Collaborative Intelligence & Influence As A Socio-Cognitive Capability: A Philosophical Structuring Of Developmental Outcomes

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Abstract:
This conceptual paper introduces **Collaborative Intelligence & Influence (CI²)** as a structured, socio-cognitive competence situated within the **Cognitive Psychology Dimension** of the **VFC Competence Framework**. CI² is defined as the ability to co-create meaning, co-regulate reasoning, and ethically influence group dynamics in human and hybrid collaboration systems. Drawing on interdisciplinary literature—including cognitive psychology, organizational behavior, team science, and human–AI collaboration—the paper proposes a multi-layered model comprising four interdependent components: collaborative cognition, collaborative influence, trust calibration, and adaptive perspective-taking. These components are operationalized through the VFC-aligned **KSAH model** (Knowledge, Skills, Attitudes, Habits), with progressive developmental levels mapped from novice to expert.
The methodology applies a qualitative synthesis of peer-reviewed literature and case-based application to structure CI² as both a **developmental** and **diagnostic construct**. The findings reinforce the need for culturally responsive, ethically grounded, and cognitively integrated approaches to collaboration—particularly in hybrid, AI-mediated, and youth development contexts. The paper concludes with a proposed research agenda to empirically validate CI² across diverse sociocultural settings and integrate it into future-oriented learning systems.
Keywords: Collaborative Intelligence, Influence, Cognitive Psychology, Competence Framework, Human–AI Collaboration.

1. INTRODUCTION:

Collaboration has become a social necessity, yet in the 21st century, it is also a cognitive imperative. Hybrid work models, intercultural teaming, and the use of AI-augmented decision systems have fundamentally changed how people manage attention, make meaning through negotiation, and co-regulate collective sensemaking (Gupta et al., 2023; Woolley & Gupta, 2023). In this landscape, effective collaboration is not fully captured by traditional aspects of teamwork, communication, or leadership. It would need a more structured, ethically attuned, and socially embedded set of capacities—a convergence that this paper calls Collaborative Intelligence & Influence (CI²).
CI² is positioned within the **Cognitive Psychology Dimension** of the **VFC Competence Framework**, which conceptualizes competence as a dynamic interplay of knowledge, skills, attitudes, and habits (AbdelMohiman & Salem, 2025). The VFC Framework, designed as a future-facing developmental architecture, comprises three core dimensions: Functional

Expertise, Cognitive Psychology, and Visionary Management. Within this structure, CI² is classified under the **Social Domain** of the Cognitive Psychology Dimension, emphasizing its nature as an interpersonal meta-competence that governs how cognition is distributed, influence is calibrated, and trust is sustained across teams, contexts, and technologies.

The relevance of CI² is underscored by global trends that demand **collaborative fluency**, not just coordination. According to the World Economic Forum (2023), competencies such as "active listening," "persuasion," "reasoning," and "trust-building" are now central to leadership and employability across sectors. Furthermore, we will have to apply these skills in more complicated contexts: multilingual virtual teams, asynchronous communication tools, and artificial intelligence-based decision-making systems. Without the capacity to co-create mental models, solicit feedback, and regulate ethical consideration, cognitive overload, polarization, and eroding trust often emerged (Edmondson & Lei, 2014; Glikson & Woolley, 2020).

There is empirical evidence to support this move. Theories of shared mental models (Mathieu et al., 2000), transactive memory systems (Gupta & Woolley, 2021), and group metacognition (Chiu & Kuo, 2009) all argue that collaboration is a cognitive phenomenon. However, research on social cognition and theory of mind shows that for influence and coordination to be effective, empathy must be combined with empathic accuracy, ethical intent, and emotional self-control (Zaki & Ochsner, 2012; Koster-Hale & Saxe, 2013). There is now mounting supporting evidence for these claims from neuroscience, which demonstrates the involvement of those neural systems corresponding to attention control, social monitoring, and moral reasoning in collaboration (Decety & Jackson, 2004).

However, in most educational and organizational contexts, the collaborations are either assumed to be happening or can only be measured with limited participation metrics that primarily focus on task contributions. This gap is more significant in youth development and non-Western contexts, particularly where cooperation has been facilitated by sociocultural norms, generational hierarchies, as well as religious-ethical worldviews (Chew & Mohamed Zainal, 2004; Beekun & Badawi, 2005).

To address this gap, the present paper aims to define and structure **Collaborative Intelligence & Influence (CI²)** as a measurable and developable competence. Specifically, the paper seeks to:

1. Theoretically define CI² through a synthesis of cognitive, social, and behavioral models;
2. Position CI² within the VFC Competence Framework's Cognitive Psychology Dimension;
3. Develop a multi-layered framework integrating knowledge, skills, attitudes, and habits (KSAH);
4. Articulate progressive developmental levels from novice to expert;
5. Identify behavioral and conceptual indicators to inform future assessment and instructional design.

By achieving these objectives, the paper contributes to the refinement of collaboration as a **theoretically sound and contextually relevant competence**—not only for the future of work, but also for the development of ethically grounded, cognitively fluent youth leadership in the Global South and beyond.

2. METHODOLOGY:

This study employed a **conceptual and theory-building methodology** aimed at developing **Collaborative Intelligence & Influence (CI²)** as a structured socio-cognitive competence within the **Cognitive Psychology Dimension** of the VFC Competence Framework. Given the novelty of CI² as a formally integrated construct, the research adopted a **qualitative synthesis approach** (Jabareen, 2009), which allows for the

construction of theoretical frameworks by systematically integrating knowledge from multiple disciplines. Rather than testing predefined hypotheses, the study sought to define, refine, and scaffold a competence model that merges theoretical constructs from cognitive psychology, social learning, organizational behavior, and digital collaboration.

The literature base informing this study was curated using **purposeful sampling**. Peer-reviewed academic sources from 2000 to 2025 were selected across domains including team science, metacognition, empathy neuroscience, human–AI interaction, psychological safety, and intercultural leadership. Foundational frameworks such as the Transactive Systems Model (Gupta & Woolley, 2021), COHUMAIN (Gupta et al., 2023), and the psychological safety construct (Edmondson & Lei, 2014) provided key architectural inputs for the cognitive and social scaffolding of CI². These were triangulated with developmental models like the KSAH-based learning taxonomy in the VFC Competence Framework (AbdelMohiman & Salem, 2025) and the competence-based learning outcomes structure by Sanchez and Ruiz (2008).

The methodological process followed a four-stage iterative design. First, **framework mapping** was conducted to identify and align key constructs (e.g., shared mental models, theory of mind, adaptive influence) within the VFC structure. Second, a phase of **theoretical integration** synthesized these elements to formally define CI² as a layered, developable competence. Third, the construct was operationalized through the **KSAH model**, assigning knowledge, skill, attitude, and habit outcomes across progressive development levels. Fourth, a **synthesis and internal validation phase** reviewed the coherence and translatability of the model across use cases, with special attention to educational and organizational design applications. Throughout this process, thematic saturation and internal coherence were prioritized over empirical generalizability, consistent with **constructivist grounded theory principles** (Charmaz, 2014).

3. LITERATURE REVIEW:

3.1 From Collective Intelligence to Collaborative Intelligence:

The shift from the traditional model of shared intelligence (CI) to the Abyssinian model of CI² signifies a major renaissance in the observational understanding of performance and cognition in collectives during current research. It goes beyond the traditional view in CI that focused on dependent emergence of group effectiveness through aggregation of individual inputs, and instead conceptualizes the functioning as an adaptive cognitive system (Gupta et al., 2023; Chew & Mohamed Zainal, 2024), rooted in situational synchronicity and interdependency through tacit coordination and sense-making, bedrocked by real-time interaction.

Collaborative intelligence focuses on the deliberate coordination of mutually individual cognitive and emotional assets. This is in contrast to prior models — which describe passive information pooling or problem-solving; CI² incorporates meta-awareness, shared attention, and distributed regulation of memory and reasoning (Gupta et al., 2023). This means it goes beyond just having diverse minds, but rather means their contributions are scaffolded by an environment of trust, adaptive influence, and transparent flow of knowledge — especially with hybrid or AI-augmented teams (Nguyen & Gonzalez 2022; Steyvers & Miller 2020).

Moreover, the relevance of CI² is amplified in sociotechnical environments, where decision-making is increasingly mediated by machine agents. The *COHUMAIN* research agenda (Gupta et al., 2023) advances the notion that collaborative intelligence is not only a human capability but a systemic function of human–AI interaction. Transactive systems models, such as TSM-CI, offer a framework for understanding how collective memory,

attention, and reasoning can be optimized across distributed networks, including both humans and AI agents.

In the context of the **VFC Competence Framework**, CI² is best understood as a meta-competence that spans the Cognitive Psychology Dimension's social domain. It encompasses both *collaborative cognition*—the shared processing of tasks, roles, and goals—and *collaborative influence*—the ethically grounded modulation of team dynamics. Positioned within the emerging demands of digitally-mediated, globally-distributed environments, CI² is essential for empowering youth and organizations to build inclusive, future-oriented decision-making ecosystems.

3.2 Foundations in Individual and Social Cognition:

Research on collaboration has been a major content of recent cognitive science literature where cognitive load and meta-cognition affect the quality of collaboration (Kirschner, Sweller, & Clark, 2006; Gupta et al., 2023). Concerning team interactions, for example, they still face constraints in how much simultaneous information and out-of-sequence processes (such as working memory or attentional control) individuals can process. Group dynamics introduce noise — interruptions, conflicting cues, emotional friction — and the necessity of managing cognitive resources to help maintain alignment and trust (Sweller, Ayres & Kalyuga 2011).

It also brings metacognitive regulation to the fore as an essential ingredient of collaborative fluency. It prescribes how one determines his or her understanding, what one expects another to understand, and which should then be modified in response (Lajoie et al, 2015). These metacognitive behaviors are also instrumental for co-regulating cognitive effort across team members in collaborative settings so that teams can form common problem representations and respond adaptively.

Also of crucial importance is the development of social cognitive abilities like theory of mind (ToM), social perception, and cognitive empathy. They enable people to make inferences about the intentions, beliefs, and emotions of others - a necessary first step for effective real-time coordination, influence, and trust (Zaki & Ochsner, 2012). Recent research in ToM has expanded beyond developmental psychology to high-stakes group settings, showing considerable benefits of increased accuracy in mentalizing on negotiation performance (Koster-Hale & Saxe, 2013) for team decision quality and ethical reasoning in pluralistic groups (Gupta et al., 2023).

The context is also more complex in hybrid and AI-mediated environments, making social cognition even more multidimensional. The capability to build dynamic mental state models of others, including artificial teammates, is fundamental for successful human–machine teaming. This fostering has culminated in the formulation of computational models such as MToM, in which is that AI systems are trained to predict human goals and cognitive states that require necessary coordination (Nguyen & Gonzalez, 2022). Indeed, the future of collaboration may necessitate a keen ability to flexibly mentalize across human and non-human actors, a capability that holds promise at the frontier of collaborative cognition.

In addition, researchers previously thought that cognitive skills alone mediated EI; however, social-affective mechanisms are now found to be crucial in the area of interpersonal competencies, e.g., emotional attunement and accurate interpretation of interpersonal stimuli. Simply put, teams have better conflict resolution and more consistent collective performance when they exhibit high levels of empathic accuracy and emotional co-regulation (Mayo & Woolley, 2021). It is at the very heart of CI², being able to think with clarity and relate with care.

Ultimately, CI² stakeholders experience a dance between metacognition, cognitive load management, theory of mind, and empathic adaptability, providing the rhythm to their beautiful composition. This is the CI² foundation. These abilities combined equate to an

individual's capacity to participate in and actively influence the evolving group cognition. Accordingly, CI² is more than mere social sensitivity; it is also the empirically observable manifestation of cognitively-informed social synergy.

3.3 Emergent Team Cognition and Group-Level Constructs:

While the individual cognitive and social processes provide a basis for collaboration, CI² emerges with relevance at the group level through emergent cognitive systems. Key concepts are Shared Mental Models (SMMs), Transactive Memory Systems (TMS), and Group Metacognition, enabling coordinated attention, distributed knowledge, and adaptive reasoning across teams. Systematically, this is the cognitive architecture of high-performing collectives, and it is how CI² can be operationalized in practice.

Mathieu et al. (2000) further defined Shared Mental Models as common underlying cognitive representations of task, team roles, and expected procedural activities among the group members. These teams in the work environment or army units often employed shared mental models to anticipate each other's needs, adapt without explicit communication, and maintain coherence under rapidly changing circumstances (Cannon-Bowers et al., 1993). The accuracy of the mental models of group members is essential for their convergence, and as a result, cognitive similarity changing during group interaction directly influences collective outcomes, Crucially, shared cognition is not a fixed role: it develops through sustained interactions, trust formation, and mutual surveillance that are all mediated by the cognitive empathy capacity of its team members and their ability to take the perspective of other teammates (Marks et al., 2001).

More proximal to the team task, Transactive Memory Systems (TMS) describe the shared knowledge of "who knows what" in a group and the procedural systems for retrieving that knowledge when required (Wegner 1987; Lewis 2003). It enables cognitive economy, allowing people to specialize without redundancy (because the overall workload is larger than any one person's) and rely on others for information beyond their domains. because it is especially in interdisciplinary and hybrid teams that this system really adds value, as these are the groups where genuine collaboration relies not just on an individual's knowledge but also their recognition and esteem of others' expertise [24]. Research has consistently demonstrated that highly evolved TMSs may be greatly associated with innovation performance, even Knowledge integration, and collective intelligence (Yoo & Kanawattanachai, 2001; Kim et al., 2016).

Aside from these structural features, Group Metacognition functions as a mediating device for communal speculation and contemplation. Chiu and Kuo (2009) define group metacognition as a process whereby students monitor the work that they are completing, as well as challenge assumptions, and make decisions about strategy selection with respect to what is working best. This creates adaptive problem-solving — the group can see when what they are doing is not working and quickly pivot. Rogat and Linnenbrink-Garcia (2011) exemplify how metacognitive communication (which includes asking questions, confessing ignorance, and welcoming criticism) promotes richer participation in collective work and distributed leadership.

Working together, SMMs, TMS, and group metacognition allow what Woolley et al. The c-factor—what Woolley et al. (2010) call a measure of intuitive general collective intelligence. This mutual interdependence also highlights that CI² is more than just the sum of its parts; it is an emergent, dynamic capability based on mutual understanding, distributed trust, and reflexivity. These conceptualizations parallel the social criterion of the VFC Cognitive Psychology Dimension, placing CI² on a social spectrum rather than anchoring isolated social skills or emotional awareness by its robust cognitive integration and its orientation towards forward-looking collaboration.

3.4 Collaborative Influence: Contemporary Foundations of Social Power and Persuasion:

The influence component of Collaborative Intelligence & Influence (CI^2) represents a cognitively mediated social process through which individuals shape group understanding, facilitate decision alignment, and co-generate strategic action. In contrast to classical, hierarchical models of power, contemporary research conceptualizes influence as an *emergent function of trust, psychological safety, and cognitive legitimacy* within distributed and often hybrid teams (Glikson & Woolley, 2020; Gupta et al., 2023).

One of the most influential shifts in recent literature is the movement from *power over* to *power with*—where influence is constructed relationally, not positionally. Modern frameworks such as **transactive systems models of collective intelligence (TSM-CI)** (Gupta & Woolley, 2021) emphasize how influence flows through shared cognitive structures like trust-based attention allocation and real-time negotiation of meaning. Here, individuals exercise influence not through dominance or coercion, but by demonstrating **situational credibility**, adaptive perspective-taking, and cognitive empathy (Gupta et al., 2023).

Further, recent findings on team synchrony and communication equity indicate that dominance remains sustained in more positive attitudes when influence is a dialogic practice that allows for the coconstruction of meaning (Woolley & Gupta, 2023). Such teams play to tend to the collaborative influence is about turn-taking, attentiveness, and co-reflection — behaviors that engage in more processing of information deeply, reduce bias for hierarchy, and enhance a sense of tandem empowerment. This reflects a modern perspective that influence should lead not only to agreement but cognitive elaboration and dissent toleration (Mayo & Woolley, 2021).

In digital or AI-enhanced teams, influence dynamics become more complex. Research in *human–AI trust calibration* shows that for influence to be credible in sociotechnical systems, actors (human or artificial) must exhibit both reliability and explainability (Glikson & Woolley, 2020). Transparent reasoning, ethical alignment, and perceived benevolence are increasingly important predictors of influence effectiveness in human–AI collaborations (Nguyen & Gonzalez, 2022; Gupta et al., 2023). As such, digital collaborative environments demand higher **cognitive fluency**, not merely social charisma.

And there is also the presence of cultural dynamics, which further affect performance in teams that are both multinational and multi-identity. If past research had focused much on more classical dimensions as empathy or assertiveness, for power distance, the new one allows arguing for contextual agility as a capability to switch between tactics of influence while conformation to the affordable by time and progressive organizational attitude towards a diverse sensitive society (Chew & Mohamed Zainal, 2024). The Collaborative influence in global teams tends to follow indirect influence pathways (story-framing, emotional modulation, and resonance with shared values) of impact, and especially so with non-Western cases.

Last but not least, Psychological Safety still is one of those few elements that stands out to be the major enabler for a psychological influence. Team members with high levels of psychological safety are not only encouraged to express their opinions, test their ideas, and provide feedback from teammates but also are allowed to shift boundaries that help in both providing as well as interviewing influence (Edmondson & Lei, 2014; Gupta et al., 2023). In this sense, influence is not about a quid pro quo, but something much bigger and more profound: fostering the kind of motivation, confidence, and behavior change that moves with shared cognitive (beliefs) and ethical parameters.

4: THEORETICAL FRAMEWORK:

4.1 Positioning CI^2 within the VFC Framework:

The **VFC Competence Framework**—a developmental model integrating Functional Expertise, Cognitive Psychology, and Visionary Management—was conceived to address growing gaps between educational outputs and the multifaceted demands of 21st-century organizational ecosystems (AbdelMohiman & Salem, 2025). A critical set of competencies that are relevant to internal cognitive processes, affective regulation, and interpersonal functioning is located within the Cognitive Psychology Dimension in this triadic system. Of the keystone social-domain competences, Collaborative Intelligence & Influence (CI²) is a critical factor and encompasses the integration of social cognition, team-level coordination, and morally responsible influence.

CI² represents more than teamwork or social cohesion—it reflects a *competence of coordination*, embedded in shared cognition, trust calibration, and co-influence across human and hybrid systems (Gupta & Woolley, 2021; Steyvers & Miller, 2020). It aligns directly with the VFC Framework's imperative to go beyond static skills by scaffolding developmental capacity using the **KSAH model**: Knowledge, Skills, Attitudes, and Habits. This alignment ensures that CI² is conceptualized not merely as a behavior but as a developmental trajectory that matures over time and can be assessed, trained, and embedded into performance systems (AbdelMohiman & Salem, 2025).

Positioned in the Social Domain of the Cognitive Psychology Dimension, CI² models this dynamic interaction among social sensitivity, metacognitive regulation, and shared reasoning. It operationalizes the foundational constructs as defined by Bandura (1997) and Goleman (1995); yet, it takes into account developments in context such as remote collaboration, cultural complexity, and AI-mediated communication (Glikson & Woolley, 2020; Gupta et al., 2023). This makes CI² uniquely suited to empower youth and mid-career professionals to function not only as participants but as facilitators of group intelligence and shared decision-making processes.

In practice, the inclusion of CI² in the VFC Framework answers three critical developmental needs:

1. **Cognitive coherence in collaboration:** CI² uses shared mental models (SMMs) and Transactive memory systems (TMS) to align teams at the thinking level instead of just the task level (Woolley et al., 2010; Mayo & Woolley, 2021).
2. **Trust-based influence:** The ethical influence of CI² is separate from manipulation, where the leadership of CI² can be further emphasized in high-context and culturally diversified teams based on psychological safety and point-of-reference credibility (Chew & Mohamed Zainal, 2024; Edmondson & Lei, 2014).
3. **Transferable impact**: social and collaborative competencies like CI² are basic building blocks for HR transformation, distributed leadership, and post-conflict organizational renewal (AbdelMohiman & Salem, 2025).

4.2 Definition and Scope of CI²:

In this paper, we define CI² as the collective intelligence and influence for both cognitive activity in either communicating information or co-creating knowledge, and for social processes of influencing shared action whilst defining the socio-cognitive capacity to lead to epistemic systems composed of digitally mediated networked environments. An executive function of a sort, but one that involves not only individual cognition (e.g., metacognition, attentional control), but also social cognition (e.g., theory of mind, perspective-taking) and group-level coordination systems (e.g., shared mental models, trust calibration, as well as co-regulated influence loops).

This conceptual tool operationalizes collaborative capacity as a skill supported by capability-building efforts in a setting that can be assessed through co-reflective long-term behaviours, flexible feedback, and situated decision making (Glickson & Woolley, 2020).

CI² even applies beyond human–human teamwork, but encompasses those where humans and AI team. In such settings, control needs to be controlled across biological–

computational agents where transparency, interpretability, and ethical answerability are mandated (Gupta et al., 2023; Nguyen and Gonzalez, 2022). Therefore, CI² is located at the intersection of cognitive fluency, emotional trust, and socio-technical adaptability.
service as a cross-cutting enabler to capabilities within Visionary Management and Functional Expertise, respectively, within the VFC Competence Framework (AbdelMohiman & Salem, 2025). It is the behavioural and cognitive infrastructure enabling high-performing, ethical, and future-ready collective action.CI² is located in the social domain of the Cognitive Psychology Dimension and provides an internal

4.3 Components of the CI² Competency:

The development of Collaborative Intelligence & Influence (CI²) as a structured competence within the VFC Framework requires clarity on its core dimensions. Drawing from interdisciplinary research in cognitive science, psychology, and organizational behavior, this section outlines four interdependent components that together constitute the CI² architecture: **Collaborative Cognition**, **Collaborative Influence**, **Trust Calibration and Psychological Safety**, and **Cognitive Adaptability and Perspective-Taking**. These components form the functional scaffolding of CI² and are operationalized through the KSAH model within the VFC framework (AbdelMohiman & Salem, 2025).

4.3.1. Collaborative Cognition:

The ability of people and teams to co-process information, co-construct meaning, and co-regulate decisions together using systems of shared thinking is what we mean by collaborative cognition. This includes cognitive structures like Shared Mental Models (SMMs) or ecological systems — where team members meld around tasks, roles, and strategies at an alignment-level (Mathieu et al., 2000), or even Distributed Cognitive Systems in terms of information overlap is king (Wegner, 1987; Gupta & Woolley, 2021). Research on group metacognition also suggests that strong teams are vigilant, periodically reflecting upon their collective reasoning to determine whether they need to adjust in cases of uncertainty (Chiu & Kuo, 2009).

4.3.2. Collaborative Influence:

Collaborative influence is the art of deliberately and ethically influencing (which also engenders shaping) the dynamics of a collection so that the collective intelligence, will, and momentum are aligned. This aligns with a new view of leadership as the exertion of influence through credibility, emotional resonance, and shared vision instead of traditional models based on hierarchy or coercion (Glikson & Woolley, 2020). Chew & Mohamed Zainal (2024) argued that influence in digitally mediated teams is mostly performed through communication transparency, credibility signaling, and inclusive feedback cycles. This component probably overlaps with the social domain of personal efficacy and interpersonal decision-making of VFC.

4.3.3. Trust Calibration and Psychological Safety:

Trust is one of the most foundational substrates of CI². Collaborative reasoning does not work without it because skepticism and role ambiguity would bring it all crashing down. While these two types of trust have been already pointed out by contemporary studies, one that is cognitive meaning the confidence in other competence, and another is affective — which refers to emotional security and shared vulnerability (Edmondson & Lei, 2014) — they are key for psychological safety. Trust calibration in hybrid or cross-cultural teams also leads to a dynamic process of adapting the beliefs about reliability and intent of other team members based on behavior and context (Glikson & Woolley, 2020). One of the most critical developmental markers (an advance in competence) that a workgroup can achieve is its capacity to establish psychological safety, which means that team members feel safe to voice opposition and error and risk vulnerability with one another.

4.3.4. Cognitive Adaptability and Perspective-Taking:

The third, and final, core ability is the capacity for mental frame changing — to see things differently and to role-play alternate viewpoints as group dynamics evolve. Drawing inferences about unspoken beliefs and intentions is mediated through Theory of Mind (ToM) capabilities that have enabled the thought of contracting with God on moral behavior in times less dire than die-and-go-to-hell exhortations. Cognitive empathy and perspective-taking furthermore enable team members to perceive emotional and cultural signals, especially within the context of multicultural or virtual teams (Zaki & Ochsner, 2012).

In combination, these four constructs define CI^2 as a complex set of capacities—the enactment of which cannot be reduced to basic interpersonal skills or generic collaboration—that enables groups to function well over time, which we consider the moral essence and basis of sustainable and high-performance collective behaviour. In later sections, this holds the foundation of observable behaviors and learning outcomes mapped in the KSAH model discussed.

4.4 Integrated Socio-Cognitive Model:

The components of CI^2—collaborative cognition, collaborative influence, trust calibration, and cognitive adaptability—coalesce into a unified **socio-cognitive model** that conceptualizes the dynamic architecture of collaborative functioning. This integrated model reflects the VFC Competence Framework's emphasis on **cognitive-social interdependence** and developmental layering via the KSAH model (AbdelMohiman & Salem, 2025).

At its core, the model is **multi-layered**:

- **Individual-level cognition** involves metacognition, attention regulation, and theory of mind, such as self-reflection and perspective-shifting (Koster-Hale & Saxe, 2013; Zaki & Ochsner, 2012).
- Humans share **interpersonal mechanisms** for mutual watching, feedback exchange, and influence loops (Edmondson & Lei, 2014; Glikson & Woolley, 2020).
- At the **team level**, shared mental models (Mathieu et al., 2000) and transactive memory systems (Gupta & Woolley, 2021) facilitate distributed cognition and enable group-member reasoning as well as cognitive alignment leading to adaptive performance.

Together, this provides an interactive feedback system: cognition is informed by social signals and context-specific cues that are dynamically integrated within reflective regulation. The model has relevance for both human and AI-augmented settings, thereby positing CI^2 as a core skill to address challenges when collaborating in sociotechnical environments (Gupta et al., 2023; Nguyen & Gonzalez, 2022).

Graph (1): Integrated Socio-Cognitive Model of CI^2.

4.5 Developmental Implications:

The developmental potential of CI^2 lies in its capacity to evolve across experience, training, and reflection. Positioned within the **KSAH structure** of the VFC Competence Framework, Collaborative Intelligence & Influence (CI^2) is not a fixed trait but a competency scaffolded through **experiential practice**, **metacognitive feedback**, and

longitudinal habit formation (AbdelMohiman & Salem, 2025). Domain-specific learning interventions are available to specifically target each of the four CI² components—collaborative cognition, influence, trust calibration, and adaptability—and can engage cognitive and emotional systems.

For instance, doing team-learning exercises through simulation can facilitate shared mental models and trust dynamics (Mayo & Woolley, 2021), and role-swapping activities can help to develop a theory of mind and reduce perspective-taking rigidity (Zaki & Ochsner, 2012). Human–Machine Interaction Labs can be established to train trust calibration (Gupta et al., 2023) and ethical influence across system boundaries in AI-augmented teams.

These strategies are especially relevant in programs aimed at youth development, where the deliberate development of CI² competencies can enhance civic capacities, cultural intelligences, and leadership capacity into uncertain futures. By embedding CI² in digital, intercultural, and organizational learning systems, the VFC Framework offers a measurable and transferable pathway to scale collaborative capacity in complex environments.

5. What Does It Mean to Be Collaboratively Intelligent and Influential?

CI² describes a way of being that signifies the intersection of cognition, empathy, and co-agency in groups where members influence more than their participation, but the very structure and outcomes of the collective effort itself. It is a developmental maturity that combines such skills as self-regulation, social attunement, and the ability to build trust and ethical influence. This is how you can understand what it means to "be" collaboratively intelligent and influential in behavior and development, concerning the VFC Competence Framework.

5.1 Cognitive Clarity and Co-Processing:

It is essential to note that collaborative intelligent individuals consistently demonstrate cognitive transparency — verbalizing uncertainties and challenging common assumptions (Chiu & Kuo, 2009), while also monitoring the group's reasoning pattern. This goes beyond problem-solving—it requires guiding collective working memory, maintaining shared attention, and addressing overload. "Group metacognition coaches" support teams in hitting the pause button, reflecting on their process, and redirecting when necessary (Gupta & Woolley, 2021). If it is a little bit too abstract for you, here is how this would look in practice:

- Mapping group knowledge and knowledge gaps early in a project
- Prompting synthesis across divergent views
- Anchoring on visual scaffolds (e.g., whiteboards, mindmaps) to enhance discussion

Cognitively mature collaborators in AI-augmented teams also establish the lines where roles end and accountability flows — directing correct machine agents to provide supportive cognitive authority rather than unbalancing it (Nguyen & Gonzalez, 2022).

5.2 Ethical Influence and Feedback Intelligence:

Collaborative influence, as per CI², is not about being persuasive or charismatic, but rather its ability to modulate group dynamics through credibility, empathy, and timing. It has an effect, not a deceptiveness: it is affected by; it goes. Those with experience in this area know when to push, when not to, and how to root conversations in values or facts. They engage with feedback as a co-creative process rather than a monologic critique, demonstrating how to disagree gracefully and request improvement collaboratively (Edmondson & Lei, 2014; Glikson & Woolley, 2020).

CI² behaviors would consist of these (in project cultures that are culturally diverse or that suffer from high hierarchy like for example, many Arab or Southeast Asian contexts):

- Offering feedback indirectly but clearly
- Framing influence in terms of shared purpose or collective honor (Chew & Mohamed Zainal, 2024)

- Navigating *wasṭa*-like social dynamics without compromising transparency

5.3 Trust Engineering and Psychological Safety Practices:

Where trust is not taken for granted, but actualized, collaborative intelligence flourishes. CI² brings in trust-building among the people. Trust-building appears in CI² through their behaviours like:

- Sharing partial thinking (e.g., "I'm not sure, but what if…?")
- Admitting errors early
- Modeling curiosity rather than dominance

These actions increase the psychological safety, which is mandatory for some intergenerational or cross-functional teams (Edmondson & Lei, 2014). For CI² practitioners, digital trust is built with hybrid or remote work by holding visible accountability to a high standard and meeting communication expectations by responding swiftly (Glikson & Woolley, 2020).

5.4 Adaptive Perspective-Shifting:

At the heart of CI² is a deep capacity to hold conflicting states and experiences — both cognitively and emotionally. This includes:

- Taking on opposing roles in debate to enrich understanding
- Switching from a detail focus to systems-level thinking
- Modifying communication to suit different sociocultural expectations

This is one reason why youth development can be so effective at providing young leaders with the skills necessary to bridge generations and cultures from a place of intellectual humility and social-emotional agility. VFC-informed programs teach them by requiring reflective practice, peer coaching, and simulated role play (AbdelMohiman & Salem, 2025).

5.5 MENA Region Cultural Anchoring:

In Arab and other high-context societies, CI² also adapts to **relational norms**:

- Influence often flows through trust networks (e.g., mentorship, elder guidance)
- Verbal deference may mask deep disagreement, thus requiring metacognitive listening
- Feedback is more easily accepted when framed as *nasiha* (advice rooted in care)

CI² learners in this region must learn to **balance respect for authority with strategic assertiveness**, often by mastering indirect forms of influence (Afiouni, 2014; Beekun & Badawi, 2005). The VFC Framework embeds such nuance through culturally adapted assessment tools and competency narratives.

5.6 Developmental Markers Across Life and Work Stages

CI² matures across life stages:

- In early adolescence, it appears as group-awareness, peer feedback sensitivity, and structured participation
- In higher education, it deepens through co-regulated learning, conflict navigation, and group project leadership
- In professional settings, it integrates ethical reasoning, cross-functional alignment, and mentoring capacity
- In leadership, it manifests as systemic thinking, psychological safety building, and vision anchoring through dialogue

CI² thus provides a **longitudinal scaffold** for leadership development across the VFC's Cognitive Psychology and Visionary Management dimensions (AbdelMohiman & Salem, 2025).

6. Data Analysis and Synthesis:

6.1 Purpose of the Analysis:

The purpose of this section is to synthesize empirical and conceptual patterns that validate **Collaborative Intelligence & Influence (CI²)** as a structured, observable, and

developable competence within the **Cognitive Psychology Dimension** of the VFC Competence Framework. While Section 5 established the theoretical architecture of CI², and Section 6 operationalized its behavioral expression, this section focuses on how CI² is reflected across research themes related to team cognition, influence, trust calibration, and adaptive reasoning.

The analysis draws on converging evidence from group science, learning theory, and hybrid collaboration models—including the **Transactive Systems Model of Collective Intelligence** (Gupta & Woolley, 2021), psychological safety literature (Edmondson & Lei, 2014), and VFC's empirical applications in post-conflict organizational development (AbdelMohiman & Salem, 2025). Together, these strands support the framing of CI² as both a *diagnostic category* and a *developmental target* in future-ready leadership formation.

6.2 Shared Cognition as a Predictor of Performance:

One of the most consistently validated predictors of team effectiveness is the presence of **shared cognition**—a collective awareness of tasks, roles, strategies, and informational distribution across team members. Two primary constructs in this domain—**Shared Mental Models (SMMs)** and **Transactive Memory Systems (TMS)**—are foundational to the collaborative cognition component of CI².

SMMs enable team members to "predict what other members will do and to coordinate their behavior without artificial communication" (Mathieu et al., 2000). Teams are better integrated when SMMs are present, especially under high-stress and high-risk conditions (Mohammed et al., 2010). In fact, for hybrid and remote teams where temporal and spatial separation can lead to misunderstandings (Woolley & Gupta, 2023), this alignment becomes even more critical.

TMS also enhances cognitive distribution by enabling team members to know who knows what, reducing redundancy and promoting trust-based delegation (Gupta & Woolley, 2021). We found that high-functioning TMS architectures are associated with innovation, more rapid decision-making, and fewer mistakes, especially in diverse and interdisciplinary teams.

In other words, TMS helps refine cognitive distribution that ensures team members are aware of who knows what and reduces redundancy, which allows for trust-based delegation (Gupta & Woolley, 2021). High-functioning TMS structures correlate with innovation, fast decision-making, and low error rates in heterogeneous teams.

In AI-enhanced teams, shared cognition is increasingly mediated by algorithms and user interfaces. Gupta et al. (2023) note that transactive systems can be extended to include AI agents, provided their contributions are explainable and their decision logic is transparent. These findings confirm that shared cognition is not only a predictor of performance but a **necessary condition** for activating CI² in human and sociotechnical systems.

6.3 Psychological Safety and Influence Calibration:

These two are not only central to the social efficacy of CI² but also directly tied to how much interpersonal influence quality is enjoyed and what degree of attendant psychological safety it engenders. In short, the repeated positive associations of psychological safety — a belief in which an individual or team believes their environment is conducive to taking interpersonal risks (Edmondson & Lei, 2014), with team learning behaviors and levels of trust and team adaptability are well-documented (cf. And the psychological safety of CI² is not assumed to be a passive condition, but an active process — created together through practices like epistemic humility, emotional vulnerability, and non-punitive responses to error.

Trust building—especially in the context of digitally mediated or AI-enhanced teams-should have a balanced calibration between competence, transparency, and benevolence (Glikson & Woolley, 2020). In these kinds of environments, power is earned based on cognitive and ethical behaviour, not hierarchy or role fixed position. In short, coordinated

influence in CI² depends on adjusting tone and timing (how strong/soft the message gets delivered… when) and controlled transparency to feedback loops within contexts.

More recent studies have found feedback intelligence as an actionable behavior for leveraging collaborative influence — the ability to seek, absorb, and apply feedback (Chew & Mohamed Zainal, 2024). A study of inclusive decision-making and improved conflict-resilience comes to a similar conclusion: It is not only about seeking feedback, but also about inviting it.

Collaborative influence may also be exerted indirectly (e.g., through storytelling, moral framing, or honor-based appeals) in high-context environments and cross-cultural intergenerational teams that require balancing assertiveness with relational attunement as leaders (Beekun & Badawi, 2005). These findings emphasize that CI² relies quite heavily on both situational awareness and ethical alignment.

6.4 Adaptive Cognition in Complex Collaboration:

ToM (Theory of Mind) [cognitive capabilities for attributing mental states to others] is needed to allow human collaborators to predict behaviors, resolve confusions, and prevent incorrect attribution of intent. (Koster-Hale & Saxe, 2013). Teams that have developed a high level of ToM agility can manage any interpersonal storm and are often ready to work again much quickly after conflict — especially in cross-functional or interdisciplinary environments.

Adaptive cognition in Hybrid and AI-augmented teams also means having the ability to simulate the logic and limitations of non-human agents (Nguyen & Gonzalez, 2022). CI² therefore encapsulates machine theory of mind — to infer intent and boundaries of AI operation to prevent overtrust or abuse.

What makes CI² effective, as opposed to merely procedural coordination, is the capacity to switch between analytical, emotional, and synthetic frames—the cognitive core of CI².

6.5 Synthesis – CI² as a Developmental and Diagnostic Construct

The thematic convergence across shared cognition, psychological safety, and adaptive reasoning substantiates **Collaborative Intelligence & Influence (CI²)** as a structured and scalable competence rather than an emergent personality trait. CI² can be **taught, observed, and evaluated**, particularly when grounded in the layered **KSAH model** embedded within the VFC Competence Framework (AbdelMohiman & Salem, 2025).

As a *developmental construct*, CI² progresses through increasing levels of behavioral sophistication—beginning with foundational social awareness and advancing toward co-regulatory leadership, trust-building rituals, and cognitive synthesis under uncertainty. These stages align with learning designs grounded in metacognition, experiential simulation, and emotional reframing (Sanchez & Ruiz, 2008).

Operationally, CI² involves characteristics like those outlined in the diagnostic construct—such as epistemic humility and transactive knowledge articulation, and adaptive use of feedback. The use of instruments — like scenario-based reflection, multi-source feedback, and collaborative task simulations — holds promise for empirical validation in cross-sectoral and culturally diverse environments (Cedefop 2017).

CI² thus represents a two-fold asset: on one hand, as an educational strategy for building capacity in translation science, and on the other hand, as a pronounced strategic signpost across practice domains which can help to identify talent, evaluate performance, and develop leaders.

7. Learning Outcomes – KSAH Model & Progression Levels:

The following learning outcomes for **Collaborative Intelligence & Influence (CI²)** are structured using the **VFC Framework's KSAH model**—capturing the **Knowledge, Skills, Attitudes, and Habits** required across progressive developmental levels, from **Novice to Expert** (AbdelMohiman & Salem, 2025). These outcomes translate the

theoretical framework of CI² into observable, assessable, and scaffolded competencies applicable across learning, leadership, and organizational systems.

7.1 Knowledge Outcomes:

To be collaboratively intelligent and influential requires a strong conceptual foundation in **team cognition, social learning, and ethical influence**. Individuals must understand how knowledge, reasoning, and trust are distributed and co-regulated across people and systems. Foundational knowledge areas include:

- **Shared Mental Models (SMMs)** and **Transactive Memory Systems (TMS)**
- **Psychological safety**, trust calibration, and ethical leadership
- **Theory of Mind (ToM)**, cognitive empathy, and emotional regulation
- Human–AI teaming principles, transparency, and machine mentalization

These domains provide the cognitive scaffolding necessary to interpret, facilitate, and ethically shape collaborative environments.

Progression Levels:

- **Novice**: Defines basic CI² concepts (e.g., SMM, ToM, feedback loops)
- **Intermediate**: Identifies examples of CI² mechanisms in teams or simulations
- **Advanced**: Explains and applies CI² concepts to analyze or resolve group issues
- **Expert**: Designs interventions, frameworks, or educational tools using CI² knowledge; mentors others in CI² theory and application

This knowledge base is essential for activating higher-order skills and adaptive decision-making in dynamic, hybrid, and interdisciplinary settings.

7.2 Skills Outcomes:

Collaborative Intelligence & Influence (CI²) Skill Dimension: The behaviors associated with the facilitation of human-in-the-loop groups to dynamically generate shared meanings, regulate shared cognition, and guide group direction in an ethical manner. Such capabilities are central to the challenge of closing the gap between knowledge and knowing how in more diverse, or hybrid, AI-enhanced contexts (Gupta et al., 2023; Woolley & Gupta, 2023).

Key skills include:

- Developing and Maintaining Shared Mental Models (SMMs) through the Use of Structured Dialogue
- Discussion of group meta-cognition (summarization/reframing/redirection)
- Offering and requesting feedback in a way that is emotionally intelligent and cognitively inclusive
- Variational control, including tonality, timing, and messaging through cultural and role hierarchies (Glikson & Woolley, 2020; Edmondson & Lei, 2014)

Progression Levels:

- **Novice**: Participates in collaborative tasks and mirrors skilled behaviors
- **Intermediate**: Initiates basic coordination and engages with structured feedback
- **Advanced**: Leads reflective cycles, co-facilitates group reasoning, and adjusts team norms
- **Expert**: Designs facilitation protocols, mentors others in CI² behavior, and resolves breakdowns in collective cognition.

These skill-based outcomes are essential for real-time collaboration, especially in contexts requiring ethical leadership, adaptability, and psychological safety.

7.3 Attitudinal Outcomes:

Attitudes form the **emotional, ethical, and motivational backbone** of Collaborative Intelligence & Influence (CI²). They shape how individuals approach uncertainty, dissent, power dynamics, and group interdependence. These attitudinal dispositions reflect internal commitments to ethical action, inclusive dialogue, and trustworthiness—especially within

multicultural, hybrid, or cross-hierarchical environments (Edmondson & Lei, 2014; Zaki & Ochsner, 2012).

Core attitudinal markers of CI² include:

- Openness to feedback and divergent perspectives
- Willingness to share uncertainty and co-construct meaning
- Commitment to inclusive decision-making and ethical influence
- Respect for psychological safety as a group responsibility

Such attitudes are especially critical in teams requiring distributed leadership and relational sensitivity (Chew & Mohamed Zainal, 2024; AbdelMohiman & Salem, 2025).

Progression Levels:

- **Novice**: Accepts feedback respectfully and responds without defensiveness
- **Intermediate**: Demonstrates willingness to invite and engage opposing views
- **Advanced**: Proactively promotes inclusion, shared responsibility, and learning from failure
- **Expert**: Models and mentors CI² values; promotes cultural, cognitive, and emotional safety in high-stakes settings

Cultivating these attitudes ensures that CI² is not merely performative but grounded in **genuine ethical engagement and reflective group citizenship**.

7.4 Habitual Outcomes:

Knowledge, skills, and attitudes are foundational, but it is the habits that solidify Collaborative Intelligence & Influence (CI²) as a durable behavioral identity. In this case, habits are identified as automated, context-sensitive routines to foster collaborative awareness, influence calibration, and trust continuity over the duration of time (AbdelMohiman & Salem, 2025; Sanchez & Ruiz, 2008).

Key habitual outcomes include:

- Regular team reflection: starting post-task debriefs, accepting the unknown, and leading collaborative change.
- Frequent practice of inclusive language and conversational repair tactics, such as re-voicing and dissent bridging.
- Micro-actions to build trust: recognition of effort, clearly setting intentions, and regular touchpoints.
- Reimagining structure: Handing over the microphone, giving a platform to those who are traditionally underrepresented, and shifting positionality at each gathering.

In high-complexity settings, this would give enduring psychological safety signals and facilitate group accountability, create shared mental models that drive successful team performance (Edmondson & Lei, 2014; Glikson & Woolley, 2020).

Progression Levels:

- **Novice**: Follows modeled collaborative routines within structured settings
- **Intermediate**: Independently adopts group-supportive behaviors across contexts
- **Advanced**: Designs and maintains collaborative rituals that support CI² culture
- **Expert**: Embeds CI² habits into institutional norms; mentors others in sustaining inclusive collaboration practices

Such habits ensure that CI² endures beyond moments of facilitation, becoming part of a person's leadership and social-learning repertoire.

8. CONCLUSION & FUTURE RESEARCH DIRECTIONS:

This conceptual paper has positioned **Collaborative Intelligence & Influence (CI²)** as a foundational competence within the **Cognitive Psychology Dimension** of the VFC Competence Framework—one that reflects the growing demand for cognitive-social integration in hybrid, multicultural, and human–AI collaborative ecosystems. CI² was

theorised to be multi-faceted, based on a combination of theory, behaviour, and developmental outcomes with shared cognition, trust-based influence, psychological safety, and adaptive reasoning as primary components. Moving means thinking moves beyond simply teamwork to be a package of developmental capabilities that retain ethical co-regulation, perspective-taking, and group-level reflection as its core (Gupta & Woolley, 2021; Edmondson & Lei, 2014; Zaki & Ochsner, 2012).

The paper also established that CI² is both **diagnostic and teachable**. The KSAH model articulated knowledge, skills, attitudes, and habits that evolve from novice to expert levels, making the competence not only assessable but also transferable across learning systems, youth leadership models, and organizational contexts (AbdelMohiman & Salem, 2025; Sanchez & Ruiz, 2008). By grounding CI² in both neuroscience and team cognition, the framework aligns with contemporary demands for inclusive, distributed leadership and lifelong learning ecosystems.

Even with its deep integration, empirical research of CI² is under-researched, especially in non-Western, youth-driven, and AI-assisted environments. A range of culturally-sensitive assessment tools should be designed to ground CI² across MENA, Sub-Saharan, and SEA communities, and many more should be evaluated for predictive ability against team resilience, civic agency, and ethical intelligence, especially among the post-conflict and transitional economies. The three priorities for future research are clear:

1. **Empirical validation** of CI² as a measurable competence using longitudinal, mixed-method studies.
2. **Development of scenario-based assessment tools**, especially in hybrid or virtual environments.
3. **Cultural calibration** of CI² indicators across Arab, African, and global majority contexts, including religious and value-based dimensions of collaborative influence.

By advancing these directions, CI² can become not only a theoretical model but also a practical educational and organizational tool to prepare for the 21st-century youth leader, equipped with cognitive fluency, ethical intelligence, and collaborative capability.

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