI to support the communication of the severely disabled participant), it is necessary to ensure that such actions do or do not comply with an inescapable moral principle, namely the denial of a definite hierarchy. In fact, observing the phenomenon through the lens of post-human ethics places radical equality at the center, and "[...] *is not based on the extension of human rights to non-humans, but on the denial of a moral and ontological hierarchy between species, and between species and nature, understood as animal life (zoe) and earth (geo)*" (Pianezzi, 2022, p. 168).
This empirical case shows how technology applied to the case at hand can be a double-edged sword: on the one hand, it enables new forms of expression and autonomy in relational and professional domains; on the other hand, it risks perpetuating abilist logics and exposing users with disabilities to

real gaps in protection, given the legal framework currently in place for cases of harm caused to third parties by the malfunctioning assistive tool.

2.5. Reasonable Accommodation in Organizational Ecosystems. A new norm to respond to emerging subjectivities?

Attention to the specificities of the disabled worker, as in the present case, should not be understood only as a technological issue, but also as an organizational challenge aimed at overcoming obstacles to participation. Therefore, the adoption of reasonable accommodations in organizational ecosystems is essential to promote the overcoming of the aforementioned obstacles, as on the other hand the most recent regulatory guidelines suggest.
In this sense, the potential use of "AI-based" technologies in the work of people with disabilities raises important legal issues, particularly with regard to civil liability in the event of harm. The integration of devices such as neuroprostheses into work activities, while an important technological advance, highlights legal gaps that need to be filled to ensure effective protection of rights. Existing legislation, in particular Articles 2043 and 2050 of the Civil Code, may provide a basis for addressing the risks associated with the use of AI, but may prove insufficient in the face of complex scenarios. In other words, the increasing decision-making autonomy of AI may require a rethinking of the legal framework so that the specificities of AI technologies can be considered in the context of disabilities, ensuring inclusion, safety and justice for the workers involved.

3. Who is civilly liable in case of damage caused by "AI based" technology applied to support people with disabilities? Ad hoc legislation to protect newly employable work units?

Authoritative doctrine, precisely with regard to torts related to the use of AI, has pointed out the unfavorable tendency to automatically promote a new norm for each new tortious phenomenon: the jurist cannot limit himself to applying the norm to the exact case outlined by it, rather using interpretation as the main tool at his disposal (Finocchiaro, 2019). Therefore, only as an *extreme ratio* could the construction of *ad hoc* legislation be envisaged.
In the rarer hypothesis in which the provider of the "*AI-based*" service and the user with a disability are bound by a contractual relationship, the attribution of civil liability for possible malfunctioning of the system appears to be unproblematic: it *tends to* be the provider who is liable for non-performance or inexact performance of contractual obligations. However, it cannot be ruled out that contractual liability may exist jointly with non-contractual liability (so-called concurrent liability) (Ferrari & Lusardi, 2019).
As for the latter, an initial theoretical orientation that envisaged the possibility of resorting to Article 2049 of the Civil Code on the employer's liability for the tort of "servants and clerks" is to be discarded today. In fact, in such a case the employer is liable for the act of a person who is abstractly liable, and proof of this is precisely the fact that the employee is liable for the damage caused jointly and severally with the employer. And yet, it has long been the case that the most authoritative Italian doctrine has moved beyond the thesis of even partial subjectivity (Teubner, 2019) of the AI system: "[...] *it seems very doubtful that the search for a solution must pass through the recognition of a subjectivity of the software agent, albeit partial. Indeed, if the recognition of a full legal subjectivity appears [...] a "forcing" that does not take into account the current reality, the same can be said of partial subjectivity* [...]" (Perlingieri, 1991, pp. 325-326).
As for indirect liability, the most accredited objective liability or aggravated liability, depending on the doctrinal classification to which reference is to be made, some authors had also envisaged an original reference to Article 2048 of the Civil Code, containing provisions on the liability of parents, guardians and tutors, who are liable for the fact caused by the minor, the subject under guardianship,

the pupil or the apprentice. In this sense, it is pointed out that the AI system reacts solely on the basis of the education given to it. The thesis-which remains suggestive, however-is bound to break down against some limitations: AI, unlike the "child", is not characterized by any capacity for self-determination; the most recent innovations in *machine learning*, *deep learning*, and generative AI adopt an *unsupervised* approach, and thus reduce the "training" phase to a minimal level of initial programming (Ferrari, & Lusardi, 2019). A similar argument could be made in relation to the former Article 2047 of the Civil Code.
Likewise, the reference to Article 2052 of the Civil Code on liability for damage caused by animals should be rejected, since, through domestication, the owner is called upon to carry out a control over the animal's ability to react that is lacking in the case of AI. In fact, the owner, custodian, or user of the "AI-based" device has a minimal possibility of affecting the conduct of the system and, as a rule, does not even adequately know the operating mechanisms.
The use of AI could also give rise to a dangerous activity *under* Article 2050 of the Civil Code. The shrewdest doctrine, however, now argues that this connotation is *improper*, and this is because AI is not inherently dangerous and should be reasonably qualified as a symbol of a more reliable technique than man, a corrective means of human inaccuracies (D'Alfonso, 2022). Conversely, it cannot be ruled out that the provision is applicable when AI is used for the performance of an activity that is dangerous in itself.
So, for non-hazardous activities, Article 2051 of the Civil Code on things in custody, which excludes liability for fortuitous events alone, would apply, while the less stringent Article 2050 of the Civil Code, which provides for the liberating proof of having done everything possible to avoid the damage, would apply only to activities that are per se hazardous. Consistently, it has been said that Art. 2050 c.c. would apply when the damage is caused by the thing subjected to the direction, albeit inadequate, of a person, while Art. 2051 c.c. would find application in cases where the thing was not directly operated by the operator (Serrao, 2021).
Other interpreters have asserted that Article 2051 of the Civil Code places the focus exclusively on the so-called *inanimate res*, that is, on an element that appears far removed from the IA instrument, which, by its very nature, is capable of producing behavior and decisions. Moreover, the very notion of "janitor" would be unsuitable when referring to an individual who, in fact, is not always concretely able to control the device in the full sense. Nevertheless, it is thought that Article 2051 of the Civil Code, in its meaning of strict liability, still remains applicable when the device is the cause of the injury as a direct source of the damage (and not as a means of the autonomous conduct of the owner/user/custodian) (D'Alfonso, 2022).
In conclusion, many of the rules mentioned above are applied by analogy, and thus the final entry into force of a European regulation on the subject will likely limit their application to only residual cases. Finally, it should be noted that among the proposals for regulations that the European Parliament had approved on October 20, 2020, in particular in one of them - namely A9-178/2020 - there was the prospect of compulsory insurance for operators to cover civil liability, adjusted to the amounts and the size of the compensation referred to in Articles 5 and 6 of the proposal, except where the activity carried out is not already subject to a compulsory insurance scheme under another EU or national law or to voluntary company insurance funds (Serrao, 2021).
For all the reasons stated so far, we believe there is a time-rooted regulatory gap in relation to the present case. To address it, it is worth insisting on the need for the legislature to construct *ad hoc* legislation to protect those who use (or, as in the case of the person with disabilities who "regains" his or her working autonomy, are often forced to use) "*AI based*" technology, precisely in anticipation of its possible malfunction. It will be up to the Italian legislature to structure the new law text, and to do so in the wake of the not insignificant organizational-relational dynamics outlined above, as well as, on the subject of non-contractual liability, of the Proposal for a Directive of the European Parliament and of the Council on liability from Artificial Intelligence (COM/2022/496 final).
In this framework, the extension of the organizational model of the "triple helix" to the "quintuple helix" implies the need to regulate, from a legal point of view, relationships that no longer refer only

to companies, academic institutions and public administrations, but also to those that involve the direct participation of society in decision-making and the environment. In other words, civil liability for damages caused by "AI-based" assistive technologies designed to support people with disabilities should be considered not only in a logic of state regulation and innovation, but also in light of the ethical and social demands raised by civil society and the environment in which it operates.

4. Concluding remarks.

"*AI-based*" technologies represent a great opportunity for the employment reintegration of people with disabilities, offering new tools for reducing the production gap and the efficient and productive employment reintegration of people with disabilities, as well as the formulation of real "new" ways of working.

However, alongside these potential benefits, it is essential to critically consider the possible legal implications, as well as the risk of perpetuating ableist logics that exalt speed and performance while penalizing aspects such as reflection and slowness, which can be intrinsic values of communication. Resolving these critical issues requires a balanced managerial approach that not only promotes work efficiency, but also the quality of interactions and respect for human dignity.

Precisely on the subject of respect for human dignity, and thus also protection of the rights of people with disabilities as set forth in the 2006 UN Convention, it is crucial to address the issue of civil liability in the event of damage caused to third parties by assistive technologies. Current regulations may be inadequate to handle complex scenarios related to the use of AI, making the introduction of *ad hoc* regulation urgent. Only by ensuring a sound and inclusive legal framework will it be possible to fully exploit the benefits of AI technologies without compromising the rights of people with disabilities and, consequently, the safety of third parties.

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What role(s) for Public Institutions in Emerging AI Ecosystems? Co-Designers, Coordinators and Promoters of Technology Transfer

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Abstract

This paper proposes a new framework for the governance of emerging AI ecosystems, reimagining public institutions as active co-designer, coordinators and promoters of technology transfer rather than mere regulators and supervisors. By providing this ecosystemic perspective, this work supports a cohesive and responsible path for AI development and diffusion.

Keywords: AI, Technology Transfer, Ecosystems, Innovation, Rome Technopole.

1. Introduction: What Role(s) for Public Institutions in Governing Emerging AI Ecosystems?

The rapid evolution of Generative Artificial Intelligence (AI) has triggered significant organizational, legal, and ethical concerns (Anderljung et al., 2023; Dwivedi et al., 2021; Robles & Mallinson, 2025; Wirtz et al., 2020). Such challenges underscore crucial questions about the role of public institutions (like governmental bodies) in shaping the governance of this fast-changing ecosystem (De Almeida et al., 2021).

Following Jacobides et al. (2021), we refer to AI ecosystems as complex, evolving systems of organizations, institutions, resources, and socio-technical arrangements that enable, produce, and apply artificial intelligence solutions. We refer to AI governance as the set of regulatory, policy, institutional, and design mechanisms—formal and informal—used to guide, constrain, or facilitate the development, deployment, and societal impacts of AI technologies, in order to maximize benefits and minimize risks across diverse domains (Taeihagh, 2021).

In the context of AI ecosystems governance, public institutions' role has primarily focused on a dichotomy of rule-setters – illustrated by the proposed EU AI Act (LanamÃ et al., 2024) – and supervision, as seen in the Italian temporary suspension to treat user data via ChatGPT (Bolici et al., 2024b). While these measures demonstrate a commitment to oversee AI development and diffusion, they tend to be reactive rather than proactive, and thus lag behind fast-evolving AI capabilities (Robles & Mallinson, 2025). Accordingly, current approaches to AI ecosystem governance may undermine long-lasting policy effectiveness (Bolici et al., 2024b, 2024a; Gualdi & Cordella, 2024), calling for the design of more proactive, systemic and integrated strategies.

To bridge this gap, we propose a network-based framework that encourages public institutions to move beyond supervising and regulating, becoming co-designers, coordinators, and promoters of technology transfer within AI ecosystems. Drawing from the Triple Helix model (Leydesdorff & Etzkowitz, 1998) and New Public Governance (Osborne, 2010), this framework promotes collaboration among public institutions, industry, and academia to support commercialization, foundational research, and regulatory legitimacy, thus driving responsible innovation (Hong et al., 2019; Wirtz et al., 2020). This framework was developed within the context of the Rome Technopole Project. Aligned with its goals, the framework supports responsible AI development and fair access to technological progress. Our dual approach to technology transfer reflects the Rome Technopole's

mission to: i) advance Technology Readiness Levels (TRLs), helping move academic research into real-world industrial use; and ii) involve a wide range of stakeholders and build strong communities around key areas of innovation.
By positioning public institutions as co-designers, coordinators, and technology transferors, our framework offers a practical model for implementing the Technopole's vision of sustainable innovation and industrial revitalization in the domain of AI systems.

2. Background: The Evolving Role of Public Institutions

The role of public institutions has progressively aligned with contemporary models of public administration, which emphasize greater interaction and cooperation with third-party stakeholders (Bryson et al., 2014). This evolution has traversed three distinct paradigms: Public Administration (PA), New Public Management (NPM), and New Public Governance (NPG) (Osborne, 2010).
Public Administration, grounded in political science, emphasized centralized decision-making with a top-down approach. In this model, policy creation and implementation were primarily the responsibilities of public officials within a unified state structure. However, criticisms of PA's rigid structure led to the emergence of New Public Management. NPM applied principles of neo-classical economics, favoring competition and efficiency through market mechanisms and contractual relationships. This approach treated public services as products managed within an open system, emphasizing organizational performance. As the complexity of public service needs grew, New Public Governance emerged, reflecting a pluralistic approach where multiple actors, including networks of organizations, collaboratively shape service delivery. NPG focuses on inter-organizational relationships and the negotiation of diverse values, addressing the limitations of PA and NPM in a more fragmented, interconnected governance landscape (Osborne, 2010). This understanding is driving a transformation in public sector reform, grounded in fundamentally different theoretical and epistemological foundations than those of traditional public administration or NPM. Central to this shift are deliberative, inclusive decision-making processes, collaboration, and co-production as key mechanisms for generating public value (Stoker, 2006).
The NPG paradigm inherently resonates with two central network-based concepts. The first is the Triple Helix model, which elucidates the pivotal role of the interplay between diverse actors - such as academics, industrial players, and governmental institutions - in leveraging innovation and development (Leydesdorff & Etzkowitz, 1998). The second is the concept of ecosystems, representing dynamic and interconnected networks of diverse actors that coexist and interact within a shared environment (Carayannis & Campbell, 2009; Haythornthwaite, 1996).
In this work, we focus on AI ecosystems: complex, evolving systems of organizations, institutions, resources, and socio-technical arrangements that enable, produce, and apply artificial intelligence solutions (Jacobides et al., 2021). These actors—ranging from hardware providers and platform developers to end users, government and research institutions —are interlinked by shared data flows, R&D collaborations and market interactions. Public institutions can significantly impact AI ecosystem governance by orchestrating the interactions among the many actors involved. AI governance refers to the set of regulatory, policy, institutional, and design mechanisms—formal and informal—used to guide, constrain, or facilitate the development, deployment, and societal impacts of AI technologies, in order to maximize benefits and minimize risks across diverse domains (Taeihagh, 2021). By integrating these theoretical perspectives, this work revises the role of public institutions within emerging AI ecosystems, qualifying them as co-designer, coordinator and promoter of technology transfer.

3. Framework and implications: Rethinking Public Institutions' Role(s) in AI Ecosystems

Recognizing the pivotal role that public institutions play in guiding the development and diffusion of responsible AI systems, this work reexamines their place within emerging AI ecosystems. In this section, we first analyze the current role of public institutions (section 3.1), with a focus on their regulatory and supervisory responsibilities, and then propose a new framework that upgrades them (section 3.2).

3.1 Current Role and Associated Limitations

Currently, AI ecosystems predominantly place public institutions in two reactive roles: as regulators drafting rules (e.g., the proposed EU AI Act) and as supervisors enforcing compliance (Bolici et al., 2024b; LanamÃ et al., 2024). While this structure ensures some legal oversight, scholars note several key drawbacks. First, the pace of Generative AI innovation outstrips that of traditional legislative processes, resulting in "governance lag" where nascent technologies remain unsupervised (Birkstedt et al., 2023; Wirtz et al., 2020). Relatedly, many interventions occur only after harms have materialized, reflecting a broader pattern of reactive governance (Wang & Siau, 2018; Wirtz et al., 2022). Such an approach can perpetuate risks, as problems like algorithmic bias or data misuse may escalate before institutions can respond (Robles & Mallinson, 2025). Second, by confining themselves to rule-setting and enforcement, public authorities often miss opportunities to shape AI solutions during early development – where integrating ethical standards and public-interest objectives is more effective (Anderljung et al., 2023). This oversight may leave non-commercial interests, including those championed by academia, underrepresented (Hong et al., 2019). Consequently, existing governance structures risk failing to capture the full collaborative potential among public agencies, private developers, and research institutions, undermining the proactive, integrated AI governance many scholars advocate (Dwivedi et al., 2021).

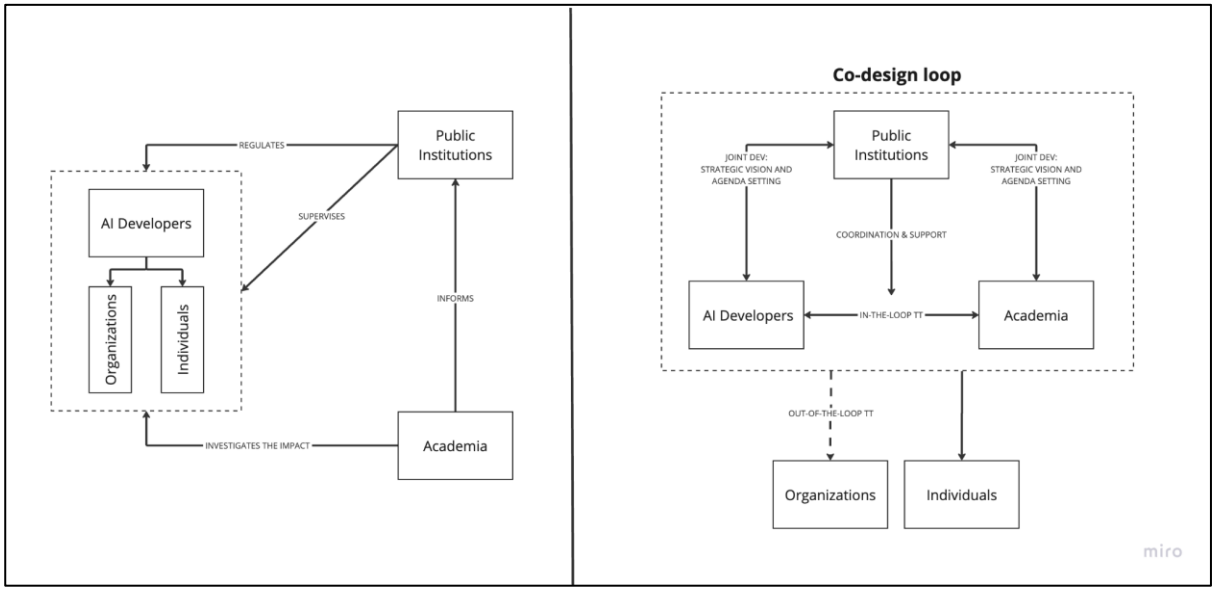
To overcome the limitations of current approaches, we propose a more proactive and integrated role for public institutions in the AI ecosystem – one that facilitates collaboration among stakeholders, embeds ethical considerations from the earliest stages of development, and creates governance mechanisms that can evolve as rapidly as the technology itself.

3.2 The Role of Public Institutions Rethought

A robust, multi-actor collaboration – supported by proactive public institutions – is indispensable for adaptive, responsible Generative AI governance. Our framework merges NPG and Triple Helix principles to foster co-creation in Generative AI ecosystems, with AI developers, academia, and public institutions collaborating on design, testing, and responsible AI deployment (Birkstedt et al., 2023; Dwivedi et al., 2021).

We propose three key roles for public institutions – co-designer, coordinator, and technology transferor – that together ensure public values remain central (Robles & Mallinson, 2025; Wirtz et al., 2020). As co-designers, governments can shape policies and standards, bridging the "principles-to-practices" gap through transparent, inclusive processes (Hadfield & Clark, 2023). As coordinators, they balance efficiency with ethical oversight, orchestrating diverse stakeholders to prevent AI misapplications (Hong et al., 2019). As promoters of technology transfer, they can foster research funding, open data infrastructures, and equitable access, particularly for under-resourced innovators (Dilling et al., 2020; Wirtz et al., 2020).

Figure 1: Current AI Ecosystem (left) vs. Proposed Framework (right)



3.2.1 Public Institutions as Co-Designers

Under NPG, public institutions are not merely rule-setting bodies, but co-designers that shape the strategic direction of AI in partnership with academia and industry. Thus, co-designer roles empower public institutions to ensure that AI models address societal challenges (e.g., equitable healthcare, fair lending) while remaining legally and ethically robust. This "upstream" engagement reflects the success factors found in triple-helix collaborations, where universities, government, and industry align on early-stage research goals (Hong et al., 2019). In practice, this has the following implications for AI systems design and development:

- **Joint Development: Strategic Vision and Agenda-Setting:** Public agencies work with AI developers and researchers to define overarching goals (e.g., "responsible by design," "human-centric AI"). Similar to "society-in-the-loop" approaches (Birkstedt et al., 2023), public institutions embed societal priorities - such as algorithmic fairness, data privacy, or climate goals - into early development phases.
- **Proactive Participation in Research & Development:** Public-sector experts or agency representatives can serve on coordinators and project steering committees to ensure that ethical and legal considerations are built into new AI models from the outset. For instance, the notion of "collaborative governance" (Wirtz et al., 2020) highlights the importance of involving public institutions in R&D settings, thus mitigating risk ex ante.
- **Democratization and Legitimacy:** By participating in design sprints, pilot programs, and prototyping exercises, public institutions help channel diverse stakeholder interests – including underrepresented community perspectives – into AI solutions (Dwivedi et al., 2021). This inclusive approach bolsters public trust (Robles & Mallinson, 2025), bridging the "democratic deficit" often noted when AI systems are solely industry-driven (Hadfield & Clark, 2023).

Within the co-design cycle, public institutions also act as coordinators (see section 3.2.2) and facilitators of In-the-loop technology transfer (see section 3.2.3).

3.2.2 Public Institutions as Coordinators

Coordination is the management of interdependencies among activities (Malone & Crowston, 1990) and, indirectly, of the relationship among the actors in charge of their implementation. As introduced in section 3.2.1, public institutions can take on a coordinator role to harmonize and streamline multi-stakeholder collaboration. In essence, the coordinator function recognizes that public institutions do more than passively watch AI innovation unfold. They orchestrate, moderate, and incentivize collaborative norms, channeling the effort of numerous and heterogeneous actors toward common public-interest outcomes (Dwivedi et al., 2021). These coordination role involves:

- **Bridging Regulatory and Technical Dialogues:** Public agencies occupy a pivotal position between formal regulation (e.g., data-protection or transparency laws) and fast-evolving AI technologies. As coordinators, they translate broad legislative objectives – such as fairness, non-discrimination, or privacy – into practical guidelines for AI developers. Mäntymäki et al. (2022) propose that effective AI governance depends on bridging corporate governance, IT governance, and data governance; public authorities can actively synchronize these domains.
- **Mitigating Fragmentation and Fostering Convergence:** Drawing on Hong et al. (2019), which shows that academia–industry collaboration weakens regional innovation divergence, public institutions can replicate this effect at a broader scale by coordinating resources and setting uniform standards. Central agencies, for instance, can diffuse best practices or unify licensing requirements, reducing duplication and fostering nationwide or international convergence in AI capabilities.
- **Promoting Public Trust and Acceptance:** As third-party brokers among competing interests, government bodies can set up oversight processes – such as auditing frameworks, risk assessments, or algorithmic impact assessments – that ensure accountability and transparency. When the public sees robust oversight, trust in AI-driven public services tends to increase (Robles & Mallinson, 2025).

3.2.3 Public Institutions as Promoters of Technology Transfer

Technology transfer (TT) is the movement of know-how, technical knowledge, or technology from one organizational setting to another (Bozeman, 2000). Public institutions can facilitate the TT process, promoting the uptake, diffusion and scaling of AI solutions. We distinguish here between In-The-Loop and Out-of-The-Loop TT.

In-The-Loop TT unfolds *within* the co-design process, where active knowledge exchange happens among researchers, industry practitioners, and public-sector agencies. As new breakthroughs emerge, they are quickly translated into industrially relevant applications. Public institutions play a pivotal role by:

- **Funding and Demonstration**: Supporting applied research programs and pilot projects (Hong et al., 2019) that test generative models in controlled but realistic environments.
- **Test Beds and Knowledge Hubs**: Offering neutral platforms where cutting-edge solutions are validated under real-world constraints before wider release (Dilling et al., 2020).
- **Matchmaking**: Connecting academics, startups, and established firms to ensure knowledge and technologies flow more easily across organizational boundaries.

This In-The-Loop mechanism promotes mutuality among actors within AI ecosystems: researchers gain early insight into practical constraints (e.g., data security, real-time requirements). Industry secures privileged access to new academic breakthroughs, thus reducing R&D time and de-risking innovation. Public Sector fosters solutions that align with social values and are validated in real-world contexts.

Out-of-The-Loop TT addresses recipients *outside* the core co-design cycle – often smaller enterprises, nonprofits, local governments, or community actors less directly engaged in ongoing

R&D. As Hong et al. (2019) suggest in the context of China's regional innovation convergence, well-structured public-led technology transfer can alleviate geographical or sectoral disparities, building a more balanced AI ecosystem. Inspired by collaborative governance models (Wirtz et al., 2020), public institutions can support Out-of-The-Loop TT by:

- **Creating AI Knowledge Hubs**: Provide standardized toolkits, training modules, and use-case frameworks to aid organizations without extensive R&D capacity.
- **Subsidizing AI Adoption**: Offer grants or public procurement initiatives that encourage use of vetted AI solutions, especially in under-resourced municipalities or sectors.
- **Expanding Data Access**: Develop open, community-driven repositories to ensure that smaller actors can train and deploy AI systems responsibly without prohibitive costs.

3.3 Some Possible Implementation Challenges and Mitigation Strategies

While the roles of co-designer, coordinator, and promoter of technology transfer often complement one another in theory, real-world collaboration between public institutions, academia, and industry can be fraught with challenges if not carefully managed. One common issue is incentive misalignment. For instance, private-sector actors may prioritize speed to market, seeking rapid deployment of AI products, while public institutions emphasize ethical safeguards and regulatory compliance. Without structured coordination, this tension can stall progress or lead to suboptimal outcomes. Mechanisms like milestone-based contracts, routine check-ins, and oversight committees can help align expectations by tying funding and approvals to demonstrated adherence to ethical standards (Dwivedi et al., 2021).

Another challenge is lack of trust. When public agencies enforce rules through top-down mandates without explaining the rationale, they risk alienating their partners. This can lead to resistance or disengagement, undermining collaborative governance efforts. Transparency is key, and open consultation formats such as stakeholder roundtables or live-streamed policy discussions, coupled with publicly accessible explanations of major decisions, can build legitimacy and foster mutual accountability (Robles & Mallinson, 2025)**.**

Incentive misalignment and trust issues are only two of many possible frictions in the governance of AI ecosystems. Future research is necessary to systematically identify such factors and possible mitigation strategies.

4. Conclusions

The rapid advancement of AI requires a reassessment of public institutions' role in governing AI ecosystems, which currently struggle to keep up with technological progress, leading to reactive policies that inadequately address new challenges. This paper proposed a conceptual framework for AI ecosystem governance that addresses these shortcomings. We introduced a collaborative AI development process that brings together public institutions, academia, and industry in a co-design cycle, representing a fundamental shift from traditional hierarchical control modes to a more proactive and participatory approach.

While purely conceptual, the framework we propose aligns closely with the objectives of key development programs in Italy, such as Rome Technopole, demonstrating the potential of our proposed governance approach to address real-world challenges in fostering responsible AI development and equitable technological progress. Specifically, our dual approach to technology transfer resonates with the Rome Technopole's vision of promoting industrial valorization of research results. The In-The-Loop Technology Transfer we propose parallels the Rome Technopole's aim to mature Technology Readiness Levels (TRL), facilitating the transition from academic research to industrial applications. Similarly, our Out-of-The-Loop Technology Transfer concept aligns with the

Rome Technopole's goal of engaging diverse stakeholders and creating communities around smart specialization areas.
By positioning public institutions as co-designers, coordinators, and technology transferors, our framework offers a practical model for implementing the Rome Technopole's vision of sustainable innovation and industrial revitalization in the domain of AI systems.

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Promoting Industrial Sustainability Through the Development of a Collaborative Ecosystem in Lazio's Naval and Aerospace Sectors

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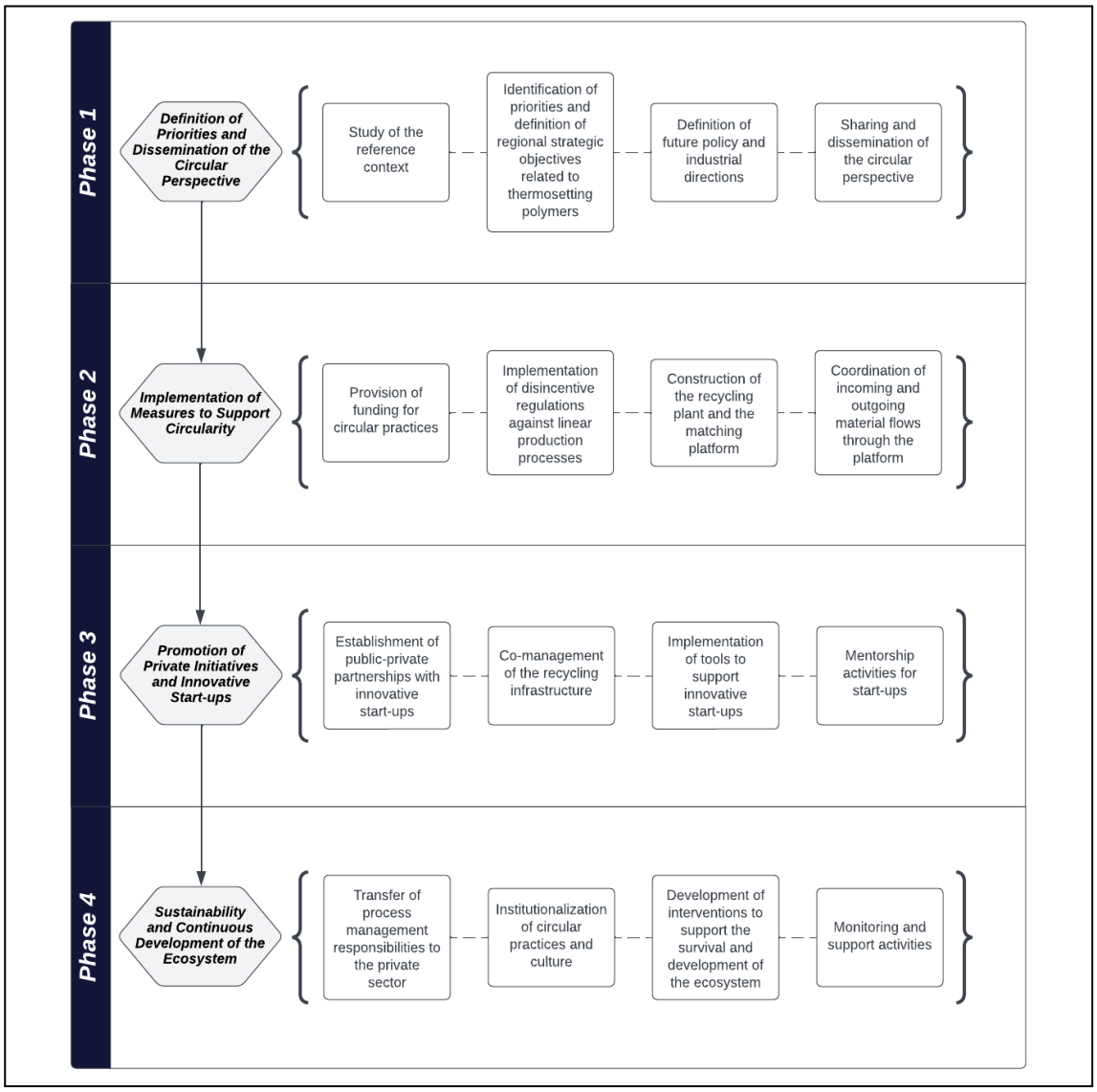
Abstract. This study proposes a four-phase framework to implement circular economy practices in Lazio's aerospace and naval sectors. By overcoming barriers in thermoset recycling, the framework enhances industrial sustainability, improves stakeholder coordination, and promotes economically viable circular practices. These advancements hold significant implications for industrial transformation and sustainable development at the regional level.

Keywords: Triple Helix; Circular Business Models; Ecosystems; Sustainability.

1. Introduction

Promoting industrial sustainability through collaborative networks represents a contemporary challenge with significant economic and social implications.
Traditional linear production systems, characterized by a "take-make-dispose" paradigm, have proven inadequate in addressing contemporary sustainability challenges. In contrast, circular models emphasizing reuse, regeneration, and recycling offer a more sustainable alternative. These approaches facilitate the transition toward what the Ellen MacArthur Foundation (2013, p. 7) defines as a circular economy – an industrial system intentionally designed to be restorative and regenerative. This system fundamentally reconceptualizes the notion of "end of life," replacing it with the principle of "restoration". It encompasses comprehensive strategies including the promotion of renewable energy, elimination of toxic chemicals, and waste minimization through enhanced design of materials, products, systems, and business models. Beyond environmental benefits, circular business models provide strategic advantages, particularly in mitigating risks associated with volatile raw material prices and improving production efficiency (Ellen MacArthur Foundation, 2013).
Despite these potential advantages, the implementation of circular strategies remains suboptimal across many industries (Rosa et al., 2019). Several structural barriers impede effective adoption, including business fragmentation, insufficient inter-organizational coordination, limited knowledge sharing regarding circular practices, inadequate financial resources for innovation, and underdeveloped regulatory frameworks (Berghuis et al., 2023; Planing, 2015).
The RIMATER project emerges as a response to these challenges, proposing an organizational solution specifically tailored to the technical and territorial characteristics of the Lazio Region (Italy). This initiative aims to cultivate and sustain an industrial ecosystem within the Region, emphasizing the critical interdependencies among stakeholders and the essential coordinating role of public institutions (Bolici et al., 2022). The project's governance model and ecosystem dynamics draw upon the Triple Helix model, which advocates for systemic collaboration among industry, Regional public authorities, and Universities (Leydesdorff & Etzkowitz, 1998).

Figure 1: Overview of the ecosystem solution



2. Theoretical Background: The Ecosystemic Perspective

The theoretical framework for this study encompasses two primary domains: circular business models and industrial ecosystems. This section examines their conceptual foundations and interconnections, providing the theoretical foundation for our research.

2.1 The Circular Business Model: Internal and External Perspectives

Circular business models represent a fundamental shift in business operations, implementing cycling, extending, intensifying, and dematerializing measures to optimize resource utilization and minimize waste (Geissdoerfer et al., 2020). The analysis of these models has evolved along two distinct trajectories: internal and external perspectives. While both approaches pursue economic and sustainability objectives (Zucchella & Previtali, 2019), they differ significantly in their analytical focus and methodological foundations.

The internal perspective concentrates on individual business units, predominantly employing the business model canvas framework as its design tool (Lewandowski, 2016; Osterwalder et al., 2010; Rosa et al., 2019). However, this approach has faced criticism for constraining business model

boundaries within organizational limits, potentially overlooking broader systemic interactions (Zucchella & Previtali, 2019). In contrast, the external perspective emphasizes organization-environment interactions, drawing from stakeholder and network theories, and more recently, ecosystem theory, which encompass the complex relationships between organizations and their environment (Geissdoerfer et al., 2020). The ecosystem perspective proves particularly pertinent for circular business models, as their successful implementation necessitates inter-organizational collaboration rather than isolated initiatives (Zucchella & Previtali, 2019).

2.2 Industrial Ecosystem: Conceptual Framework and Principles

The ecosystem concept, originally rooted in ecological science, has evolved significantly in its application to industrial networks (Korhonen, 2001). Frosch & Gallopoulos (1989) pioneered the industrial ecosystem concept, defining it as an integrated system that optimizes energy and material usage while minimizing waste through cross-process utilization. This framework parallels biological ecosystems through four fundamental principles: roundput, diversity, locality, and gradual change (Korhonen, 2001).

Roundput describes the retention and transformation of vital resources within ecosystems, analogous to industrial systems' utilization of renewable and recycled materials. The principle of diversity manifests through varied species, interdependencies, and cooperation patterns, promoting ecosystem resilience through adaptability. The locality principle suggests that environmental conditions significantly influence ecosystem configuration, often resulting in regionally specific industrial ecosystems (Gamidullaeva et al., 2022). Finally, gradual change promotes sustainable resource utilization within natural renewal capacities (Korhonen, 2001).

Industrial symbiosis, mirroring biological mutualism, characterizes how traditionally unrelated businesses exchange resources for mutual benefit (Chertow, 2000). This symbiotic relationship generates collective advantages that exceed individual benefits, often manifesting in eco-industrial parks—communities of businesses that cooperate internally and with local communities to share resources efficiently while generating both economic and environmental gains (PCSD, 1996).

2.3 Organizational Dynamics of Industrial Ecosystems

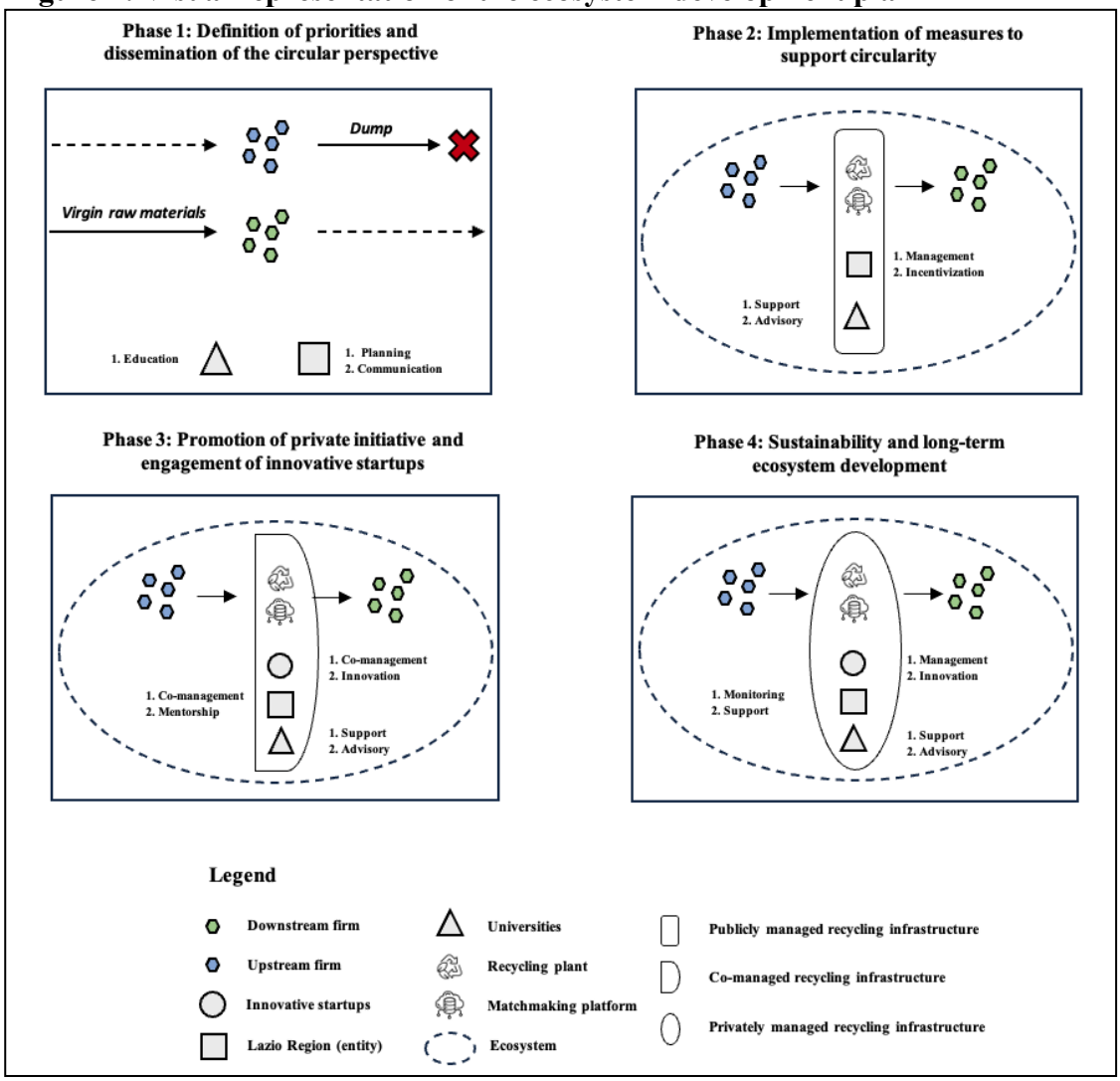
Industrial ecosystems comprise heterogeneous, hierarchically independent, and interconnected actors, including businesses, startups, government entities, and investment funds (Aarikka-Stenroos et al., 2021; Tolstykh et al., 2020). These diverse participants fulfill distinct roles and contribute varying inputs and outputs within waste exchange mechanisms (Korhonen, 2001; Tsujimoto et al., 2018). While fundamentally self-organized, these ecosystems require coordination through network orchestrators who facilitate collaborative practices through shared vision, trust, and transformational leadership (Tolstykh et al., 2020; Zucchella & Previtali, 2019). The orchestrator promotes sustainable ecosystem development by facilitating technological, innovative, and economic transformations (Tolstykh et al., 2020). Regional sustainable development can be described as following Communities-of-Practice (CoPs) logic, involving Innovators, Influencers, and Initiators (Liu et al., 2023). These networks, commonly led by research or government entities, support knowledge co-creation through practice (Brown & Duguid, 2001). Industrial platforms facilitate ecosystem operation through modular architectures (Gawer, 2014), incorporating resource providers, consumers, intermediaries, and coordinators (Benedict et al., 2018; Mukhopadhyay & Bouwman, 2019). Notably, local authorities have evolved from supervisors to facilitators, increasingly cooperating with private sectors while providing organizational resources, knowledge, funding, and infrastructure support (Berghuis et al., 2023; Von Malmborg, 2004).

3. Ecosystemic Solution: A Four-Phase Implementation Plan

Analysis of the Lazio entrepreneurial landscape through the RIMATER project has identified significant barriers to implementing circular strategies for thermosetting material waste recycling at an ecosystem level. These impediments, exacerbated by the Region's fragmented industrial context, manifest across technical, financial, and systemic dimensions, creating a scenario where landfill disposal remains more economically viable than composite material recycling.

To address these multifaceted challenges, we propose a comprehensive four-phase implementation plan designed to foster industrial ecosystem development. This approach leverages stakeholder complementarity (Cuel et al., 2021) and synergetic interdependencies to generate integrated economic, environmental, and social value. The proposed solution encompasses both upstream and downstream companies, innovative startups, regional authorities, and the scientific community, and is structured across four macro-interventions: i. defining priorities and disseminating the circular perspective; ii. implementing circularity support measures; iii. promoting private initiative and innovative startups; iv. promoting ecosystem sustainability and continuous development (Figure 1 and 2).

Figure 2: Visual representation of the ecosystem development plan



3.1 Phase 1: Definition of priorities and dissemination of the circular perspective

The initial phase focuses on three primary objectives: industrial context mapping, strategic priority establishment, and circular objective articulation for thermosetting materials recycling. These interventions align strategically with the Lazio Region's Ecological Transition Plan guidelines (Regione Lazio, 2023), advocating for a systemic, interdisciplinary approach to circular production systems.

Building on RIMATER analyses, the Regional authority conducts targeted interviews with ecosystem-compatible enterprises to proactively identify potential obstacles and opportunities. This engagement serves dual purposes: establishing critical touchpoints between regional authorities and key ecosystem actors while addressing potential resistance to change. Simultaneously, it reinforces the Region's commitment to implementing circular policies.

Concurrent with mapping activities, the Region develops a comprehensive framework of transition objectives for relevant materials and industries, establishing clearly defined intervention areas across medium and long-term horizons. Information dissemination occurs through multiple channels, including institutional websites, social media platforms, dedicated newsletters, and industry events. This multi-channel approach facilitates direct industry-Region dialogue and promotes the development of a shared vision for circular transformation.

The scientific community assumes a crucial role in this phase through the development and delivery of specialized circular economy training courses and workshops, conducted in collaboration with regional authorities. These educational initiatives serve dual purposes: establishing fundamental knowledge bases and catalyzing interaction between industry professionals. This interaction facilitates the development of collaborative networks and potential symbiotic relationships among participants.

The priority-setting and perspective-dissemination process represents a crucial foundation for developing regional consensus on industrial directions, establishing essential groundwork for subsequent implementation phases.

3.2 Phase 2: Implementation of measures to support circularity

The second phase encompasses a comprehensive approach to establishing the fundamental infrastructure and regulatory mechanisms necessary for circular economy implementation. This phase manifests through three primary dimensions: regulatory initiatives, infrastructure development, and industrial matching platform implementation.

Recognizing the absence of private sector first-movers, the Region assumes direct managerial responsibility for recycling facility operations. This intervention addresses a critical market gap while ensuring the integrity of recycling processes and promoting the economic-financial viability of circular practices. The strategic location decision for the recycling infrastructure favors the Province of Rome, supported by RIMATER project analyses demonstrating the highest concentration of ecosystem-compatible businesses in this area.

Central to this phase is the development and implementation of an industrial matching platform that facilitates ecosystem development through the aggregation of upstream and downstream actors. This platform serves multiple functions (see Table 1): i. facilitating supply-demand matching for recycled materials; ii. enabling operational information sharing regarding material availability, logistics, and recycling processes; iii. promoting industrial partnerships and innovative practices; iv. supporting knowledge dissemination across the ecosystem.

Public control of the platform aligns strategically with the Region's enabling role, allowing for balanced ecosystem development while maintaining stability. Additionally, the Region leverages its procurement capacity by utilizing the platform to source secondary raw materials for compatible public works projects.

The scientific community assumes a crucial supporting role in this phase, providing expertise across two critical dimensions: i) technical support for recycling facility development and management; ii)

strategic guidance for platform coordination and optimization. This collaboration ensures that both physical and digital infrastructure development benefits from academic expertise while maintaining practical applicability.
The Region promotes three key objectives through these integrated strategies: i) enhanced collaboration among complementary actors; ii) improved scalability of recycling processes; iii) and systematic reduction in operational costs. Collectively, these interventions create a cohesive ecosystem focused on the revalorization of thermoset material waste, specifically targeting the aerospace and naval sectors in Lazio.

Table 1: Benefits arising from the matchmaking platform

Category	Benefits	Description
Economic	Reduction in Operational Costs	Companies can access secondary raw materials at competitive prices via the matching platform, lowering production costs and increasing profitability
	Scalability of Recycling Processes	The platform supports the scaling of recycling operations, enabling efficient management of higher waste volumes and fostering ecosystem growth
Environmental	Promotion of Circularity	The platform accelerates the shift towards circular production processes by reducing reliance on virgin materials and promoting the recycling of thermoset composites
	Environmental Sustainability	Participation in the platform helps reduce environmental impact, aligning companies with sustainability goals and ensuring compliance with stricter regulations
Support and Collaboration	Support from the Scientific Community	Collaboration with the scientific community ensures the integration of theoretical, technical, and managerial expertise, forming a solid foundation for strategic and operational decision-making within the ecosystem
	Active Industry Participation	The platform encourages companies to actively engage, creating business opportunities in recycling and the purchase of recycled materials.
	Industrial Collaboration and Innovation	The platform fosters collaboration among companies, enabling the exchange of best practices and joint innovation, which drives sector growth and strengthens competitiveness

3.3 Phase 3: Promotion of Private Initiatives and Engagement of Innovative Startups

The third phase marks a strategic transition in ecosystem development, focusing on private sector integration and innovation promotion following the successful implementation of core infrastructures. This phase represents a crucial evolution in the Region's role from primary infrastructure manager to co-manager and mentor, manifested through strategic public-private partnerships with innovative startups focused on ecosystem material flow management.
Startups serve as critical agents of ecosystem renewal and flexibility, distinguished by their innovative capacity and rapid market adaptation capabilities. Their operational agility supports the essential collaboration, integration, and dynamism required within the circular economy context. Through targeted funding calls, the Region actively incorporates these enterprises into ecosystem material flow coordination, facilitating shared coordination and intermediation functions through the established matching platform. These innovative entities promote novel approaches to enhance recycling process efficiency and sustainability, simultaneously supporting creative solution design and sustainable ecosystem development.
Concurrent with innovative design processes, the co-management strategy enables systematic knowledge transfer from the public to private sector, particularly regarding plant management expertise and ecosystem interaction dynamics. The scientific community maintains its crucial technical-management support role, providing startups with essential competencies in engineering and innovative project management. This knowledge transfer mechanism ensures the preservation and enhancement of accumulated expertise while facilitating private sector capability development.

3.4 Phase 4: Sustainability and Continuous Development of the Ecosystem

The final phase focuses on transitioning infrastructure management to the private sector, ensuring long-term ecosystem sustainability, and establishing mechanisms for continuous growth and development. Building on the capability development achieved in Phase 3, the Region systematically reduces its direct operational involvement while maintaining essential support and oversight functions. The Region introduces regulations promoting circular initiatives and economic incentives to foster a favorable institutional environment for the ecosystem's survival and growth.

The Region promotes circular economy culture through awareness campaigns, best practice exchanges, and continuous training programs. These initiatives foster a cycle of ongoing improvement while strengthening the foundational understanding of circular economy principles among stakeholders. A comprehensive monitoring framework evaluates the ecosystem's environmental, social, and economic impacts, enabling timely identification and correction of operational inefficiencies while optimizing ecosystem performance.

Innovative startups remain fundamental to the ecosystem's development. The Region, in collaboration with the scientific community, continues to provide funding, resources, and networking opportunities. This partnership drives research incentives, promoting collaboration between industry and Universities through applied research projects and shared laboratories. This multi-faceted approach ensures the ecosystem's economic sustainability while institutionalizing circular practices and promoting continuous research and development activities.

The fourth phase thus establishes the foundation for long-term ecosystem viability, combining private sector leadership with ongoing public sector support to maintain momentum in circular economy development. Through this carefully orchestrated transition, the ecosystem achieves both operational independence and sustainable growth potential, while maintaining the innovative capacity essential for continuous improvement in circular practices.

4. Conclusions and Implications

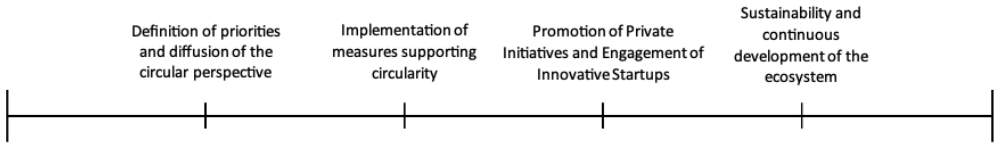
This research presents an organizational framework designed to facilitate the adoption of circular practices in the Lazio Region, with specific emphasis on thermoset material waste recycling in the naval and aerospace sectors. While the framework maintains inherent flexibility, its targeted approach addresses specific challenges within these strategic sectors.

The proposed solution adopts a systematic four-phase approach: priority setting and circular perspective promotion; circularity support measure implementation; private initiative and innovative startup encouragement; and ecosystem sustainability and continuous development facilitation. This structured progression aims to catalyze the formation, expansion, and innovation of an industrial ecosystem within the target sectors.

The framework is anticipated to strengthen Lazio's industrial capacity across four strategic dimensions: circularity enhancement, stakeholder coordination optimization, industrial innovation acceleration, and economic-financial sustainability of circular practices (Figure 3). Upon full implementation, the initiative is expected to yield an industrial ecosystem characterized by several distinctive features. These include widespread adoption of circular economy principles ensuring long-term sustainable development, autonomous private sector management of processes and ecosystem interactions, sustained focus on continuous growth, and financial sustainability of circular processes driven by collaborative innovation and coordinated stakeholder engagement.

This research contributes to the practical implementation of circular economy principles at a regional level. The proposed framework offers a structured approach to addressing the complex challenges of industrial transformation while maintaining flexibility for adaptation to specific sectoral needs. Future research might explore the framework's applicability to other industrial sectors and regional contexts, as well as examine the long-term impacts of such ecosystem-based approaches on regional industrial development.

Figure 3: Expected impacts of the proposed solution on the Industrial Context of Lazio



Dimension	Current State (AS IS)	Post-Implementation Phase 1	Post-Implementation Phase 2	Post-Implementation Phase 3	Desired State (TO BE)
Circularity	Predominantly linear production processes with limited involvement in thermoset material recycling.	Growing awareness of circular practices among companies	Companies adopt circular industrial practices (roundput), supported by regional financial assistance.	Circular practices expand as innovative startups engage in managing material flows.	Stakeholders embrace a circular and ecosystemic culture, driving sustainable industrial development in the long term.
Coordination	Limited communication among stakeholders and lack of a systemic vision.	The Region identifies key obstacles and coordination mechanisms needed through industrial	The Region establishes recycling infrastructure and acts as a network orchestrator, managing material flows and launching a matching platform.	Innovative startups co-manage the matching platform in collaboration with the Region and universities.	The ecosystem is privately managed, supported by a suitable regulatory framework and well-established interactions.
Innovation	Predominantly linear processes with little incentive for innovation.	Training and networking initiatives provide companies with foundational knowledge for managing innovative practices.	The Region acts as a first-mover, building recycling infrastructure and promoting the adoption of recycling and future innovation practices.	Innovative startups managing recycling infrastructure develop new approaches to ecosystem processes.	The ecosystem fosters continuous development through collaboration between companies, startups, the Region, and universities.
Economic-Financial Sustainability	Recycling of thermoset materials offers low economic and financial feasibility.	The Region identifies sustainable economic models based on analysis of Lazio's industrial landscape.	Circular practices are promoted through funding and the establishment of recycling infrastructure by the Region.	Financial sustainability improves as innovative startups contribute to co-managing material flows.	The ecosystem operates on circular, economically sustainable practices enabled by the coordination, collaboration, and innovation of involved stakeholders.

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Sistema sanitario nazionale digitale: tensioni generate ed implicazioni indotte sui professionisti e sulle associazioni dei pazienti coinvolti nei processi innovativi in evoluzione

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Abstract

Il presente studio si propone di esplorare l'impatto delle innovazioni digitali nel SSN sui professionisti sanitari e sulle associazioni dei pazienti, con particolare attenzione sul fenomeno del tecnostress. Dai risultati emerge la necessità di interventi formativi e implicazioni manageriali per orientare le innovazioni digitali e affrontare le sfide della digitalizzazione.

Introduzione

La digitalizzazione ha interessato negli ultimi anni sempre più settori, dalla produzione alla consulenza (Amankwah-Amoah et al., 2021). In letteratura, la digitalizzazione è stata definita l'insieme di "*prodotti, processi o modelli di business percepiti come innovativi determinanti nell' ingenerare lo sviluppo di un cambiamento significativo da parte di coloro che li adottano e sono abili o incorporati nell'uso delle tecnologie digitali*" (Fichman et al., 2014).

Tale processo ha avuto un impatto anche sul Sistema Sanitario Nazionale (SSN) Italiano, concepito come un complesso di strutture e servizi finalizzati a garantire l'accesso universale ad una assistenza sanitaria equa per tutti i cittadini, a parità di condizioni, e ciò in accordo con principi fondamentali su cui si basa il SSN: universalità, uguaglianza ed equità (Legge n.833/1978). Ai principi fondamentali del SSN si aggiungono i principi organizzativi: i) centralità della persona; ii) responsabilità pubblica per la tutela del diritto alla salute; iii) collaborazione tra i livelli di governo; iv) valorizzazione della professionalità degli operatori sanitari; v) integrazione tra assistenza sociale e sanitaria.

Il SSN ha di fatto saputo rispondere a sfide derivanti sia dalla ridefinizione dei modelli organizzativi sia dal processo di digitalizzazione che ha comportato un cambiamento radicale. Il Covid-19, peraltro, ha imposto la necessità di riadattare il sistema e di valutare il livello di risposta al cambiamento degli stakeholder garantendo l'assistenza sanitaria per tutti i pazienti.

La risposta pandemica ha richiesto un uso crescente di tecnologie digitali all'interno delle organizzazioni sanitarie. Per abilitare l'assistenza sanitaria a distanza è necessario che professionisti e pazienti possiedano competenze adeguate (Galpin et al., 2021); il proporre nuovi metodi di formazione al fine di sviluppare nuove conoscenze dei professionisti sanitari e un maggiore coinvolgimento dei pazienti nella assistenza territoriale, dotandoli di adeguate competenze digitali, sia soft che hard digital skills, potrebbe essere un primo passo in questa direzione (Di Vaio et al., 2021; Hartviksen et al. 2018; DM 77/2022).

Secondo Brice e Almond (2020), l'acquisizione di competenze digitali ha avviato il processo di evoluzione degli operatori sanitari che divengono "operatori sanitari digitali". La letteratura ha evidenziato come gli operatori sanitari digitali debbano avere un equilibrio tra lavoro e vita personale poiché il miglioramento delle competenze richiederà l'adattamento ad un modo di lavorare imperniato sulla formazione specializzata (Tams et al., 2020; Tiwari, 2021). In Italia, il Piano Nazionale di Ripresa e Resilienza (PNRR) prevede notevoli investimenti circa (0,74 miliardi di euro) sulla formazione destinati allo "Sviluppo delle competenze tecniche, professionali, digitali e manageriali", evidenziando così la necessità di creare operatori sanitari idonei alla gestione la futura erogazione dei servizi stessi.

Gli attori principali del nostro sistema sanitario quando si parla della sua riorganizzazione sono i pazienti che con il supporto delle loro associazioni dedite all'advocacy (PAA), raccolgono e diffondono informazioni su patologie specifiche, forniscono piattaforme di condivisione consentendo così di ampliare l'accesso alla conoscenza sulle opzioni di cura e trattamento (Allmark & Klarzynski, 1992; Morrison, 1991). In Italia, le PAA sono presenti ed operanti dal 1978, e cioè dalla creazione del Servizio Sanitario Nazionale, ed inoltre la loro importanza nel processo decisionali si è molto accresciuta negli ultimi anni (Vanara, 2008) tant'è che il Ministero della Salute e alcune autorità sanitarie regionali le coinvolgono ormai sistematicamente in progetti significativi (Jones et al., 2004). L'avvento di Internet e dei social media hanno offerto nuove opportunità alle PAA di connettersi e condividere informazioni, superando i confini geografici (Koay et al., 2013). La pandemia ha accelerato l'adozione di soluzioni digitali per la cura dei pazienti cronici, migliorando la comunicazione e la collaborazione tra i professionisti sanitari (Petrangolini et al., 2022).
Oltre alla documentata necessità per gli operatori sanitari e per i pazienti di acquisire nuove competenze e abilità al fine di utilizzare correttamente le tecnologie, la letteratura individua un altro tema centrale legato al grado di preparazione dei professionisti sanitari e alle conseguenze comportamentali connesse all'uso delle tecnologie: il tecnostress.
Brod (1984) e successivamente Weil e Rosen (1997) definirono il "tecnostress" come lo stress indotto, direttamente o indirettamente, dall'uso di nuove tecnologie, specialmente la tecnologia dell'informazione, che genera conseguenze negative sugli atteggiamenti, i pensieri e i comportamenti delle persone. È un dato di fatto che l'implementazione dell'innovazione digitale e il continuo processo di digitalizzazione hanno notevolmente influenzato il benessere degli operatori sanitari (Tu et al., 2005). Pertanto, è necessario analizzare l'impatto del tecnostress sia a livello individuale che collettivo (team multidisciplinari, Unità Operative). Inoltre, la pandemia e il rapido passaggio al lavoro remoto hanno determinato l'assenza di una linea di divisione chiara tra lavoro e vita personale, generando così un nuovo tipo di stress.
Fatte queste premesse, l'obiettivo che il presente studio si propone è quello di esplorare l'impatto delle innovazioni digitali nel settore sanitario, spinto al limite dell'operatività dalla pandemia che, tra l'altro, ha portato le organizzazioni sanitarie a dipendere fortemente dalla tecnologia necessaria alla gestione dei servizi facilitando al contempo la comunicazione tra tutti gli attori del sistema con l'utilizzo della telemedicina. Lo studio vuole pertanto esplorare l'impatto di una delle prime conseguenze emerse dall'implementazione della tecnologia concentrandosi in questa prima fase sui pazienti.

Metodologia

Contesto
Il presente lavoro esplora l'impatto dell'innovazione digitale sui professionisti sanitari in Italia e sulle associazioni dei pazienti dedite all'advocacy. Il campione raccolto per questo questionario comprende un primo gruppo variegato di professionisti attivamente coinvolti nel settore sanitario (medici, infermieri e comparto, amministrativi - campione 1) e un secondo gruppo costituito dalle associazioni dei pazienti di diverse patologie (campione 2), il tutto al fine di poter osservare, in via esplorativa, due degli attori principali nel processo di digitalizzazione. È stato utilizzato un questionario per raccogliere i dati forniti dai due campioni diversificati. Entrambi i campioni erano composti da soggetti che si stavano specializzando in percorsi di formazione post-laurea di un'università italiana specializzata nella gestione sanitaria.
Al campione 1 il questionario è stato somministrato tra aprile e giugno 2023 ed al contempo i partecipanti sono stati invitati a inviarlo alla loro rete. Successivamente, per colmare alcune lacune informative, sono state avviate delle recall: recall 1 (giugno - agosto) e recall 2 (agosto - settembre) per garantire dati completi e accurati, essenziali per una ricerca di qualità.

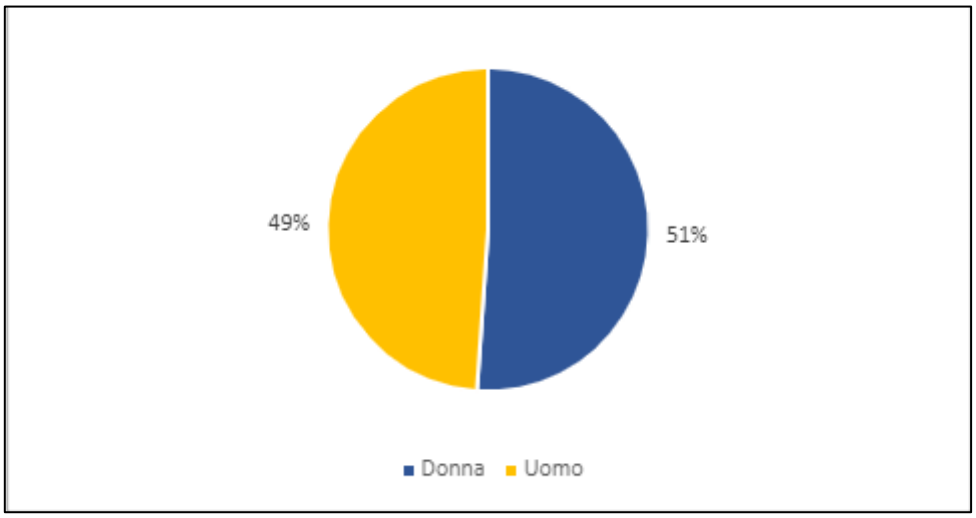
Al campione 2 il questionario è stato somministrato invece tra settembre e ottobre sempre con invito alla trasmissione alle proprie reti
Entrambi i questionari prevedevano una chiara dichiarazione sulla privacy nella sezione generale, in conformità con il Regolamento Europeo sulla Protezione dei Dati 2016/679. Di seguito la sintetica descrizione.

Struttura del questionario
È stato organizzato allo scopo di indagare l'effettivo impatto della digitalizzazione dei professionisti sanitari (campione 1) e dei pazienti (campione 2) nel sistema sanitario con, inoltre, con un focus specifico rivolto al fenomeno del tecnostress. Il questionario è suddiviso in sezioni ciascuna delle quali legata alle specifiche prospettive dei due campione oggetto dell'analisi.
Per le indagini rivolte ai professionisti sanitari, è stato utilizzato un questionario composto da nove sezioni: i) informazioni generali (genere, età, posizione lavorativa, organizzazione); ii) uso delle tecnologie digitali (percentuale di servizi erogati tramite telemedicina); iii) percezione dell'uso della tecnologia, quali creatori di tecnostress, facilitatori, performance (Ragu-Nathan, 2008); iv) performance auto-riferita (efficienza lavorativa, qualità della performance, rispetto delle scadenze, adesione al budget, risoluzione dei conflitti); v) livello di competenze (auto-valutazione competenze comportamentali e tecnico-professionali); vi) impegno (percezione dell'impegno nell'unità operativa e organizzazione, Lomi et al., 2014); vii) stress (Elo et al., 2003); viii) competenze digitali (auto-valutazione del livello di competenze digitali); ix) propensione all'innovazione e al cambiamento.
Il questionario sottomesso al primo campione dei professionisti sanitari è stato poi adattato e quindi sottomesso al secondo campione oggetto dell'analisi, le associazioni dei pazienti; è composto dalle seguenti sezioni: i) informazioni generali (genere, età, associazione di appartenenza, consenso all'uso dei dati aggregati); ii) attività svolte con l'utilizzo delle tecnologie digitali (conformemente al DM 77/2022); iii) percezione dell'uso della tecnologia, quali creatori di tecnostress, facilitatori, performance (Ragu-Nathan, 2008); iv) livello di competenze (auto-valutazione delle competenze comportamentali e tecnico-professionali); v) impegno (percezione dell'impegno, Lomi et al., 2014); vi) stress (Elo et al., 2003); vii) propensione all'innovazione e al cambiamento.
Infine, sebbene il questionario fosse strutturato in 9 sezioni per il primo campione e 7 per il secondo, la presente analisi si concentra su un sottoinsieme di tali sezioni sulla base alla rilevanza rispetto agli obiettivi di ricerca.

Risultati

Campione 1: professionisti sanitari
Alla conclusione del processo di raccolta, il totale delle risposte è stato di 94 individui, con una distribuzione di genere quasi equa: 49% maschi (46) e 51% femmine (48).

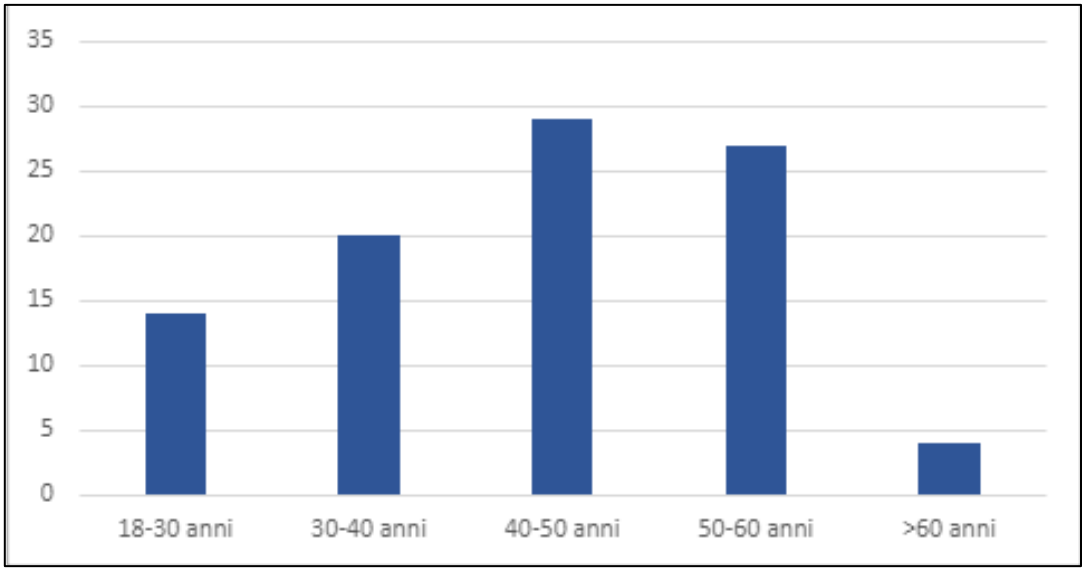
Figura 1: Genere del campione



Fonte: Elaborazione personale

Il grafico 2 mostra l'età dei professionisti sanitari coinvolti. Il campione comprendeva le seguenti fasce demografiche: 14 persone tra 18 e 30 anni; 20 persone tra 30 e 40 anni; 29 persone tra 40 e 50 anni; 27 persone tra 50 e 60 anni; 4 persone over 60.

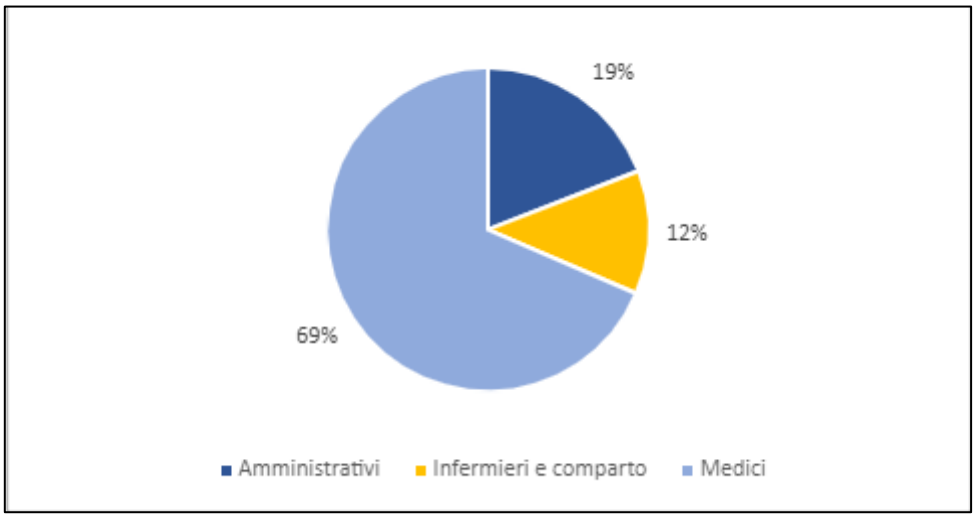
Figura 2: Età del campione



Fonte: Elaborazione personale

In termini di ruoli, il campione è risultato variegato, con il 19% in posizioni amministrative (17), il 12% composto da infermieri e comparto (11), e la maggior parte, pari al 69%, costituita da medici (61) (Figura 3).

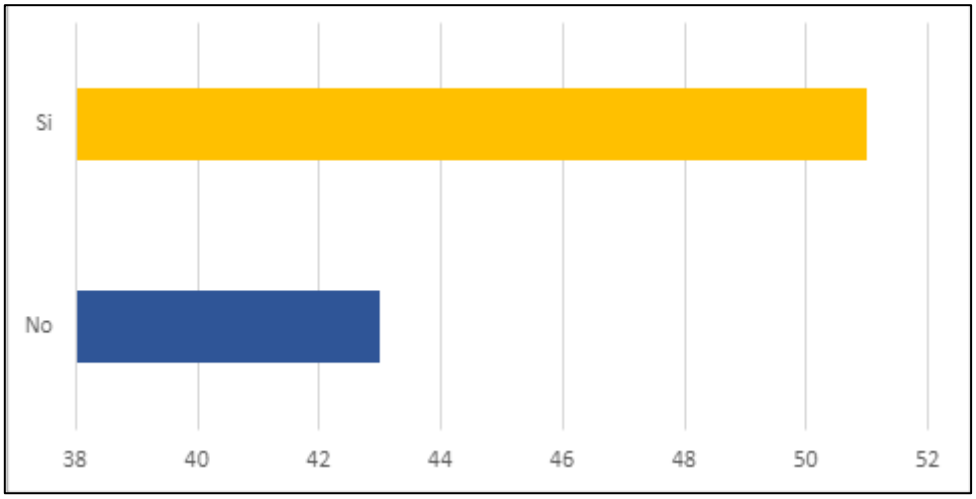
Figura 3: Ruolo del campione



Fonte: Elaborazione personale

Dall'esame delle tecnologie utilizzate all'interno del campione si è osservato che 51 individui utilizzano effettivamente le tecnologie, mentre 43 non le utilizzano.

Figura 4: Utilizzatori dei dispositivi digitali



Fonte: Elaborazione personale

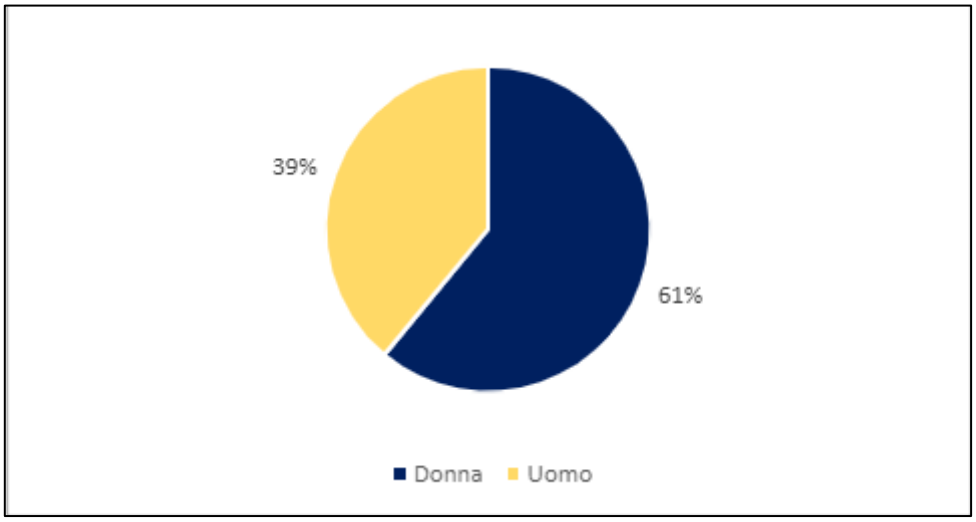
I grafici permettono una chiara completa panoramica delle caratteristiche del campione e della relazione tra le variabili, facilitando così l'interpretazione e l'analisi dei dati.

Campione 2: associazioni dei pazienti

I risultati offrono una panoramica dettagliata del sondaggio tra le associazioni di pazienti. Il campione totale comprende 118 persone.

Il Grafico 5 mostra come il campione sia leggermente sbilanciato verso il genere femminile, con il 61 % donne (72) rispetto al 39% degli uomini (46).

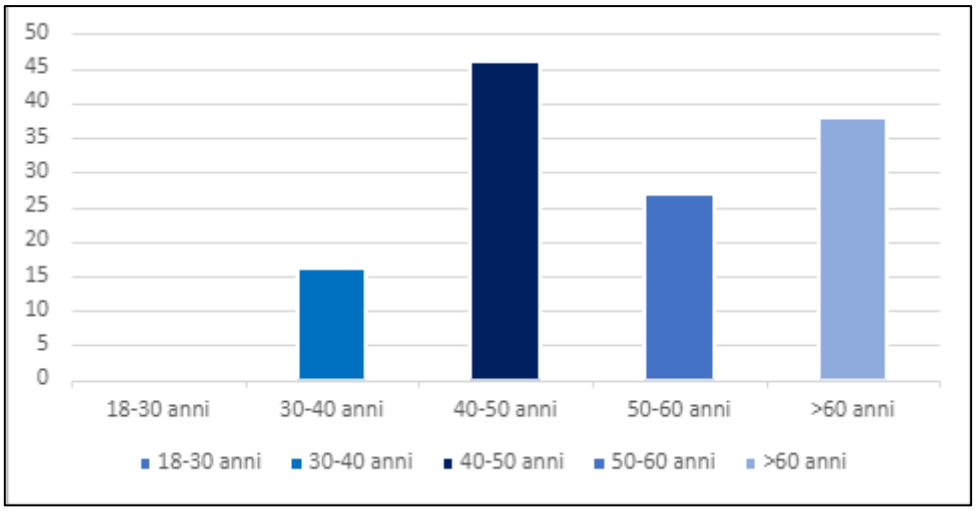
Figura 5: Genere del campione



Fonte: Elaborazione personale

La Figura 6 illustra la distribuzione per età, rivelando una varietà di gruppi di età. Il gruppo di età tra 40 e 50 anni è il più rappresentato, con 46 partecipanti. Tuttavia, anche i gruppi di età tra 30-40 anni, 50-60 anni e oltre 60 anni sono ben rappresentati, con rispettivamente 16, 27 e 38 partecipanti. Non ci sono rispondenti nel gruppo di età 18-30 anni.

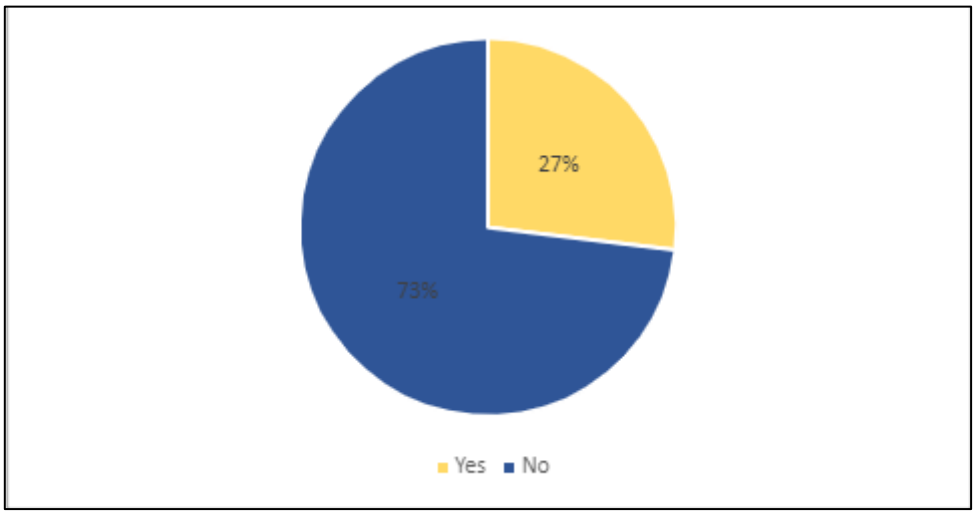
Grafico 6: Età del campione



Fonte: Elaborazione personale

La figura 7 rappresenta i membri delle associazioni che utilizzano tecnologie digitali per attività come la telemedicina e la televisita. Il 27% utilizza tecnologie digitali, mentre il 73% non le utilizza, mostrando una differenza significativa nell'adozione della tecnologia tra i membri del campione.

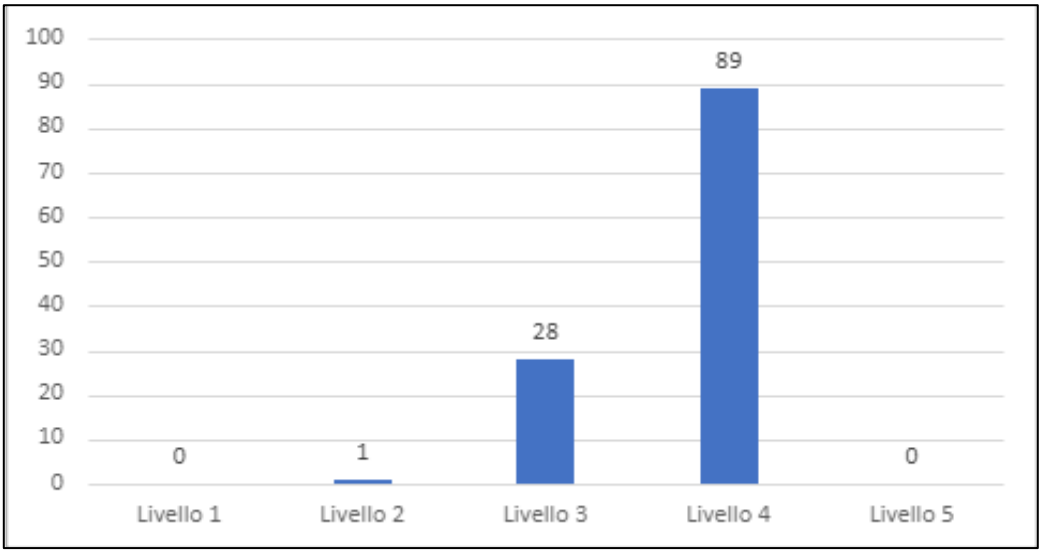
Figura 7: Utilizzatori di tecnologie digitali



Fonte: Elaborazione personale

La figura 8 mostra i livelli di tecnostress in un campione di membri di associazioni di pazienti. I dati indicano una prevalenza significativa di tecnostress al livello 4, con 89 osservazioni. Solo una persona ha riportato un tecnostress relativamente basso al livello 2, mentre 28 individui si trovano al livello 3, suggerendo un moderato tecnostress. Non ci sono osservazioni per i livelli 1 e 5, indicando che nel campione nessuno ha esperito tecnostress estremamente basso o alto.

Figura 8: Livello tecnostress



Fonte: Elaborazione personale

Discussione

Una prima analisi dei dati emersi dello studio fornisce una visione dell'impatto della digitalizzazione nel settore sanitario.
Il fenomeno del tecnostress emerge come una questione cruciale sia per i professionisti sanitari che per i membri delle associazioni di pazienti. Nello studio, è stata condotta una prima analisi del livello di tecnostress nel campione 2, con un numero massimo di osservazioni nel livello 4 (89 individui); tale circostanza potrebbe dipendere dall'età o dal genere, ma occorrerà approfondire ulteriormente tale fenomeno in relazione anche alle altre variabili rilevate, ma non ancora studiate. Inoltre, sarà necessario estendere l'analisi ai professionisti sanitari (campione 1) per comprendere il livello di tecnostress e, successivamente, valutarne i risultati e gli antecedenti. Questo approfondimento sarà in linea con studi precedenti che hanno evidenziato come l'adozione delle tecnologie digitali possa provocare stress tra i professionisti sanitari (Brod, 1984; Weil e Rosen, 1997). Il COVID-19 ha ulteriormente evidenziato questa problematica, rendendo imperativo sviluppare strategie, qualora risultasse elevato il livello di tecnostress dei professionisti sanitari, per gestire il tecnostress e conseguentemente migliorarne il benessere (Galpin et al., 2021; Tu et al., 2005).

Implicazioni, limiti e future ricerche

Le implicazioni manageriali derivanti dai risultati indicano come sia cruciale sviluppare programmi di formazione personalizzati per i professionisti sanitari, con un focus specifico su competenze digitali e la gestione del tecnostress, come del resto evidenziato nel Piano Nazionale di Ripresa e Resilienza (PNRR). La predominanza di medici e la loro maggiore propensione all'uso della tecnologia rispetto ad altri attori del sistema sanitario richiede anche un approccio mirato che affronti le diverse esigenze formative dei vari gruppi professionali (Amankwah-Amoah et al., 2021); la formazione dovrebbe, pertanto, includere strategie per ridurre il tecnostress e migliorare l'accettazione delle tecnologie digitali, come raccomandato da studi precedenti (Galpin et al., 2021; Tu et al., 2005).
Le associazioni di pazienti, con la loro prevedibile resistenza all'uso delle tecnologie digitali richiede, inoltre, che le politiche manageriali facilitino l'accesso alle tecnologie e promuovano la relativa formazione soprattutto con riferimento a prestazioni sanitarie innovative, come, ad esempio l'utilizzo della telemedicina e delle televisite. La maggiore partecipazione di adulti maturi rispetto ai giovani indica che le strategie di coinvolgimento dovranno essere opportunamente adattate per attrarre e supportare anche i gruppi più giovani. Sarà necessario, inoltre, valutare e implementare interventi che migliorino la comunicazione e il supporto ai pazienti attraverso l'uso delle tecnologie, considerando le differenze di accesso e competenza tecnologica tra i membri delle associazioni. Al contempo, un'attenzione particolare dovrà essere rivolta alla rilevazione di tutti quei fenomeni che possono influire sui tempi di attesa per l'accesso alle prestazioni e ciò anche in riferimento alle necessità di lunghi spostamenti, trattandosi di un'esigenza molto sentita soprattutto da parte dei pazienti.
In estrema sintesi, le implicazioni teoriche del presente studio tendono ad una maggiore comprensione delle conseguenze dell'adozione tecnologica e del tecnostress, mentre le parallele implicazioni manageriali evidenziano la necessità di interventi formativi e di supporto mirati per migliorare l'efficacia della digitalizzazione.
Sicuramente, da questo primo studio emergono necessità di ulteriori approfondimenti. In primo luogo, l'analisi dei dati si è basata prevalentemente su tecniche descrittive, in linea con l'approccio esplorativo, ma che limita la possibilità di studiare relazioni statistiche - come modelli di regressione o tecniche inferenziali, per approfondire le relazioni tra l'adozione tecnologica e il tecnostress percepito - da implementare in future indagini. Inoltre, il campione, sebbene composto da due gruppi distinti, presenta dimensioni contenute rispetto alla complessità del contesto sanitario italiano. Infatti, ulteriori studi saranno condotti per implementare il campione analizzato, e ciò al fine di renderlo maggiormente significativo attraverso l'individuazione di una popolazione di riferimento sempre più

ampia. Ancora, l'approfondimento ulteriore di analisi dei modelli organizzativi delle diverse strutture e dei differenti ruoli nei quali operano i professionisti sanitari consentirà di approfondire e verificare quanto emerso dalle prime fasi dello studio.
Analoga procedura di approfondimento sarà condotta nei confronti delle associazioni dei pazienti con l'ampliamento del campione, rivolgendola anche alla rilevazione dei differenti bisogni in rapporto alle diverse patologie.
In ultimo, sulla base dei risultati dello studio che potranno essere via via sempre più affinati sarà possibile analizzare ulteriori fenomeni emergenti, oltre al tecnostresss, associati al più ampio impatto di una digitalizzazione sempre più necessaria.

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The role of collaborative spaces in enabling innovation ecosystems: a qualitative study in Italy

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Abstract

Recently, we have witnessed a proliferation of work settings reflecting a culture of openness and collaboration. This article provides evidence from Italy of how these work settings – i.e., collaborative spaces – provide support to and act as intermediaries among local actors from different fields, thus facilitating the emergence of innovation ecosystems.

Toward an ecosystemic perspective on innovation

In recent years, the locus of innovation has shifted from individual entrepreneurs and organizations to broader networks of actors. The resources and knowledge required to foster innovation are often dispersed across multiple actors (see Baldwin et al., 2024), with innovation emerging as a multi-stakeholder, multi-modal, and multi-scalar endeavor. Within this scenario, scholars have taken an ecosystemic perspective on innovation. This perspective posits that innovation is embedded in an ecosystem of autonomous actors contributing to it in complementary ways by collaborating, co-creating value, and sharing their individual resources and knowledge endowments (Baldwin et al., 2024; Mars et al., 2012). As a result, many organizations have moved from a more traditional "silo mentality" of enclosure and protection of knowledge to increased distribution, or even democratization, of innovation processes, outputs, and impacts (Baldwin & von Hippel, 2011; Chesbrough et al., 2006). This shift has resulted in many organizations relying on open models of innovation to accelerate their internal innovation processes and market the resulting outputs more successfully (see Chesbrough et al., 2006), for instance, by establishing inter-organizational partnerships or by activating (and combining) inbound and outbound knowledge flows to boost their research and development capabilities and sense, recognize, and exploit new opportunities for innovation (Cassiman & Valentini, 2016).

Inbound and outbound knowledge flows are crucial for organizations to sustain innovative endeavors in the longer term. Indeed, whereas inbound flows (flowing "from the outside-in") contribute to increasing an organization's knowledge base through the integration of suppliers, customers, or activities from external sources, outbound flows (flowing "from the inside-out") allow organizations to earn greater returns (e.g., profits) by favoring the circulation of internally developed ideas, intellectual property, or technology in the ecosystem. The activation and combination of these flows show how, in today's fast-changing competitive environment, it is pivotal for organizations to gather, integrate, and exploit inputs residing both inside and outside of their organizational boundaries to deliver greater value to customers, achieve greater economic viability, and increase their innovation capabilities (Cassiman & Valentini, 2016; Chesbrough et al., 2006). By mobilizing internal and external resources, organizations can also pursue a more user-centric and community-oriented approach to innovation and generate greater social impact (Baldwin & von Hippel, 2011). As a result, greater openness contributes to "*innovation that is explicitly for the social and public good […], innovation inspired by the desire to meet [the] social needs*" (Murray et al., 2010, p. 10) of the local community whenever more traditional market provision and welfare systems fail to meet those needs. Indeed, local actors – e.g., private and public, non-profit and profit-oriented – can collaborate and co-create solutions to favor social inclusion, societal well-being, and more equitable socioeconomic

development by simultaneously showing greater openness and incorporating the local community's needs.

Helix models of innovation and intermediary actors

The idea of innovation that meets social needs emerging from the interplay of multiple actors from different fields is at the forefront of the triple-, quadruple-, and quintuple-helix models of innovation (see Carayannis & Campbell, 2011). These models rest on the idea that the intertwining of multiple "spheres" of actors (or "helices") sets the conditions for the emergence of a broader ecosystem that accelerates and sustains innovation at the local level (Carayannis & Campbell, 2011; Hasche et al., 2020). Whereas the triple-helix model was originally modeled around the contribution of university, industrial, and governmental actors, the quadruple- and quintuple-helix models consider civil society as a crucial "helix" in defining innovation processes and outputs that are more equitable and socially and economically sustainable (Carayannis & Campbell, 2011; Hasche et al., 2020). The helix models show how, besides being increasingly open, innovation is often highly place-based and localized and thrives from the greater – social, cultural, organizational, and institutional – proximity and the co-location of actors operating in one single territory (Boschma, 2005; Von Krogh & Geilinger, 2014). Indeed, proximity and co-location facilitate communication, coordination, and the diffusion of tacit knowledge among actors from different fields while enhancing trust, mitigating tensions, and enabling cross-fertilization (see Boschma, 2005).

Through innovation ecosystems, organizations collaborate and open their boundaries to gather and integrate external resources and knowledge and increase their innovation capabilities. However, ecosystems also encompass challenges, as they often involve divergent interests that may spark tensions and require specific governing mechanisms (see Reischauer et al., 2021). These challenges can be addressed by intermediary actors that anchor and shape interactions and enable resources and knowledge to flow more smoothly across an ecosystem's multiple "helices" (Mars et al., 2012; Reischauer et al., 2021). These actors typically comprise intermediaries such as university knowledge transfer offices, professional services providers, or finance providers (e.g., venture capitalists, angel investors, public funding) – see Clayton et al., 2018. More recently, collaborative spaces have become important intermediaries in local innovation ecosystems (Aumüller-Wagner & Baka, 2023; Capdevila, 2015).

Collaborative spaces and innovation ecosystems

Collaborative space is an umbrella term that encompasses many work settings, such as coworking spaces, incubators, makerspaces, creative hubs, and science parks (see Montanari et al., 2020). These work settings can be differentiated in terms of primary target audience, size, governance, and business models. Despite these differences, they are all designed and managed based on the assumption that face-to-face interaction positively affects the likelihood of actors from different fields – e.g., from different "helices" – to exchange ideas, learn from each other, and develop a sense of community (Capdevila, 2015; Montanari et al., 2020). Coherently, Capdevila (2015) defines collaborative spaces as "microclusters" that favor innovation by concentrating and co-locating locally based entrepreneurs, start-ups, companies, and investors in the same work setting and orchestrating their interactions and innovative endeavors (Aumüller-Wagner & Baka, 2023; Cabral & van Winden, 2024). In doing so, collaborative spaces facilitate cross-fertilization through "knowledge pipelines" that involve formal and informal, more and less established local actors in value co-creation (see Capdevila, 2015). By involving less established actors (e.g., newly founded start-ups or younger entrepreneurs), collaborative spaces also endow them with social capital that they would otherwise find difficult to develop autonomously (Cabral & van Winden, 2024). Moreover, the community-infused ethos of collaborative spaces contributes to a "buzz" where local actors feel free to venture out of their

boundaries, are more entrepreneurially alert, and are keener to experiment and test new ideas (Aumüller-Wagner & Baka, 2023; Montanari et al., 2020).
However, Parrino (2015) notes that proximity and co-location alone are not sufficient for knowledge sharing, mutual learning, cross-fertilization, and, ultimately, innovation to occur. Innovation often requires an active role of collaborative spaces' founders, community hosts, and staff members, for instance, through the design of training activities, events, and networking tools and opportunities for local actors to improve their capabilities and embed themselves in their ecosystems (Cabral & van Winden, 2024; Parrino, 2015).
As these recent accounts suggest, collaborative spaces favor knowledge flows, interactions, and collaboration and contribute to innovation locally in various ways. We take stock of these accounts to investigate how collaborative spaces provide support to and act as intermediaries among local actors while facilitating the emergence of innovation ecosystems. To address this issue, we conducted a qualitative study on eight Italian collaborative spaces from March to June 2023. Some preliminary findings are illustrated in the next section.

Our qualitative study

We interviewed the founders and community hosts of eight collaborative spaces located all across Italy: three spaces were located in northern Italy (i.e., in the Emilia-Romagna, Lombardy, and Veneto regions), two in central Italy (i.e., in the Lazio and Tuscany regions), and three in southern Italy (i.e., in the Apulia and Calabria regions). The selected spaces differed in terms of the size of their urban areas: four spaces were located in larger cities (i.e., Milan, Rome, Bologna, and Florence), whereas three were located in mid-sized cities (i.e., Venice, Brindisi, and Lecce) and one in a smaller town in the Calabria region. Our qualitative study included four incubators, three coworking spaces, and one creative hub. Despite representing different types of work settings, all selected spaces focused on entrepreneurship and individual- and business-level innovation by offering acceleration, incubation, and mentorship programs alongside other forms of support for local entrepreneurs, start-ups, and companies. Most spaces combined this entrepreneurial orientation with a focus on solving unmet social needs of the local community by partnering with local authorities and third-sector organizations. They were all privately owned; however, most relied on public tenders to partly support their activities. The selected spaces were at different development stages, ranging from well-established spaces to spaces at an early development and growth stage that were still consolidating their role within their respective ecosystems.

Collaborative spaces as hosts in the ecosystem

Our study shows how collaborative spaces host local actors by providing access to shared resources such as coworking areas, digital fabrication tools, or meeting rooms and areas to otherwise locally dispersed entrepreneurs, start-ups, or companies. By sharing resources, local actors – primarily less established ones – can observe what others do, build social capital, and participate in collective practices that foster cohesion, trust, and an overall sense of community through formal meetings and informal mingling. The provision of coworking areas, tools, and other physical resources is seen as crucial by collaborative spaces' founders, as it enables their members to feel anchored to a localized community of practice. In turn, such anchoring makes members feel more capable of collaborating in value co-creation and innovation, as they perceive themselves as truly being "in the loop" of where ideas and knowledge flow in the ecosystem.
Most of the spaces in our study also act as a "showcase" for activities (e.g., neighborhood events, arts festivals, public talks, seminars, workshops, courses) offered by locally based creative professionals, artists, or organizations who do not own facilities where they can perform such activities and need to rent them more or less temporarily. By acting as a "showcase" for local actors, collaborative spaces can increase their visibility while enabling actors who have yet to establish themselves to access and

intercept a broader audience. In doing so, collaborative spaces can also strive to generate greater social impact and become a focal "third place" (see Montanari et al., 2020) for the local community to come together and jointly address specific challenges. As our study suggests, this is especially true for those coworking spaces and creative hubs combining entrepreneurial and financial support for creative professionals and artists with activities and services targeting the cultural awareness and well-being of neighborhood residents (including more vulnerable ones), thus potentially facilitating innovation that is at the same time collaborative and community-oriented and meets social needs.

Collaborative spaces as producers in the ecosystem

Our study shows how, by renting facilities and providing a "showcase" for local actors (and their activities), collaborative spaces can also design vital – and, most often, more reliable – revenue streams that help them balance their attempts to yield greater social impact with issues of economic viability. For instance, collaborative spaces usually use these streams to feed the in-house production of new activities and services that are then circulated locally and cover their costs over time. Thus, besides hosting externally produced activities and services, collaborative spaces complement and expand the existing local pool of activities and services by engaging in in-house production that directly boosts innovation.

The activities and services that collaborative spaces produce vary a lot depending on each space's size, governance, and mission. Most of the spaces in our study do not only engage in more traditional acceleration and incubation but also specialize in delivering education and training for entrepreneurs and start-ups (e.g., through seminars, workshops, or courses focusing on managerial, communication, team-building, and digital skills). Some spaces, mostly incubators and coworking spaces, have also recently started consulting and working alongside larger companies that are willing to engage in co-creation and open innovation. In doing so, collaborative spaces contribute to local talent, scout and nurture entrepreneurial ideas, and connect less and more established local actors.

Most collaborative spaces produce activities and services in collaboration with local municipalities, regional authorities, schools, and universities. In doing so, they emerge as important tools for designing and implementing smart specialization strategies and place-based policies that successfully involve local actors and cater to their needs. For instance, an Apulia-based space included in our study effectively acts as an intermediary in its ecosystem by helping municipal and regional authorities organize focus groups and hackathons aiming to involve residents and grassroots organizations in social innovation projects and harmonize the different voices of actors belonging to all five of Apulia's "helices" (i.e., university, industrial, governmental, civil society, and environmental actors).

Collaborative spaces can also facilitate the emergence of innovation ecosystems in rural and peripheral areas and economically deprived regions, where resources for entrepreneurs and start-ups – such as venture capital, public funding, tailored policies, shared workspaces, or training and education – are inherently scarce. In these areas, collaborative spaces incorporate activities and functions similar to those of other intermediary actors whose support typically lags or is non-existent. In doing so, they act as "leaders" – or even "firstcomers" – in supporting entrepreneurship and innovation and facilitating the emergence of innovation ecosystems. As one space operating in a peripheral area in the Calabria region shows, it is possible for collaborative spaces to address the lack of locally based private and public funding by devising fundraising initiatives for entrepreneurs and start-ups or directly investing in new entrepreneurial ideas and ventures. In doing so, they can activate (and liberate) local resources and innovation capabilities and help higher-scale innovation policies (e.g., EU- or national-level policies) match the actual needs of actors who pertain to left-behind territories of different scales and sorts. Conversely, instead of acting as "leaders" in providing support, collaborative spaces located in larger, wealthier, and more entrepreneurially vibrant cities such as Milan, Bologna, or Florence often act as "complementors" that work alongside and coordinate with other intermediary actors in providing support to and enabling collaboration among local actors.

Collaborative spaces as brokers in the ecosystem

Our study shows how collaborative spaces broker interactions among local actors and embed themselves locally by combining the hosting of local actors and the production and circulation of activities and services. To successfully broker interactions, collaborative spaces must reach some critical mass and become more easily identifiable by other actors in the ecosystem. For instance, the spaces in our study that are seemingly more established locally have achieved this by diversifying their target audience and overall offering. In doing so, they have combined profit-oriented activities (e.g., consulting or training for larger companies' employees) with activities delivered not for profit (e.g., public talks, cultural events) but to increase local awareness and participation in their overall offering and appeal to a broader audience.

Providing socially and culturally oriented activities allows collaborative spaces to take a "semi-public" role in brokering interactions between public actors (e.g., local authorities, schools, universities, cultural institutions) and the local community. For instance, a coworking space in our study has managed to connect and integrate the activities of youth associations, social cooperatives, and other third-sector organizations with public providers of services relating to education and welfare, in turn helping co-create solutions to local needs, yielding greater social impact, and fostering social innovation. Moreover, by hosting in-person events, most collaborative spaces offer their members an informal setting for interaction, helping them exit formalized social norms and perceived communication barriers that would otherwise prevent them from interacting and sharing ideas with people from other organizations, fields, or career paths.

Although collaborative spaces' spatial features and physical resources play a vital role in fostering innovation through proximity, co-location, and a sense of community, most of the spaces in our study seek to blend on-site and online forms of brokering. Indeed, most spaces offer networking tools and apps or other online platforms for entrepreneurs, start-ups, and mentors to coordinate with each other and keep interacting after in-person events, workshops, and courses. These online platforms also allow collaborative spaces to expand their outreach beyond their local ecosystems – e.g., by engaging start-ups, investors, or mentors from different Italian cities and regions or outside Italy. Moreover, a coworking space in our study has designed and curated a dedicated website to map all local innovation actors (e.g., coworking spaces, incubators, creative hubs, mentors, investors, public funding providers, and university spin-offs), gather potential best practices (e.g., in terms of innovation-related public-private partnerships, funding, or training), increase the local visibility of specific projects or funding opportunities, and match the needs and resources of each actor in the ecosystem.

Discussion and practical implications

Our qualitative study shows how collaborative spaces deliver support to and act as crucial intermediaries among local actors in three different ways: i) by hosting local actors within their premises and showcasing their activities and services; ii) by producing activities and services in-house and circulating them locally; iii) by brokering interactions among private and public, formal and informal actors belonging to multiple local "helices". In doing so, collaborative spaces favor proximity and co-location and enable open and collaborative forms of innovation in a specific territory.

Our findings hold relevant implications for founders, community hosts, and local proponents of collaborative spaces by suggesting the different roles these spaces can play and leverage to contribute to knowledge exchange and innovation in local ecosystems. First, our findings show how collaborative spaces play a "transformative" role for local actors by hosting and showcasing their activities. In doing so, collaborative spaces attract, incorporate, and expand knowledge and resources that, for the most part, already exist in the ecosystem. As a result, they activate inbound knowledge flows that go from the "outside-in" by flowing from the ecosystem to the collaborative spaces' premises. Second, by producing activities in-house, collaborative spaces play a "generative" role at

the local level, as they create (or co-create, whenever they partner with other private or public actors) new knowledge and resources that are then circulated within the ecosystem. As a result, they activate outbound knowledge flows that go from the "inside-out" by flowing from collaborative spaces' premises to the ecosystem. Finally, by brokering interactions, collaborative spaces combine inbound and outbound knowledge flows, thus facilitating the emergence and consolidation of ecosystemic relationships and arrangements locally.

Our findings hold relevant implications for companies, too. They underline how companies can engage with local intermediaries, such as collaborative spaces, to improve their knowledge base and innovation capabilities. In doing so, companies can also increase the visibility and economic viability of their innovation outputs while striving to generate a positive impact locally by better matching their needs with those of the local community. One way for companies to achieve this goal is to allow remote workers to access collaborative spaces as their primary work locations. Coherently, an interesting avenue for future research would be to explore how the current "return-to-office" trend and its effects on companies' remote-working policies shape the enabling role of collaborative spaces within their ecosystems.

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