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A Knowledge-Driven Framework for Integrating e-Communities of Practice into Intelligent Organizational Decision Systems

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Abstract

Aim/Purpose	The present paper focuses on the necessity of systematically incorporating knowledge produced within e-Communities of Practice (eCoPs) into formal organizational decision-making mechanisms, especially in environments of complexity, uncertainty, and accelerated digital evolution.
Background	Even though eCoPs have been acknowledged as formidable tools for collaborative learning and knowledge sharing, their systematic integration into executive-level Decision Support Systems (DSS) has yet to be achieved. A coherent theoretical integration has not yet been developed.
Methodology	The study takes a conceptual and design-based research approach in which the authors synthesize the modern literature on digital collaboration, knowledge management, leadership, and intelligent decision-support systems. Based on this, a knowledge-based, leadership-focused decision model is created.
Contribution	The paper also proposes a reference architecture that serves as a layer of knowledge formation between eCoPs collaboration platforms and Intelligent Decision Support Systems (IDSS), facilitating two-way integration of tacit community insights and formal analytical models. In contrast to conventional data-based DSS models, the proposed model integrates socially constructed, practice-based knowledge into the decision-making process.

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Findings	The discussion shows that the systematic integration of knowledge generated by eCoPs makes decision-making more rational, helps address semi-structured and unstructured issues more effectively, and improves organizational learning and adaptive capacity.
Recommendations for Practitioners	The eCoPs should be strategically institutionalized within organizations, supported by collaboration-enabling infrastructures coupled with decision systems, and embedded in leadership practices that encourage trust, openness, and the co-creation of knowledge. The model is especially relevant in SMEs and organizations undergoing digital transformation, where tacit knowledge is essential in strategic responsiveness.
Recommendations for Researchers	In future research, the framework should be empirically tested in organizational settings, the governance and trust mechanisms of eCoPs-based decision systems should be studied, and the ways AI could be used to improve collaborative knowledge extraction and structuring should be identified.
Impact on Society	The framework helps to make organizational decision-making more transparent, inclusive, and knowledge-based by formally integrating collective expertise into organizational decision systems.
Future Research	Future research must use longitudinal and mixed-method designs to identify the quantifiable effects of eCoPs-created knowledge on decision quality and organizational performance, and to conduct cross-sector and cross-cultural comparisons.
Keywords	eCoPs; knowledge-driven systems, intelligent decision support systems, tacit and explicit knowledge, organizational decision making, collaborative intelligence

INTRODUCTION

In an environment marked by rapid digital transformation and intensifying global competition, organizations increasingly view knowledge as a key resource for innovation, resilience, and long-term performance (Kraus et al., 2021; Vial, 2019). The ability to create, share, and mobilize knowledge has therefore become an essential part of gaining organizational advantage. Within this landscape, eCoPs have re-emerged as an important organizational mechanism for enabling social learning, collaborative problem-solving, and the sharing of a common expertise (Wenger-Trayner & Wenger-Trayner, 2020). Their role is also not static or traditional, but rather a dynamic structure in which experience-based knowledge and professional identities develop.

At the same time, improvements in artificial intelligence, cloud-based collaboration platforms, and data-driven decision technologies have transformed how organizations orchestrate their work and process information (Berente et al., 2022; Leonardi, 2021). This accelerated pace of technological change has added to a long-standing strategic dilemma: while organizational knowledge is becoming ever more complex and specialized, its relevance is declining ever more rapidly. Organizations must thus build adaptive learning capability and embrace the right tools to facilitate rapid sense-making and intelligent decision-making (Nonaka & Toyama, 2003). Consequently, there has been a strong need for digitally supported e-Communities of Practice (eCoPs) that enable the upscaling of knowledge exchange across organizational boundaries.

Nonetheless, organizations lack a systematic process for transferring collaboratively generated, practice-based knowledge into structured inputs for intelligent decision systems. The current DSS remain highly data-oriented and fail to consider tacit and context-based knowledge generated in eCoPs adequately. This gap leads to a basic research question: how can socially constructed knowledge generated through eCoPs be formally integrated into intelligent organizational decision architectures?

These challenges are particularly notable in small and medium enterprises (SMEs), where limited financial and technological resources can be seen as constraints on investments in advanced knowledge management infrastructure (OECD, 2023). In many such organizations, knowledge is still dispersed through informal communication channels or stored in unstructured repositories that lack semantic organization, intelligent retrieval, and analysis capabilities (Scuotto et al., 2021). The lack of sound collaboration and DSS makes it hard for employees to access valuable shared expertise or respond appropriately to increasing business complexity.

From a knowledge management perspective, in contemporary times, organizations can be thought of as networks of eCoPs, each contributing its own pixel-like domain of expertise as a collaborative community (Scarso & Bolisani, 2012; Wenger-Trayner & Wenger-Trayner, 2020). Through continued interaction, these communities evolve their shared practice, problem-solving strategies, and new information. ECoPs, therefore, play several roles, including circulating and interpreting knowledge, preserving tacit know-how that cannot be fully captured by formal systems, building professional competence, and anchoring members' identities in the wider organizational context (Kane et al., 2015). Importantly, innovation tends to occur at the intersections of different communities, as different perspectives converge and recombine knowledge in new ways.

Despite the proliferation of Collaboration Support Systems (CSS) and IDSS, organizations still face difficulties in systematically linking the rich, practice-based knowledge generated within eCoPs to formal decision-making infrastructures (Power et al., 2010; Watson & Wixom, 2007). While explicit knowledge is commonly embedded in analytical and rule-based decision processes, tacit and experiential knowledge, which are often of greatest value for providing strategic insight, are underutilized by conventional decision systems (Alavi & Leidner, 2021). This disconnect limits the potential of intelligent decision technologies to support informed, transparent, and adaptive organizational action.

To address this gap, the current study will design a knowledge-driven, leadership-focused decision architecture by systematically integrating eCoPs with CSS and IDSS. It aims to go beyond the descriptive theory of knowledge management (Berente et al., 2022; Malone, 2018; Power et al., 2010) and develop an operational model that formalizes the sources of tacit and explicit knowledge for decision-making evaluation systems. The suggested framework, in particular, presents three essential elements: (1) distributed knowledge generation via eCoPs, (2) a mediating layer of Forming Knowledge that transforms collaborative input into structures of decision relevance, and (3) a two-way integration process with the DSS core under the organizational strategic leadership.

The paper first identifies the structural constraints of data-driven decision systems, then defines the socio-technical needs for knowledge integration, and finally outlines an operational framework to support the incorporation of eCoPs-generated knowledge into decision-making. Finally, it concludes by discussing the implications of this for the organization.

LITERATURE REVIEW

The research strategy employed in this literature review was based on a structured search of the Scopus and Web of Science databases for the 2015-2024 period, supplemented by seminal foundational materials. Search terms included eCoPs, digital collaboration, knowledge co-creation, CSS, DSS, IDSS, and leadership in digital environments. The inclusion criteria were based on peer-reviewed journal articles that dealt with (a) knowledge integration in digital collaboration settings, (b) socio-technical aspects of knowledge management, and (c) decision-support architectures that considered human-generated expertise. Research that was purely descriptive of online communities that did not involve any organizational or decision significance was not considered. The last corpus was chosen for its contribution to the theories, its empirical rigor, and its applicability to the problem of integrating collaborative knowledge into decision systems.

ECoPs as Knowledge Co-Creation Ecosystems

ECoPs are leveraging networked digital technologies to enable collaboration and knowledge sharing across geographical, organizational, and temporal boundaries. In contrast to traditional, place-based communities, engagement in eCoPs is largely motivated by common professional interests, aims, and problem-solving processes rather than by physical space or formal organization (Scarso & Bolisani, 2012; Wenger-Trayner & Wenger-Trayner, 2020). It is possible to note that recent literature intends to conceptualize eCoPs as an ecosystem of dynamic knowledge co-creation, where interaction, digital platforms, and social learning intersect to support distributed organizational intelligence and value creation (Chatterjee et al., 2024; Majchrzak et al., 2018; Nonaka & Toyama, 2003; Vial, 2019). Professional service firms and technologically intensive SMEs have also shown, through empirical research, that digitally mediated communities can shorten innovation cycles and enhance strategic responsiveness when supported by an organized organizational infrastructure (Li et al., 2021; Scuotto et al., 2021).

The fixity of membership, the setting of standards, and a well-defined social organization characterize conventional societies. Conversely, eCoPs are more fluid and flexible in terms of membership and changing patterns of participation, reflecting the relevance of tasks and collaborative needs (Li et al., 2021; Scarso & Bolisani, 2012). Digital spaces lessen the social and hierarchical restrictions that encourage greater individual contribution of knowledge, self-organization, and the manifestation of informal leadership (Leonardi, 2021). Modern digital collaboration platforms are becoming the so-called social spaces for such groups, facilitating asynchronous and synchronous communication, shared repositories, and joint problem-solving (Berente et al., 2022; Oliveira et al., 2014; Watson & Wixom, 2007).

Past studies indicate that the successful creation of virtual and hybrid communities follows a patterned life cycle. Initial models highlighted like formation, conflict, collaborative performance, and dissolution. More recent empirical research shows that eCoPs are still developing through successive stages of initiation, engagement, knowledge integration, and transformation in digitally mediated spaces (Majchrzak et al., 2018; Scarso & Bolisani, 2012; Wenger-Trayner & Wenger-Trayner, 2020). Such temporal dynamics play a critical role in understanding the processes of trust, participation, and the cultivation of knowledge over time in digital collaboration environments.

Process-based learning and knowledge development in eCoPs are extensively understood as phenomena. Modern knowledge construction and co-creation frameworks focus on stages of intention preparation, commitment building, collaborative bargaining, and knowledge standardization (Bresciani et al., 2018; Nonaka & Toyama, 2003). Gradually, the interaction among participants leads to the emergence of a common vocabulary, customs, routines, and digital artefacts that help build the community's emerging body of knowledge (Chatterjee et al., 2024; Scarso & Bolisani, 2012).

In terms of knowledge management, eCoPs should be considered as socio-technical forms of learning in which people acquire knowledge by engaging in valid practice in real professional activities (Alavi & Leidner, 2021; Wenger-Trayner & Wenger-Trayner, 2020). Such communities are not only member-based (consisting of amateurs and professionals) but also digital artefacts, tools, workflows, and collaborative infrastructures that facilitate the creation and transfer of knowledge (Faraj et al., 2018; Watson & Wixom, 2007). Collaboration, facilitation, and problem-based interaction are all forms of constructivist learning, and they continue to play a key role in knowledge building in real and online CoPs (Cabrera & Cabrera, 2005).

CSS as Enablers of Knowledge Co-Creation in eCoPs

Although eCoPs are the social and psychological basis for knowledge co-creation, their effective functioning in digital formats depends heavily on the technological infrastructure that facilitates communication and cooperation. Here, CSS becomes the main facilitating layer in which the co-creation of knowledge is realized in eCoPs.

CSS is a fundamental technology layer in a facilitator layer that supports interaction, coordination, and knowledge creation in physical and virtual Communities of Practice. Initial investigation of collaboration technologies had concentrated on groupware and computer-supported cooperative work. However, recent investigations have focused on cloud-based solutions, social enterprise systems, and AI-enhanced collaboration environments as the most common infrastructures supporting modern eCoPs (Leonardi, 2021; Maruping et al., 2019; Oliveira et al., 2014; Watson & Wixom, 2007). These systems possess built-in capabilities for communication, content sharing, coordination, and collaborative problem-solving, which support maintaining community contact both spatially and over time.

The existing literature is moving towards conceptualizing CSS as a socio-technical facilitator of collective intelligence rather than a communication tool. CSS enables the co-creation, diffusion, and recombination of knowledge in an organizational ecosystem through the confluence of social interaction mechanisms and digital affordances (Benbya et al., 2020; Chatterjee et al., 2024; Faraj et al., 2018; Majchrzak et al., 2018). Enterprise social networks, collaborative workspaces, and knowledge-sharing portals have enabled community members to externalize experience, share knowledge, and mutually refine practices in real time (Cabrera & Cabrera, 2005; Scarso & Bolisani, 2012; Watson & Wixom, 2007).

The use of CSS in eCoPs had a profound effect on participation intensity, trust development, and knowledge-sharing behavior. According to empirical research, discussion forums, shared repositories, version control systems, and tools of synchronous collaboration have been found to increase individual activity and the social capital of virtual communities (Cabrera & Cabrera, 2005; Li et al., 2021; Oliveira et al., 2014). Furthermore, the contextual factors that influence the successful use of CSS in collaborative contexts include leadership support, moderation mechanisms, and platform usability (Berente et al., 2022; Scarso & Bolisani, 2012; Tarafdar et al., 2022).

The current developments in data analytics and artificial intelligence are further changing the role of CSS in eCoPs. Recommendation systems, automated content classification, expertise-location services, and conversational agents are increasingly integrated into intelligent collaboration platforms to support knowledge discovery and decision-making (Benbya et al., 2020; Duan et al., 2025; Leonardi, 2021; Power et al., 2010). These features make CSS transcend the passive exchange of information to active mediation of collaborative knowledge processes, thereby improving efficiency and strategic value.

In terms of knowledge management, CSS serves as the main digital infrastructure where explicit knowledge is the focus of capturing, storing, and spreading, and at the same time, as the social process of knowledge exchange, tacit knowledge (Alavi & Leidner, 2021; Cabrera & Cabrera, 2005; Nonaka & Toyama, 2003). The interaction between structured knowledge repositories and the unstructured social interaction space enables e-cop to balance codified knowledge management with experiential learning and informal sense-making.

Recent studies, despite the potential, also show that challenges remain in implementing CSS in eCoPs. Among them, there can be the problem of information overload, uneven participation, the lack of digital skills, data privacy, and the mismatch between technological design and community practices (Majchrzak et al., 2018; Maruping et al., 2019; Oliveira et al., 2014; Scuotto et al., 2021; Standaert et al., 2022). Resource constraints and disjointed digital policies tend to limit the successful institutionalization of collaboration support infrastructures in SMEs, especially (OECD, 2023; Scuotto et al., 2021; Tarafdar et al., 2022).

Experience with enterprise collaboration deployments shows that analytics-enabled CSS can enhance the quality of collective problem-solving and reduce decision latency, but integration with formal DSS architectures is mostly experimental (Dellermann et al., 2019; Duan et al., 2025). Nevertheless, the successful alignment of CSS with the rest of the organization's knowledge management and intelligent decision support architectures remains a research gap, which encourages further exploration of knowledge-based and AI-supported collaborative structures.

LEADERSHIP IN ECOPS FOR KNOWLEDGE CO-CREATION

Leadership has also been widely accepted as a key driver of the formation, sustainability, and performance of eCoPs. The initial leadership models of CoPs focused on the formal designation of facilitators, coordinators, or sponsors to create a baseline governance system (Alavi & Leidner, 2021; Nonaka & Toyama, 2003; OECD, 2023). These role-oriented views position leadership as a structuring attribute that shapes the norms of participation, the distribution of responsibilities, and the community's initial developmental path. Nevertheless, modern studies tend to suggest that e-leadership in eCoPs is far more than role assignment and should be perceived as a dynamic, socially constructed process that evolves over the community life cycle (Bresciani et al., 2018; Hoch et al., 2018).

Recent sources emphasize that leadership success in eCoPs should not be limited to initial role identification but also depend on the execution of leadership practices, negotiation, and redistribution throughout the development period as new challenges and opportunities arise (Hoch et al., 2018; Uhl-Bien & Arena, 2018). Contextual, political, and organizational factors mediate leadership behaviors, and inappropriate fits between formal leadership functions and actual leadership competencies can severely limit the effectiveness of community performance and knowledge co-creation outcomes (Chatterjee et al., 2024; Tarafdar et al., 2022). Consequently, the existing views tend to embrace distributed and relational models of leadership when elaborating on the collective exercise of influence, coordination, and accountability in digitally mediated communities (Cortellazzo et al., 2019; Uhl-Bien & Arena, 2018).

Virtual and digital leadership research also highlights the roles of relational and communicative practices in knowledge sustenance in eCoPs. Instead of being seen as controllers of information flows, leaders are perceived as facilitators of interaction, trust, and openness, which encourage participation, psychological safety, and common sense-making (Contreras et al., 2020; Cortellazzo et al., 2019). Research indicates that transparency, continuous feedback, and the conscious cultivation of trust are the key preconditions for successful leadership in online teamwork settings (Cabrera & Cabrera, 2005; Cortellazzo et al., 2019; Tarafdar et al., 2022). Such dynamics of relations foster the development of collective identity and enhance the social capital needed to maintain the process of knowledge co-creation.

Regarding the socio-technical aspects of eCoPs, leadership also goes hand in hand with the architecture and management of the virtual processes that affect collaboration. How collaboration technologies are appropriated, norms of participation institutionalized, and power relations embedded in spaces of digital interaction are influenced by leaders (Berente et al., 2022; Kane et al., 2015; Standaert et al., 2022). The governance systems, moderation policies, and methods of digital engagement determine the extent to which CSS reinforces or reinforces structural asymmetries.

The eCoPs leadership is also linked to the wider organizational adaptation and renewal processes as found in strategic leadership research. Leaders are particularly important for understanding environmental cues, harmonizing organizational strategy with community wisdom, and leveraging collective intelligence to sustain organizations in the long term in turbulent, digitally transformed environments (Kraus et al., 2021; Uhl-Bien & Arena, 2018; Vial, 2019). Perceptions of eCoPs leaders towards environmental change, technological opportunities, and organizational misfit have a strong impact on the degree to which knowledge generated by eCoPs is used to learn strategically and to renew the organization (Cortellazzo et al., 2019; Duan et al., 2025).

CRITICAL SYNTHESIS AND RESEARCH GAP

Although current studies have explored digital collaboration, knowledge management, and intelligent decision systems in detail, few have examined their integration. Empirical research shows that eCoPs increase knowledge exchange, innovation levels, and organizational learning (e.g., Li et al., 2021; Scarso & Bolisani, 2012), but they are typically measured in terms of social or performance outputs rather than formal decision integration. In like manner, studies on DSS focus on analytical rigor and data-based optimization (Power et al., 2010; Watson & Wixom, 2007), but do not discuss systematic integration of tacit, socially constructed knowledge.

There is a growing yet slight literature on hybrid intelligence and socio-technical integration (Dellermann et al., 2019; Duan et al., 2025), indicating the usefulness of integrating human and machine intelligence. These contributions, however, fail to go further to suggest an operational architecture that formally entrenches community-generated knowledge into DSS scoring mechanisms. Additionally, there is still empirical support for completely integrated DSS-collaboration architectures that are scattered and situation-specific, and frequently restricted to case-based studies that do not provide generalized design reasoning.

Three limitations can be identified in the literature, however: (1) a lack of operationalization of tacit knowledge conversion mechanisms, (2) a lack of architectural models that relate collaboration infrastructures to decision cores, and (3) a lack of leadership-oriented integration logic. These deficiencies create incentives to develop a systematic, knowledge-based model that connects distributed collaborative knowledge production to intelligent decision support processes. The synthesis above establishes the conceptual and empirical foundations that motivate the architectural integration proposed in the following section.

E-COPS IN KNOWLEDGE-DRIVEN BUSINESS MANAGEMENT

INTEGRATING INFORMATION TECHNOLOGY AND BUSINESS KNOWLEDGE FOR KNOWLEDGE CO-CREATION

Recent empirical evidence shows that relational and cognitive misalignment is more often cited as a reason for the ineffectiveness of knowledge sharing between business and IT functions than technological fragmentation alone (Bresciani et al., 2018; Osterloh & Frey, 2000). Professional, epistemic, and knowledge-sharing differences often create communication barriers that cannot be addressed solely by increasing IT integration. These discrepancies give rise to two ongoing Knowledge Management Business IT interface challenges: (a) the creation of a mutual strategic awareness and (b) the operationalization of efficient inter-functional knowledge-sharing systems.

Regarding the former challenge, it is consistently found that IT units focus on technological optimization, whereas business functions focus on responsiveness, market agility, and immediate operational performance (Bharadwaj et al., 2013; Peppard & Ward, 2016). IT solutions are often sought quickly and lack strategic direction by business leaders, which leads to poor alignment and a lack of a shared team mindset (Li et al., 2021; Mittal et al., 2018). The domain illiteracy between the parties limits both parties' ability to co-define issues and co-develop solutions, thereby inhibiting the strategic use of digital capabilities.

The second obstacle is that of knowledge-sharing asymmetry between business and IT societies. Previous research indicates persistent communication failures, conflicting knowledge-sharing types, and incongruent documentation and sense-making patterns (Leonardi & Vaast, 2017; Li et al., 2021). These asymmetries are further compounded in digitally transformed organizations, where technological and business knowledge are more interdependent. Without long-term cross-boundary communication and mutual meaning-making, digital initiatives are often destined to lack meaning, be misunderstood, violently opposed, and poorly learnt by organizations.

A paradigm of Knowledge Management literature has traditionally been IT-centric, codification-focused, and can be traced back to the original application of artificial intelligence and expert systems. This approach views knowledge as a formalized object that can be stored and transferred through repositories and information systems (Cabrera & Cabrera, 2005; Faraj et al., 2018). Modern empirical research shows that a significant share of KM studies remains focused on explicit knowledge, systematic databases, and tool-based implementations (Alavi & Leidner, 2021; Bharadwaj et al., 2013; Cabrera & Cabrera, 2005).

Later KM studies take a socio-technical, practice-based approach and emphasize that organizational knowledge is created through interactions among people, technologies, processes, relationships, and shared practices (Bresciani et al., 2018; Nonaka & Toyama, 2003). In this perspective, knowledge cannot be reduced to mere data or documents; it is constantly enacted through dialogue, collaboration, and problem-solving. The research on digital collaboration tools and eCoPs also testifies to the fact that professionals tend to seek more informal networks, conversational communication, and peer learning contexts as the means of complex knowledge sharing rather than strictly codifying it (Cabrera & Cabrera, 2005; Leonardi & Vaast, 2017; Oliveira et al., 2014).

In knowledge-based business sectors, the interaction between IT and business expertise is thus more co-creation of knowledge than a one-way flow of information (Chatterjee et al., 2024; Khin & Ho, 2019; Majchrzak et al., 2018). Boundary-spanning positions that share cognitive frames and digitally mediated interaction spaces, which facilitate sustained interpretation, negotiation, and recombination of heterogeneous knowledge, are necessary for good integration. Leadership support, trust, and platform governance mechanisms further influence the extent of IT-business knowledge integration, including organizational learning, strategic alignment, and innovation capacity (Bharadwaj et al., 2013; Bresciani et al., 2018; Cortellazzo et al., 2019; Kane et al., 2015)

On the whole, the literature leads to a similar conclusion: effective integration of Information Technology and business knowledge towards knowledge co-creation requires a sensitive balance between technological infrastructures and socio-relational processes. As much as IT platforms create structural conditions for knowledge capture and exchange, relational alignment, shared understanding, and cross-functional collaboration ultimately influence the success of knowledge-driven business management.

Requirements and Challenges of Collaboration Technologies for Knowledge Co-Creation

Modern studies on collaboration technologies focus on their contributions to knowledge co-creation in socially dynamic and cognitively complex settings. The initial empirical studies showed that collaboration practices, strategies, and mutual understanding in such settings can be enhanced only through means beyond traditional communication tools. The recent extensive research demonstrates that digitally mediated collaboration in the context of management, engineering, and learning is marked by high cognitive load, heterogeneous stakeholder involvement, and quickly evolving artefacts of knowledge (Benbya et al., 2020; Faraj et al., 2021; Maruping et al., 2019; Oliveira et al., 2014). All these conditions introduce a complex set of consistent technological and socio-technical demands that contemporary CSS should satisfy.

Among the most common issues reported are cognitive overhead and information overload. Ecosystems of digital collaboration produce enormous amounts of diverse data, such as ideas, arguments, documents, annotations, and traces of social interaction (Faraj et al., 2021; Maruping et al., 2019; Watson & Wixom, 2007). Participants cannot create a consistent mental representation of the collaborative state without scalable mechanisms for filtering, prioritization, and contextualization. Recent articles highlight that there has been an increasing demand to use AI to curate content, rank it by relevance, and provide real-time analytics to ease the cognitive load and facilitate informed participation (Benbya et al., 2020; Dedotsi et al., 2023; Dellermann et al., 2019; Duan et al., 2025). Ineffective information overload management may seriously undermine collaboration and decision quality.

The second significant need concerns the expression and control of social behavior on collaboration platforms. Knowledge co-creation is an inevitable component of social structures comprising individuals, groups, and inter-organizational relations. Adaptive modelling and visualization of user profiles, group dynamics, and interaction patterns, as well as changing communities, have thus become central research issues (Kallinikos et al., 2010; Oliveira et al., 2014). Modern collaboration systems are increasingly based on social network analytics and behavior-aware services to capture a dynamic view of social relations and mediate interactions and influence adaptively.

The other critical crunch is supporting various and changing modes of collaboration. Empirical evidence consistently demonstrates that collaborative knowledge creation is gradual, as ideas are refined through numerous iterations, meanings are negotiated, and emerging concepts are gradually formalized (Benbya et al., 2020; Duan et al., 2025; Leonardi, 2021). Very strict interaction models can push knowledge that remains tacit, ambiguous, or challenged into premature formalization. On the other hand, a lack of higher-level representations restricts the system's ability to accommodate high-level functionality, such as reasoning, supervision, and decision support. Modern platforms should thus sacrifice informality in knowledge emergence and formalization in support of computations to provide flexible hybrid interaction models that adapt to the maturity of the collaboration process (Dellermann et al., 2019; Faraj et al., 2021; Oliveira et al., 2014).

Another basic requirement of collaboration technologies in eCoPs is the exploitation of tacit knowledge. Experience, intuition, and insight gained through practice are tacit knowledge that is hard to externalize and formalize, and that prevails in most professional collaboration situations (Alavi & Leidner, 2021; Nonaka & Toyama, 2003). Recent studies emphasize the growing importance of narrative-based interaction and multimodal communication, as well as AI-based methods for eliciting knowledge, to support the expression of tacit expertise in the virtual world (Benbya et al., 2020; Cabrera & Cabrera, 2005; Mesgari & Faraj, 2012). Without these capabilities, collaboration technologies will capture only a small share of the knowledge produced by knowledge communities.

The incorporation of past knowledge resources is also a long-standing issue for technology and governance. Collaborative processes are increasingly multitasking across platforms such as enterprise social networks, document management systems, messaging systems, and external web repositories. The process of knowledge co-creation involves the smooth integration and subsequent reuse of the results of the previous collaboration processes and, at the same time, the problem of provenance, trust, access control, and protection of intellectual property (Kallinikos et al., 2010; Oliveira et al., 2014; Standaert et al., 2022). Contemporary collaboration architectures thus focus on interoperability, metadata management, and secure lineage tracking of knowledge.

Lastly, modern collaboration technologies are increasingly anticipated to possess dynamic data processing and decision-support capabilities. In addition to supporting interaction, platforms are currently infused with intelligent services that enable real-time analytics, trend detection, argument aggregation, and outcome estimation (Dellermann et al., 2019; Duan et al., 2025; Power et al., 2010). These strengths enable CSS to proceed to proactive mediation of collaborative sense-making and decision-making processes, helping participants derive practical knowledge of interaction patterns. Such intelligent functions are especially vital to integrate into organizational settings where the results of collaborative efforts directly inform strategic and operational decision-making.

The current literature sources are united in the opinion that the successful collaboration technologies to enable knowledge co-creation should meet a highly complex system of interdependent cognitive, social, technical, and governance needs. Although digital platforms offer the framework underpinning collaboration, it is the ability to respond to information overload, social change and dynamics, multiple forms of collaboration, tacit knowledge process, and intelligent decision support that eventually defines their usefulness to eCoPs and knowledge-based business management.

Motivational Drivers of Knowledge Co-Creation through Digital Interaction

The tendency to view knowledge sharing transactionally arises when knowledge is implicitly treated as a possession or proprietary asset. Contribution in these environments is often conditional on anticipated individual payoffs, tangible (e.g., career progression, monetary benefits) or intangible (e.g., reputation, status, reciprocity). This reasoning positions knowledge exchange as an economic decision, dictated by perceived cost-benefit analysis (Bock et al., 2005; Osterloh & Frey, 2000). Nevertheless, this point of view is insufficient to explain the long-term, voluntary trend of contributions in numerous successful eCoPs.

Conversely, if knowledge is viewed as a collective good, the motivation will shift towards pro-social, community-driven motives. People do not participate because they are officially expected to contribute; rather, they do so because they are part of the community, have a duty towards its success, and feel a sense of purpose in the group. According to this rationale, co-creation of knowledge is an act of common purpose, professional care, and moral duty, rather than a market action (Cabrera & Cabrera, 2005; Cortellazzo et al., 2019; Gagné et al., 2018).

We suggest that the conflict between these two motivation logics is highly exaggerated in the digital interaction environment. To the extent that social presence is diminished, anonymity is reinforced, and weak relational visibility, opportunistic behavior, or free-riding behavior can be aggravated (Bock et al., 20; Contreras et al., 2020). Conversely, properly designed digital platforms that increase visibility of contributions, peer recognition, community feedback, and trust-building mechanisms can build intrinsic motivation and solidify collective identity (Benbya et al., 2020; Cortellazzo et al., 2019; Gagné et al., 2018). Therefore, the motivation within eCoPs is not only an individual attribute but an emergent feature of the socio-technical system (Bresciani et al., 2018; Osterloh & Frey, 2000).

Organizationally, the increasing reliance on extrinsic incentive plans to drive knowledge sharing should be reconsidered. However, short-term compliance can be achieved through rewards; however, over-reliance on such systems risks turning knowledge co-creation into a competition or transactional behavior. This may erode trust, fracture community cohesion, and eventually undermine the very processes of learning and innovation that organizations aim to foster (Bock et al., 2005; Van Knippenberg & Sitkin, 2013). Psychological safety, mutual trust, perceived fairness, and a strong sense of belonging, in our opinion, would significantly contribute more to sustainable knowledge co-creation than the instrumental rewards alone (Cortellazzo et al., 2019; Gagné et al., 2018).

We also argue that leadership is critical to shaping the motivational climate of digital knowledge ecosystems. Leaders send implicit cues about the kinds of behavior to like and reward through communication, recognition, governance, and platform policies. In cases where leadership focuses on openness, learning, and collective success, motivational energy will lean toward knowledge co-creation rather than knowledge protection (Cortellazzo et al., 2019; Hoch et al., 2018; Kane et al., 2015; Van Knippenberg & Sitkin, 2013).

In general, we view the motivation for knowledge co-creation through digital interaction as a strategic organizational resource rather than a secondary behavioral variable. It cannot be cultivated effectively without the coherent alignment of technology design, leadership practices, organizational culture, and incentive structures (Bresciani et al., 2018; Gagné et al., 2018; Kankanhalli et al., 2005; Osterloh & Frey, 2000; Van Knippenberg & Sitkin, 2013).

A Leadership-Centered Decision-Making Framework for Strategic Planning through eCoPs

Building upon the preceding theoretical synthesis, the following section operationalizes the proposed integration architecture. The human premise outlined in the preceding section provides the motivation dynamics that enable knowledge co-creation via eCoPs. Nonetheless, motivation is not enough to change collaborative knowledge into strategically actionable intelligence. It is necessary to have a systematic socio-technical process that directs the flow of community-generated knowledge into organizational decision-making. Here, the decision-making model we currently propose is leadership-based and operationalizes how eCoPs, CSS, and DSS can be incorporated into the integrated strategic planning framework.

The contribution of this work is a shift from traditional data-driven decision-making to a knowledge-driven, eCoPs-based decision-making framework, in which eCoPs and CSS proactively enrich the organizational DSS. The framework institutionalizes the way explicit organizational information- and practice-based, socially constructed knowledge is organized into a single decision-making pipeline coordinated by the leadership.

In the conventional decision-making paradigm, as illustrated in the left section of Figure 1, formal data repositories and ordered analytical processing are the key drivers of organizational decisions. Operational data is obtained both in-house and externally and stored in organizational databases, which serve as DSS inputs in numerical form. Under this paradigm, the rationality of decisions is established by the historical records, preset rules, and quantifiable performance measures. Human experience is indirectly involved in the process through model configuration and post hoc interpretation of the system's outputs. Even though this methodology can provide consistency, traceability, and computational rigor, it is also fundamentally limited in its capacity to embrace tacit, context-specific judgment and experience. These restrictions are especially acute in strategic and semi-structured decision-making scenarios, characterized by environmental uncertainty and dynamism.

Figure 1 (on the right) presents the new element of the proposed framework, eCoPs-based knowledge formation, as part and parcel of decision-making. In this case, eCoPs serve as distributed units of knowledge production, where professionals understand issues together, share their experiences, and create actionable knowledge. Each community mediates interaction through CSS, which facilitates both structured and unstructured communication, argumentation, negotiation of alternatives, and sense-making. This interaction does not involve a simple transfer of knowledge but rather co-creation, a synthesis of individual knowledge and socially constructed meaning. This is clearly reflected in the model as the "Forming Knowledge" layer, which converts raw opinions, arguments, and experiential input into knowledge usable by the organization.

The main novelty of the framework is the direct inclusion of eCoPs-based knowledge into the DSS, represented by the two-way flow of knowledge between the Forming Knowledge element and the DSS core, as shown in Figure 1. In contrast to traditional DSS architecture that relies on structured databases, the proposed architecture enables the DSS to act on hybrid knowledge, simply put, formal quantitative data, semi-structured collaborative data, and partially articulated tacit knowledge. This hybridization makes the DSS a knowledge-enhanced decision system, capable of reasoning contextually and synthesizing statistical data and overall human wisdom. The results of a decision are therefore a manifestation of the overlap between data technology and community-based intelligence, rather than the result of numerical inferences.

Leadership is embedded in the structural context as the orchestrating system that aligns knowledge generation with organizational strategy through collaboration. The system is not passively used by leaders but actively constructed by them to enable knowledge co-creation and decision-making in a socio-technical environment. They are tasked with legitimizing strategic eCoPs, providing resources for collaboration infrastructure, outlining governing principles for participation and knowledge reuse, and ensuring that community-generated insights are translated into executive decision-making. The leadership also controls the feedback on decision outcomes to the communities, thereby perpetuating continuous organizational learning and avoiding the isolation of community knowledge.

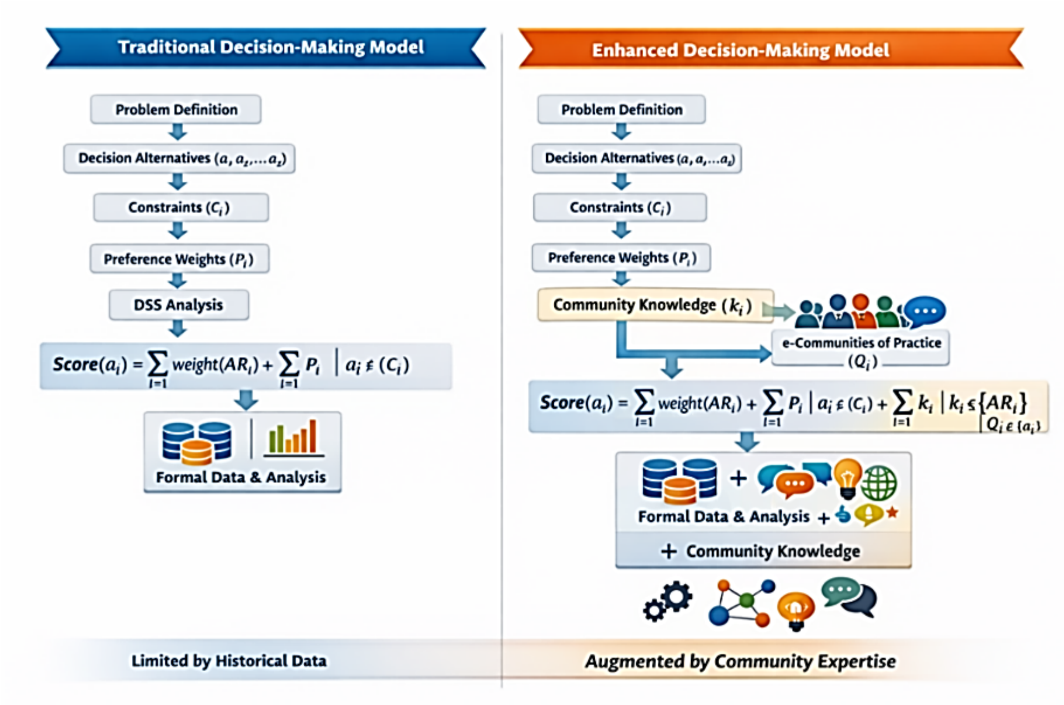

Figure 1. Our proposed knowledge-driven decision-making framework

In this context, strategic planning is no longer a top-down, periodic management task. Rather, it is rationalized as a never-ending knowledge-decision feedback loop, in which organizational data, the creation of knowledge within communities, and executive interpretation are repeatedly coupled. The decisions made based on the DSS, as shown in Figure 1, change future community practices. However, the community knowledge constantly transforms the knowledge base on which the next decision is made. This creates a self-reinforcing learning process in which strategic adaptation, innovation, and organizational intelligence continuously feed off one another over time.

The suggested framework directly operationalizes the main theoretical concepts developed in this paper: eCoPs as socio-cognitive ecosystems; knowledge co-creation as an interaction-oriented process; the tacit-explicit knowledge duality; CSS as socio-technical mediators; DSS as computational reasoning cores; and leadership as the strategic alignment force. By combining these aspects into a single architectural construct, the framework shifts to an actionable decision paradigm at the system level, in preference to a descriptive knowledge-management theory. The critical value of the framework lies in the structural linkage between collaborative human knowledge development and intelligent decision support. Unlike classical DSS models, which either externalize human expertise or treat it as a post-processing variable, the proposed system will incorporate collective judgment into the decision pipeline. Thus, it expands on classical DSS theory, serves as a mediator between knowledge management, collaboration systems, and strategic leadership, and offers a scalable template for knowledge-based strategic decision-making in digitally transformed organizations.

In the traditional decision-making process, (shown in Figure 1), the process is structured by a series of actions that involve: formal problem definition, assessment of a finite number decision alternatives ($a_i, a_j, \ldots, a_z$), decision constraints specification (C_i) and assignment of weighted arguments in favor or against each decision alternative ($weight(AR_i)$) and specification of user preferences (P_i). These stages are operationalized using traditional DSS that are based on formalized data and predetermined analysis models. In this classical DSS environment, the total performance rating of every alternative is calculated based on:

$$U_{DSS(a_i)} = \sum_{i=1}^{n} weight(AR_i) + \sum_{i=1}^{n} (P_i) | a_i \notin \{c_i\}$$

According to the above formulation, the alternatives (**a_i**) are evaluated based on a collection of decision arguments, with a predetermined constraint set imposed by the decision maker. The arguments used in the evaluation process are usually derived from either existing organizational knowledge repositories or previously solved similar cases, as per a case-based reasoning paradigm. As a result, the quality and breadth of the resultant decision recommendations are necessarily constrained by the availability, completeness, and relevance of historical and explicitly codified knowledge.

The suggested decision model builds more on this traditional logic by systematically considering knowledge generated in eCoPs. Informal, experience-based knowledge is increasingly being expressed, screened, and converted into explicit, decision-relevant knowledge structures through the mediation of CSSs. Supposing that **k_i** is the knowledge generated by a particular Community of Practice (**Q_i**), this new contribution of knowledge is incorporated formally into the alternative evaluation function as represented in:

$$U(a_i) = U_{DSS(a_i)} + \sum_{i=1}^{n} k_i \, | k_i \subseteq \{AR_i\} | Q_i \in \{a_i\}$$

The proposed model supports the coexistence of historical data, formalized preferences, and socially constructed expertise by enhancing the traditional DSS scoring mechanism with community-generated knowledge. Consequently, the ultimate judgment of the decision options is not bound by existing bodies of knowledge. However, it is dynamically augmented by specialist, context-dependent information generated during collaborative practice. This outreach goes a long way toward improving the system's ability to support semi-structured and unstructured decision-making, which has historically been challenging to resolve with purely data-driven DSS solutions.

DEMONSTRATIVE APPLICATION: A STRUCTURED DECISION CASE

To demonstrate concretely how the proposed framework operationalizes eCoPs-generated knowledge within a DSS, we present a structured simulated decision case.

Consider an SME evaluating three strategic alternatives:

a_1 = Incremental Product Upgrade

a_2 = New Market Expansion

a_3 = Investment in AI-Based Automation

The organization evaluates alternatives based on four baseline DSS criteria:

C_1= Expected Financial Return (weight 0.35)

C_2 = Implementation Risk (weight 0.25)

C_3 = Strategic Alignment (weight 0.20)

C_4 = Resource Availability (weight 0.20)

All the above concepts are presented in Table 1.

Table 1. Baseline DSS evaluation

Alternative	C_1	C_2	C_3	C_4	$U_{DSS}(a_i)$
a_1	7	8	6	9	**7.55**
a_2	9	5	8	6	**7.45**
a_3	8	6	9	5	**7.35**

Under purely data-driven DSS evaluation, a_1 ranks highest. Let us assume that during structured eCoPs deliberation, engineers, project managers, and market analysts identify additional qualitative insights:
k_1 = Hidden Technical Debt Risk (affects **a_1** negatively)
k_2 = Emerging Market Timing Advantage (affects **a_2** positively)
k_3 = Long-Term Innovation Leverage (affects **a_3** positively)

Through the "Forming Knowledge" layer, these insights are translated into adjustment coefficients (**Δ_k**) scaled from -1 to +1 and incorporated into the DSS scoring mechanism. The adjusted evaluation is presented in Table 2.

Table 2. Knowledge-adjusted evaluation

Alternative	Baseline score	Δk	Adjusted $U(a_i)$
a_1	7.55	–0.40	**7.15**
a_2	7.45	+0.35	**7.80**
a_3	7.35	+0.25	**7.60**

In this demonstrative case, we set **α=1** and directly report the net adjustment **$\Delta k(a_i)$** produced by the "**Forming Knowledge**" layer after screening and aggregation of claims. Thus, $U(a_i) \approx U_{DSS(ai)} + \Delta k(a_i)$, yielding **$U(a_1)$** = 7.55 − 0.40 = **7.15**, **$U(a_2)$** = 7.45 + 0.35 = **7.80**, and **$U(a_3)$** = 7.35 + 0.25 = **7.60**. This scenario is depicted in Figure 2.

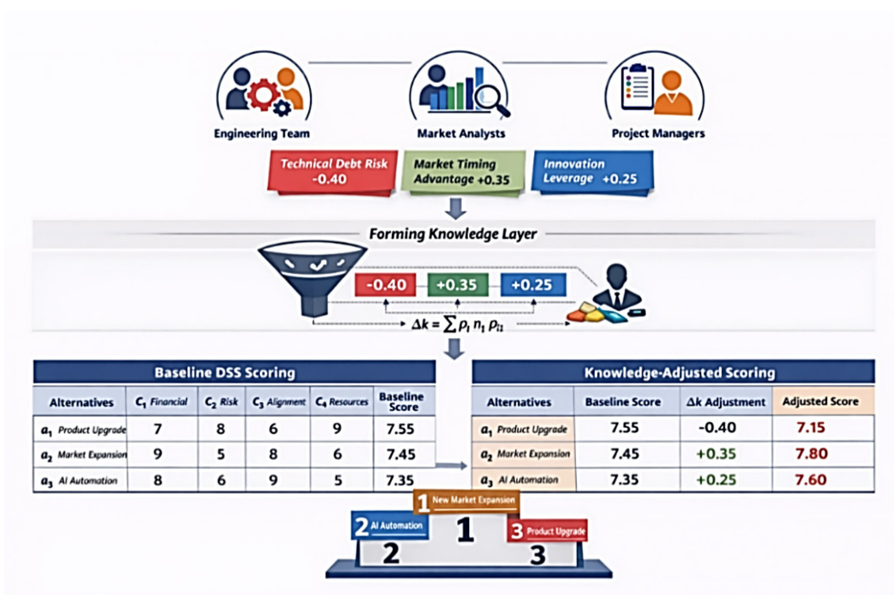

Figure 2. Demonstrative application scenario: structured decision case

CONCEPTUAL ROBUSTNESS AND IMPLEMENTATION CONSTRAINTS

Although the given framework has proven operationally feasible based on the systematic demonstrative case, its practical use raises several non-trivial issues that cannot be overlooked.

To begin with, epistemic bias and dominance can skew eCoPs' knowledge by privileging dominant actors, informal hierarchies, or persuasive rhetoric. The absence of structured moderation and clear validation procedures can make the "Forming Knowledge" layer even more biased, rather than promoting group intelligence. **Second**, the complexity of governance and validation: The transformation of collaborative discourse into formal decision parameters demands well-formulated screening mechanisms, role-based validation rights, and documentation standards. Inappropriately structured governance regulations can lead to confusion, procrastination, or inconsistent knowledge assimilation. **Third**, over-adjustment risk: Overweighting of the knowledge-based parameters (**Δk**) can compromise the analytical stability of the DSS. The framework thus assumes the existence of limited adjustment mechanisms and the explicit use of scaling controls to enforce computational discipline. **Fourth**, limitations on scalability: With large volumes of collaborative data, processing bottlenecks can arise in the "Forming Knowledge" layer of large organizations, requiring AI-assisted aggregation and filtering systems. **Fifth**, resistance of culture and organization: the integration of eCoPs-created knowledge into official decision-making channels challenges hierarchical authority models. Implementation, hence, does not rely solely on technological integration but also on leadership commitment and alignment with organizational culture.

These practical considerations provide the basis for the concluding synthesis and evaluation of the framework's contribution. These points suggest that the framework cannot be viewed as a "universal fix", but rather a designed architectural proposal, the success of which is conditional upon the maturity of governance, the capacity of the digital infrastructure, and cultural preparedness.

DISCUSSION

Having established the architectural structure and demonstrated its operational logic, this section synthesizes the broader implications of the framework. The research problem of this work was to shift between disjointed information on digital cooperation, knowledge management, and intelligent decision systems to a comprehensive architectural suggestion. The literature review determined that eCoPs increase knowledge sharing, joint problem solving, and learning in the organization; that CSS create a structured and traceable interaction; and that DSS offer analytical rigor but do not adequately embrace tacit expertise. The suggested structure fixes this structural disconnect by adding a new layer of formalization, the "Forming Knowledge" layer, operationalizing the transformation of collaborative discourse into formal decision parameters. The architecture closes the gap between socio-technical knowledge generation by integrating screening, aggregation, and limited adjustment mechanisms into the DSS scoring logic and computational evaluation. The demonstrative case scenario of the decision process also shows that structured knowledge adjustments can materially change the alternative ranking, indicating that the framework is not merely conceptual but can have quantifiable consequences for the decision. The architecture thus integrates three historically distinct fields, namely, collaborative intelligence, knowledge management, and DSS theory, to form a single decision pipeline. Table 3 summarizes how key literature findings motivate the main architectural components of the proposed framework.

Table 3. Evidence-to-framework mapping

Framework element	Literature insight	Design implication in proposed model
eCoPs	Empirical studies show eCoPs enhance tacit knowledge sharing and innovation (Li et al., 2021; Scarso & Bolisani, 2012).	Positioned as distributed knowledge production units generating decision-relevant insights
Collaboration support systems	CSS enables traceable, structured interaction and knowledge capture (Majchrzak et al., 2018).	Serve as the capture and metadata layer feeding the "Forming Knowledge" mechanism.
Hybrid intelligence	Combining human and machine intelligence improves decision quality (Dellermann et al., 2019; Duan et al., 2025).	Motivates bounded integration of Δk adjustments within computational DSS scoring.
Knowledge management theory	Tacit knowledge requires socialization and contextual interpretation (Alavi & Leidner, 2021; Nonaka & Toyama, 2003).	Justifies the conversion layer, translating discourse into structured evaluative parameters
Leadership research	Distributed digital leadership enables alignment and governance in collaborative systems (Hoch et al., 2018; Uhl-Bien & Arena, 2018).	Leadership is embedded in orchestrating governance and validation authority.
DSS literature	DSS provides analytical rigor but underutilizes qualitative input (Power et al., 2010; Watson & Wixom, 2007).	Framework extends the DSS evaluation function to incorporate structured knowledge adjustments.

CONCLUSIONS

This paper attempted to fill a structural gap in organizations' decision-making processes: there is no systematic means to incorporate collaboratively produced knowledge into formal DSS. Based on studies on digital collaboration, knowledge management, hybrid intelligence, and DSS theory, the paper proposes a leadership-oriented, knowledge-based model that operationalizes the integration of eCoPs-driven insights into the intelligent decision-making process. The model is composed of five main aspects: (1) eCoPs distributed knowledge production-units; (2) CSS structured interaction and capture infrastructures; (3) a "Forming Knowledge" layer which provides screening, validation, and transformation of collaborative discourse into decision-ready parameters; (4) a DSS that is extended for structured knowledge adjustments; The connection between collaborative intelligence and strategic goals is facilitated by a leadership mechanism that is the coordinating governance system (5). The model's central interaction logic is the two-way integration between the "Forming Knowledge" layer and the DSS core. The data on quantitative and historical performance metrics is augmented with context-sensitive, collectively validated expertise created via eCoPs. The demonstrative decision case described the extent to which this type of integration can substantially change alternative rankings, and thus, broaden the epistemic foundation of semi-structured strategic decisions. The paper was structured as follows: first, the limitations of data-driven DSS models were identified; then, the socio-technical basis of eCoPs and CSS was reviewed; a proposal for an integrated architectural solution was presented; the solution was operationalized; and finally, the feasibility and constraints of implementation were reviewed. Based on the above, the study offers a coherent design rationale that links collaborative intelligence to the rigor of computational decision-making.

FUTURE RESEARCH DIRECTIONS

The present study needs to be followed in several complementary directions in the future. One of the main research paths is the direct relationship between eCoPs and organizational leadership that needs to be empirically studied. In particular, future research should identify and corroborate a set of predominant indicators to measure leadership initiatives, motivational forces, and participation dynamics in digital communities. Such indicators might then be processed using appropriate statistical and computational methods to assess their effects on the community's vitality, knowledge diffusion, and decision-making effectiveness. Specific focus should be placed on the structure of incentive and recognition systems that will turn independent people into active members of the community and gradually develop a sustainable collaborative culture.

The second important area of future research concerns the interoperability of heterogeneous information systems within the organizational decision-making ecosystem, including Management Information Systems (MIS), Executive Information Systems (EIS), DSS, Analytical Support Systems (ASS), and CSS. Communication between these systems still faces enduring issues related to data representation, semantic compatibility, interface design, and communication protocols. Further efforts in this direction are needed to develop standardized data formats, compatible interfaces, and common communication models that enable frictionless integration and real-time knowledge sharing between these systems. Such interoperability is likely to become invaluable for achieving the intensity of system use and the overall efficiency of organizational decision-making.

Also, the rapid pace of artificial intelligence, machine learning, and large language model development creates new research opportunities to automate the extraction, structuring, and semantic enrichment of knowledge generated by eCoPs. The paper can be improved in future research by examining how intelligent agents integrated into CSS systems can aid argument analysis, knowledge validation, pattern identification, and decision-making, thereby further reinforcing the cognitive abilities of the suggested system.

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