

3 Methodology

3.1 Setting

The Italian market landscape, characterized by the presence of regional industrial districts, provides a robust setting for examining IPO decisions and studying how proximity shapes organizational learning and isomorphic behavior. IPO activity has declined in the last years in Italy: the limited market participation underlines a deeper cultural and organizational characteristics of Italian SMEs, embedded in a bank-centric model.

3.2 Data and Variables

The current study assesses a sample of Italian SMEs conducting IPOs on the EXM, EGM, formerly AIM/AIMMA markets, from January 2015 to December 2024. Data integrates information from Borsa Italiana's official database and corporate data from AIDA. Following established methodologies in network studies, a dyadic analytical approach was adopted where the unit of analysis is a pair of firms (dyad), generating $N*(N-1)/2$ possible pairs, in a context of market adoption (Boschma & Frenken, 2010; Marsden & Campbell, 2012; Garcia-Pont & Nohria, 2002; Gang Peng *et al.*, 2014). From the initial sample of 233 valid companies, the pairs were constructed considering firms going public within a two-year temporal window, generating 12,609 pairs. Pair-level filtering then removed 2,991 pairs (23.7%) lacking complete data, resulting in a final analytical sample of 9,618 companies.

The dependent variable was operationalized as the timing difference between IPO events, measured as the absolute time-related distance in days between the listing dates of two companies in each dyad: $T = |IPODate_i - IPODate_j|$, where $IPODate_i$ and $-IPODate_j$ represent the respective listing dates, taking inspiration from the methodology of Mascia *et al.* (2018).

Physical proximity was measured through complementary indicators: physical distance (linear distance in kilometers between companies' registered offices, calculated using the Haversine formula to account for Earth's curvature) (von Graevenitz *et al.*, 2021), and regional co-location (binary variable indicating whether companies are located in the same administrative region). Cognitive proximity was captured through sectoral similarity (Garcia *et al.*, 2018) (binary variable indicating whether companies operate in the same sector based on the first two digits of ATECO codes).

The model employed an OLS regression model to examine the patterns of time separation, controlling for multiple dimensions of organizational and contextual factors. Size effects were captured through a binary similarity measure (50% revenue ratio similarity), temporal controls included a COVID-period dummy (2020-2022) to account for pandemic-era market disruptions. The interaction term between physical distance and sectoral similarity was included to test the moderating effect of cognitive proximity on territorial proximity's influence (from Model 3 onward).

4 Results

The study revealed mixed results: the dynamics resulting from the effects of isomorphic pressures on adoption timing are complex and interdependent (See Table 1: regression results Model 4). The Physical Proximity variable (distance) showed a statistically significant but modest positive effect, supporting H1: each additional kilometer of separation added approximately 0.03 days to the timing differences between IPOs. However, the cumulative effect was more evident for firms located further apart (e.g., Milan-Naples ~770km), experiencing timing differences of approximately 23 additional days.

H2a was not supported by the findings: contrary to more simplistic imitation theories, firms pertaining to the same sector showed longer time-related differences in their IPO decisions (+16.8 days), reinforcing evidence for strategic differentiation, where similar companies space market entries to avoid direct competition.

Institutional embeddedness, operating through regional networks, promoted synchronized strategic decision-making, reflected in the Same-region variable with shorter timing differences (-12 days).

BEYOND INDIVIDUAL COMPETENCES TOWARDS COLLECTIVE INTELLIGENCE: A SYSTEMATIC LITERATURE REVIEW

Research Idea

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Abstract

A new research stream on Collective Intelligence (CI), defined as a “group’s general ability to perform consistently well across a wide variety of tasks” began in 2010. Subsequent empirical research presents a mixed picture and the term has been entrusted with many synonyms. Overall, CI appears to be a phenomenon that is inherently complex and difficult to define. While the term is widely used across various disciplines, ranging from organizational studies to artificial intelligence, there remain a lack of consensus on its precise definition. The aim of this article is to clarify the concept of the CI and offering a new definition that highlights all the components of the CI through a systematic literature review (SLR). From SLR of 400 papers concerning the objectives of the study, the key areas of focus, theoretical models, and research gaps are identified. Future research avenues are suggested.

Keywords: Collective Intelligence, Organizational Learning, Teamwork, Learning Process, Systematic Literature Review.

1 Introduction

As organizations grow more complex, we often wonder: what kinds of intelligence enable them - intentional systems of people and resources - to achieve their goals, and how do these intelligences operate? An organization can be seen as a collective of individuals pursuing a shared purpose. While individual intelligence is essential for purposeful action, it is worth asking whether the sum of individual intelligences alone guarantees effective organizational performance. It may be necessary - but not sufficient. The literature has addressed the concept of organizational intelligence, understood as an organization’s ability to generate knowledge and use it strategically to adapt to its environment (Halal, 1997). However, today, boundaries have become limitations rather than protection. In the current phase of global hypercompetition - marked by the integration of digital technologies into products and services - competitive advantage is increasingly built by shaping the digital environment through value co-creation within a network of interconnected firms (Kock & Windsperger, 2017). Even the definition of social intelligence (Thorndike, 1920) presents a partial view of the intelligence organizations develop to fulfill their goals, as it focuses only on human relationships. This raises doubts about whether individual intelligence is the only form that matters. These models of intelligence do not adequately address the growing environmental complexity in which organizations operate, nor do they tackle the challenges of human-machine interaction - especially in a competitive context where innovation, in all its forms, results from co-creation within a network of organizations characterized by their available resources.

In this scenario, Collective Intelligence (CI) gains importance due to its ability to transcend rigid boundaries and open up to relationships mediated by digital technologies.

A digital platform-based business model is a clear example of how CI is captured and nurtured to produce a multiplicative effect on participants' innovation capabilities. This is achieved through platform design rules and standards that have evolved over time to support the expansion of the platform's core functionalities (Tiwana, 2014).

In a de-structured and loosely bounded environment like that of a digital platform, a multitude of individuals - who may not know each other - are called to collaborate. In such contexts, the concept of CI becomes especially relevant. It plays a central role when, in the absence of a formal organizational structure, it becomes necessary to connect people with diverse skills and attributes in order to pursue a shared objective.

A review of the literature has helped refine the definition of CI and highlight a level often overlooked in organizational research: the inter-group level. CI involves not only internal (intra-group) dynamics but also interactions between groups (inter-group), which has significant operational implications for assessing the quality of inter-group collaboration.

Our study explores the concept of CI through a systematic literature review. First, we aim to clarify its conceptual boundaries by identifying the core components that enable it to function. Second, the study provides a basis for operationalizing the concept, in order to strengthen organizations' ability to navigate the complexity of the competitive environment. Finally, the study contributes to the ongoing debate on the various levels and types of intelligence by proposing an operational definition of CI.

2 Theoretical Background

The popularity of the CI research area has increased significantly, especially considering the digitalization of production processes and more recently the advent of Artificial Intelligence (Berditchevskaia et al., 2022). The term CI was introduced by Charles Spearman in 1904 starting from general intelligence and taken up by Woolley et al. (2010), that have transposed it from an individual dimension to a group dimension. Since this period, the various applications of CI have expanded across a broad range of research fields, including sociology, psychology, biology, management, economics, and computer science, among others (Malone & Bernstein, 2015). Woolley et al. (2010) definitively take up the concept of CI by investigating no longer a purely individual dimension but a group dimension. This last step is fundamental in the definition of this construct because previously CI was seen as a combination of different individual intelligences that together led to CI, but the focus always remained on the individual. Subsequently, Woolley et al. (2010) move from this more individual assumption to study CI in its entirety, at the group level, bringing the individual dimension to a secondary level.

A first relevant point is the persistent lack of clarity about the meaning of CI. Intelligence itself remains vaguely defined, though most literature agrees it represents a general cognitive ability involving information processing and environmental adaptation (Schlinger, 2003). Our investigation aims to provide a relevant contribution to the literature on CI. First, we aim to clarify the boundary of CI, which means we will define the components that activate CI. In addition, our work provides new theoretical insights, meaning that we are introducing fresh perspectives or ideas that can deepen the understanding of CI. Thus, we propose a potential refinement of the CI definition. This means that we might suggest an updated definition of CI based on our findings. Therefore, our concept of CI is that of a dynamic process that implies the ability of individuals to adapt suitably and flexibly to a variety of routines, successfully overcoming the challenges that arise from the context. Indeed, always based on our definition CI is not merely additive but multiplicative of the individual capabilities. The interaction between individuals within a group can lead to synergistic effects, where the combined abilities result in outcomes that would not be possible if the individuals worked independently. Additionally, the group must be capable of integrating and utilizing these differences productively. Thus, because of the multiplicative effect raised by CI, the group should be able to leverage the individual differences and manage differing opinions and possible conflicts.

3 Methodology

A Systematic Literature Review (SLR) is chosen because, compared to a narrative literature review, this methodology represents a more impartial, transparent, and reliable process for planning, conducting, and reporting a literature review (Tranfield et al., 2003). The primary intention of this paper is to analyse the state of the art regarding the topics of CI. Guided by the research question: "How can we define Collective Intelligence in Organizational studies?", this analysis aims to explore the scope and depth of the academic discourse on these topics. The researchers explored the Web of Science database alongside Google Scholar using the search keywords shown in Figure 1.

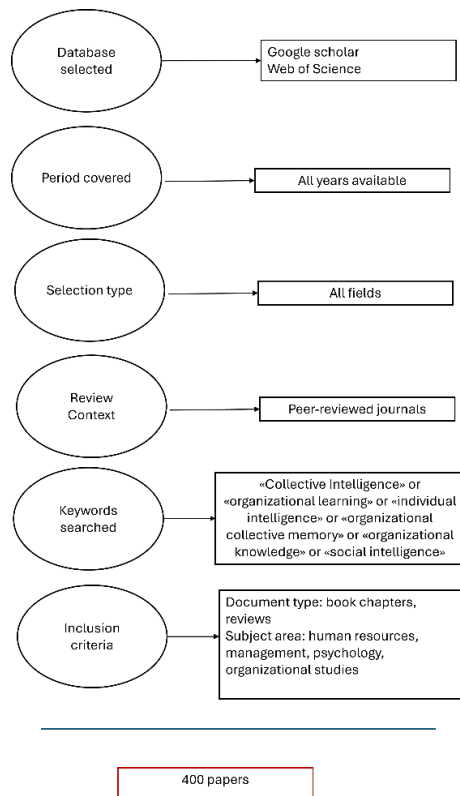


Figure 1. Sample extraction procedure.

4 Findings

It is possible to state that CI has been analysed under three main strands.

The first is the psychological and sociological one, starting from the studies of Glynn (1996) who sees organizational intelligence (a construct, in those years, studied as a synonym of CI) functioning in an identical way to individual intelligence. There are then some developments with Shankar & Tewari (2021) who compare CI to collective emotional intelligence, paying attention not to the process of collecting and using information to achieve a goal but to the emotions that are triggered in the interaction between people. A second trend that sees the development of CI is that of computer science. Szuba (2001) and then Bonabeau (2009) were the first to explore the term in this context, fundamentally defining decision-making as a process that can be broken down into two tasks: generating potential solutions and evaluating them. Each of these tasks can be negatively affected by various human biases. A prime example of the power of numbers is the development of open-source software.

The third and final strand is the organizational one and it is the strand that also sees the most overlap between CI and other constructs such as knowledge management (Boder, 1996) and organizational learning/intelligence (term also taken from psychology). In this stream of research, authors such as Riedl & Woolley deserve a special focus (Riedl et al., 2021; Woolley et al., 2023). Woolley et al. (2023) first of all no longer looks only at individual intelligence but at group intelligence, precisely collective. In fact, they defined CI as “the team’s ability to work together across a wide range of tasks and can vary significantly between teams”. To focus even more on the team aspects, they examine how team structure leads to different behavioural manifestations of collective attention as evidenced in team speaking patterns. In summary, we decided to formulate our own definition of CI, since all the previous definitions do not take into account the recent developments in the field, nor do they reflect the changes in social, technological, and cultural dynamics that have influenced its practical application. Therefore, CI can be defined as: an ability that manifests when individuals are able to learn and/or adapt routines and implies overcoming their individual limits through collaboration and the support of the various skills and knowledge within the group. So, CI is a multiplicative process, not simply an additive one.

5 Discussion

This study stresses the need to better understand the components of CI, recently recognized as a distinct group trait reflecting the ability to perform complex tasks. CI shows that collaboration enables teams to solve problems more effectively than individuals, provided that conditions such as openness and psychological safety are ensured (Edmondson, 2019). Defining CI requires clarifying what *collective* and *intelligence* mean. Collectives differ from groups by their complexity and decentralized interaction. CI begins with individual abilities and unfolds through collaboration, where shared learning amplifies potential and leads to outcomes beyond individual capacities. As a multiplicative process, CI emerges through collective results rather than isolated moments, introducing uncertainty that leaders must learn to manage.

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