

Efficiency of Information Systems: Influence on Collective Intelligence and Organizational Agility

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Abstract

The main objective of this study is to analyze the effectiveness of information systems (IS) and its influence on collective intelligence and organizational agility within companies. In particular, the research explores how a well-designed and high-performing IS can facilitate collaboration between employees, improve knowledge sharing, and strengthen organizational responsiveness to market changes. The study also seeks to understand the extent to which collective intelligence acts as a mediator between IS effectiveness and organizational agility.

A mixed approach was used in this study, combining quantitative and qualitative methods to provide a comprehensive analysis of the phenomenon. A sample of 150 companies was selected to answer a structured questionnaire measuring the effectiveness of their IS, their level of collective intelligence and their organizational agility. In addition, 30 semi-structured interviews were conducted with company managers to deepen the understanding of the organizational dynamics around IS and their impact on internal collaboration and flexibility. Quantitative data were analyzed using multiple regressions and correlations, while qualitative data were explored using thematic analysis.

The results reveal a significant correlation between IS effectiveness and collective intelligence (0.62), as well as between collective intelligence and organizational agility (0.58). The study shows that companies with effective information systems benefit from better collaboration between their teams. This promotes collective decision-making and strengthens their ability to react quickly to changes in the market. The qualitative analysis confirms that IS facilitates knowledge sharing and allows for greater transparency in decision-making processes, which improves organizational responsiveness. Moreover, it has been found that collective intelligence acts as a key mediator between IS efficiency and agility, increasing the flexibility and adaptability of companies.

The theoretical implications of this study reinforce existing work on information systems, showing how they promote collective intelligence and organizational agility. From a practical perspective, the results indicate that companies need to invest in flexible and collaborative information systems to improve their overall performance. Information systems that facilitate knowledge sharing and cross-functional communication within teams are strategic assets for organizations looking to increase their responsiveness and competitiveness in ever-changing environments. It is also essential to promote a culture of collective intelligence to maximize the impact of information systems on organizational agility.

Keywords: Information systems; Collective intelligence; Organizational agility; Efficiency; Influence

1. Introduction

In a context marked by an acceleration of technological and organizational transformations, information systems (IS) play a central role in the performance of companies (Bell, Bryman, & Harley, 2022; Mignenan, 2023b). They are no longer limited to being operational support tools but are becoming strategic levers to stimulate collective intelligence (Mignenan, 2021c; Zentar, Ilahyane, & Douari, 2020) and strengthen organizational agility. These two dimensions – collaboration and adaptability – have become essential to meet the demands of an ever-changing economic environment.

Despite the growing importance of IS, their direct impact on collective intelligence and organizational agility is still little explored in the scientific literature (Ologeanu-Taddei, Gauche, Morquin, & Bourret, 2015). While the majority of research focuses on the isolated benefits of IS (such as operational efficiency or data management), few examine their influence on the ability of teams to collaborate, share knowledge, and respond quickly to emerging challenges. This gap is particularly problematic in a world where collaborative innovation and organizational flexibility determine the long-term success of companies.

The originality of this study therefore lies in its integrative approach: it proposes to simultaneously analyze the links between the perceived effectiveness of IS, collective intelligence, and organizational agility. This approach not only fills an academic gap, but also provides practical recommendations for business leaders looking to maximize the impact of their technology investments.

Thus, this research is part of a dual approach of academic relevance and practical value. By exploring these relationships from an innovative perspective, she answers a crucial question: how can information systems be optimized to foster the collaboration and flexibility necessary for contemporary organizations to compete? This questioning, at the crossroads of the fields of management, technology and organizational strategy, fully justifies the need for this study. However, in order to adequately answer the central question, three sub-questions are formulated below:

- What are the criteria that determine the effectiveness of an information system?
- How can a high-performance information system promote the creation and optimization of collective intelligence within teams?
- What specific mechanisms does an information system support to improve organizational agility, and how can organizations leverage them to become more flexible and responsive?

2. Literature Review

2.1 Effectiveness of Information Systems

An effective information system is generally defined by its ability to provide accurate, relevant, and timely information to relevant stakeholders (Hameed, Singla, & Goel, 2024). In contrast, information systems are defined as structured sets of technological, human, and organizational resources designed to collect, process, store, and disseminate information within organizations. According to DeLone and McLean (DeLone & McLean, 1992), the main criteria for evaluating the effectiveness of information systems include the quality of information, the quality of the system, and user satisfaction. These three dimensions ensure that an information system does not just collect and store data, but actively facilitates its transformation into actionable information. For other authors, the effectiveness of IS is measured by its ability to meet user needs, improve business processes, and support strategic decision-making. With this in mind, several studies (Mignenan, 2023a; Wang & Strong, 1996) show that the quality of information, in particular its reliability and relevance, plays a crucial role in strategic decision-making. In addition, the effectiveness of information systems depends on their ability to seamlessly integrate different information flows, reducing redundancy and ambiguity. In the same perspective, according to a study by Rdiouat et al. (2021), the agility of IS, i.e. its ability to adapt quickly to changes, is crucial to maintaining high organizational performance.

2.2 Collective Intelligence and Information Systems

Collective intelligence refers to the ability of a group to solve problems more effectively than an isolated individual (Mignenan, 2021a, 2022). Similarly, this intelligence refers to a group's ability to collaborate effectively to solve complex problems, innovate, and make informed decisions. It is based on the synergy of individual skills, open communication and knowledge sharing. Gill (2012) points out that social networks and collaborative platforms play a key role in mobilizing collective intelligence within organizations.

Levy (Lévy, 2013) introduced the concept of collective cyber-intelligence, where information systems and digital technologies allow groups to coordinate their efforts and amplify their collective know-how. In the context of

business, this translates into an increased ability to share knowledge and collaborate effectively.

More recent research (DeLone & McLean, 1992) demonstrate that collaborative systems based on information platforms can bring together the diverse skills and perspectives of employees. These systems improve interpersonal communication and facilitate co-creation. This strengthens collective intelligence in the organization. Therefore, a high-performance information system is a vector for strengthening collective intelligence, as it allows for the fluidity of information exchanges, real-time collaboration and access to centralized knowledge bases.

2.3 Organizational Agility and information Systems

Organizational agility is a company's ability to quickly adapt to market changes, new technologies, and customer expectations (Al-Dwairi, Al-Khataybeh, Najadat, & Rawashdeh, 2024). This agility implies structural flexibility, a culture of innovation and rapid decision-making. Brangier et al. (2015) discuss organizational agility as an essential managerial innovation to cope with contemporary transformations. Several authors (Hameed et al., 2024; Sambamurthy, Bharadwaj, & Grover, 2003; Seo, Cho, & Jo, 2024) identify three key dimensions of organizational agility: responsiveness, flexibility, and continuous innovation. A high-performance information system plays a key role in supporting these dimensions (Seo et al., 2024).

Well-integrated information systems provide better visibility into business processes and facilitate fast, informed decision-making, which is essential for agility. For example, the Business Intelligence (BI) model helps provide managers with real-time analysis of market data, allowing them to react instantly to opportunities or threats.

In addition, research such as that of Tallon and Pinsonneault (Al-Dwairi et al., 2024; Tallon & Pinsonneault, 2011) emphasize that the flexibility of information systems (including their ability to be updated quickly and integrate new features) is a key factor in organizational agility. This allows companies to quickly restructure their operations and change their strategies in response to changing market conditions.

2.4 Relationship between IS Effectiveness and Collective Intelligence

Effective information systems facilitate communication and information sharing, which are fundamental elements of collective intelligence. Collaborative platforms, knowledge management tools, and enterprise social networks allow employees to share their ideas and expertise, strengthening the organization's collective capacity to innovate and solve problems. A study by Marhraoui and El Manouar (2017) proposes a theoretical framework linking knowledge management systems to organizational agility, highlighting the mediating role of absorption capacity.

2.5 Relationship between Collective Intelligence and Organizational Agility

High collective intelligence promotes better adaptation to change, as organizations can quickly mobilize the knowledge and skills needed to respond to emerging challenges. Agile teams, characterized by open communication and effective collaboration, are better equipped to innovate and adapt to market fluctuations. Olive et al. (2019) explore agile team building with a focus on collective intelligence and human relationships.

2.6 Relationship between IS Effectiveness and Organizational Agility

High-performance information systems enable rapid decision-making, efficient allocation of resources, and adaptation to new technologies, which are essential elements of organizational agility. Agile information systems not only allow for better responsiveness to customer needs, but also for effective collaboration within the company.

2.7 Summary of Tripartite Relations

The effectiveness of IS positively influences collective intelligence by facilitating communication and knowledge sharing. This enhanced collective intelligence in turn improves organizational agility, allowing the company to adapt quickly to changes. Thus, IS plays a central role as a catalyst for collective intelligence and organizational agility.

3. Theoretical Framework and Conceptual Model

The study of the effectiveness of information systems (IS) and their influence on collective intelligence and organizational agility is based on several key theoretical frameworks. This sequence explores the theoretical bases underlying this complex relationship and proposes a conceptual model to articulate the interactions between these concepts. This model seeks to demonstrate how the effectiveness of information systems contributes to the optimization of collective intelligence and the creation of increased organizational agility (Hameed et al., 2024).

3.1 Theory adopted

To study the effectiveness of information systems and its influence on collective intelligence and organizational agility, several theories of management and information systems can be applied. Among these, two theoretical frameworks are particularly relevant: the theory of resources and skills and the theory of socio-technical systems.

➤ Resource-Based View (RBV)

Barney's Theory of Resources and Skills (RBV) (Barney, 1991) states that companies gain a competitive advantage by exploiting internal resources that are scarce, inimitable, and non-substitutable. Information systems, as strategic resources, play a key role in creating this advantage. An effective information system becomes a valuable resource for a company, as it allows it to manage information, coordinate processes, and facilitate decision-making.

By integrating collective intelligence into this framework, IS acts as catalysts to amplify the cognitive capabilities of the organization, allowing employees to collaborate, share knowledge and innovate together. This not only boosts individual performance, but also collective efficiency, improving the overall agility of the business.

➤ Theory of socio-technical systems

The theory of socio-technical systems, developed by Trist and Bamforth (Trist & Bamforth, 1951), examines how technological and social systems interact within an organization. This theory emphasizes the importance of alignment between technologies (such as information systems) and human processes. Information systems are only effective when they are well integrated with human and organizational capabilities.

According to this theory, collective intelligence emerges when employees can effectively interact with technology to solve complex problems. Additionally, organizational agility is enhanced when technology systems are flexible enough to support innovation and collaboration. Thus, the design and implementation of information systems must take into account human aspects to promote maximum collective intelligence and rapid adaptation to changes.

3.2 Proposal of a Conceptual Model

Based on the theoretical frameworks mentioned, we propose a **conceptual model** that links the efficiency of information systems to collective intelligence and organizational agility. This model illustrates the dynamic interactions between these three concepts, with a focus on the key mechanisms that promote the optimization of organizational performance.

❖ Components of the conceptual model

The conceptual model is made up of three components: Information System Efficiency, Collective Intelligence and Organizational Agility.

Indeed, 1) Information Systems Effectiveness (ISE) is manifested by (a) information quality, i.e. the ability of the IS to provide relevant, accurate and real-time information to users; b) user satisfaction, i.e. the measure of the adequacy between user expectations and the performance of the system and c) the quality of the system, which translates into the stability, reliability and flexibility of the IS to adapt to the changing needs of the organisation. second, 2) Collective Intelligence (CI) translates into knowledge sharing, i.e. a) the ability of the IS to facilitate the dissemination and exchange of knowledge between collaborators, b) enhanced collaboration, i.e. the use of technological platforms to encourage teamwork, co-creation and collective problem-solving and c) organizational learning which means the ability to transform experiences in collective capital of collective knowledge. Finally, 3) Organizational Agility (OA) consists of a) responsiveness, i.e. the ability of the IS to enable rapid decision-making in the face of market changes, b) flexibility, i.e. the ability of the IS to adapt to new requirements and integrate organizational changes in real time and c) continuous innovation which translates into the ability of the organization to innovate by relying on high-performance IS that support creativity and experimentation. Figure 1 below shows the conceptual model.

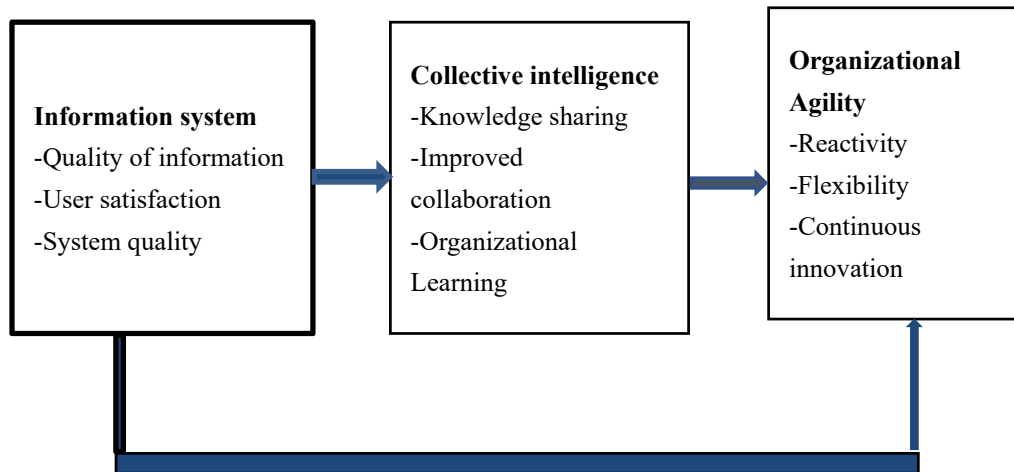


Figure 1. Conceptual model of research

Note. Spring. Literature review, author, September 2024

❖ Hypothesis Development: Relationships between Model Variables

The examination of the proposed conceptual model allows us to suggest three key hypotheses below:

Hypothesis 1. The efficiency of information systems has a direct influence on collective intelligence.

Indeed, a high-performance IS allows employees to share their knowledge more effectively, improve collaboration and create a more robust collective intelligence. Information systems also make it easier to collect and integrate ideas from all members of the organization, strengthening their ability to innovate together.

Hypothesis 2. Collective intelligence positively influences organizational agility.

When employees are able to collaborate and share ideas quickly and efficiently, the organization becomes more agile. Collective intelligence enables better responsiveness to changing market conditions, as teams can quickly identify threats and opportunities and adjust their strategy accordingly.

Hypotheses 3. The efficiency of information systems directly influences organizational agility.

A flexible and responsive IS allows the organization to quickly modify its processes, make informed decisions and adapt to new opportunities or threats. The IS thus becomes a lever for organizational agility, allowing for continuous innovation and better management of uncertainty.

Figure 2, developed for the purpose of synthesis, presents the conceptual model.

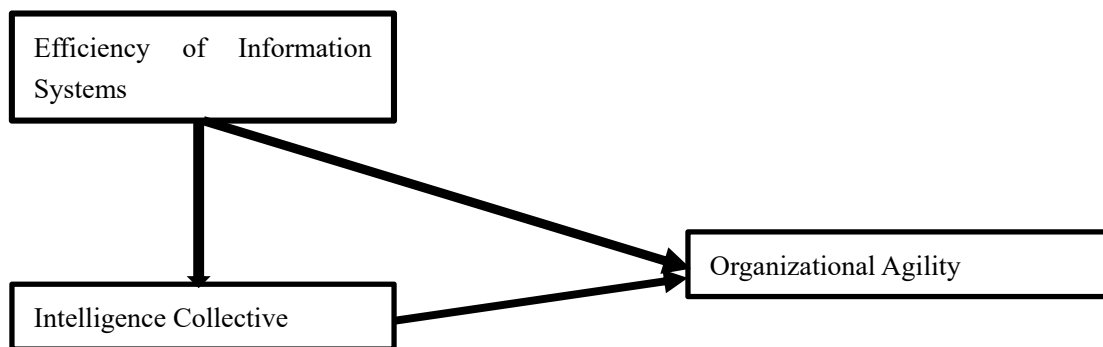


Figure 2. Purpose of synthesis, presents the conceptual model

In this model, the efficiency of information systems is the key factor that feeds both collective intelligence and organizational agility. Through a dynamic cycle, enhanced collective intelligence drives agility, enabling the organization to adapt quickly and remain competitive in a changing environment.

4. Research Methodology

To explore the influence of information systems (IS) efficiency on collective intelligence and organizational agility, we have implemented a rigorous methodology to produce and analyze relevant data. This sequence presents the sampling setting, data collection, and data analysis techniques used in this research. The objective is to ensure the reliability and validity of the results obtained to answer the research questions posed.

4.1 Sampling Frame

The sampling frame determines the target population of the study, as well as the method of selecting participants. As part of this research, the sample was selected to represent various companies according to their size, industry, and degree of digitalization.

❖ Target population

The target population of this study includes companies operating in various sectors in Africa, including industry, services, technology, and trade. The study targets companies that:

- ✓ Have already implemented integrated information systems (ERP, CRM, etc.).
- ✓ Have a workforce of more than 20 employees to be able to observe the effects on collective intelligence and organizational agility.
- ✓ Are in dynamic environments, where rapid adaptation to change is crucial.

❖ Sampling method

The sampling method adopted for this study is quota **sampling**, to ensure representation of a wide range of types of organizations, industries, and firm sizes. Quotas have been set to include:

- ✓ Small businesses (20-50 employees).
- ✓ Medium-sized companies (51-250 employees).
- ✓ Large companies (more than 250 employees).

❖ Sample size

To ensure the statistical reliability of the study, a sample of 150 companies was selected. This sample size allows for enough data to be collected to analyze differences between business types and industries, while reducing sampling bias. Each company has designated at least three respondents: an information systems manager, a senior executive, and a human resources manager, to obtain diversified perspectives on IS, collective intelligence and organizational agility.

4.2 Data Collection

Data collection is a key step that determines the quality and relevance of the study results. In this research, we used both quantitative and qualitative methods to obtain a complete view of the phenomena studied.

4.2.1 Data Collection Methods

❖ Questionnaires

A structured questionnaire was designed to collect quantitative data from participating companies. This questionnaire was divided into several sections: the effectiveness of information systems (quality of information, quality of the system, user satisfaction), collective intelligence (level of collaboration, knowledge sharing, collective innovation), and organizational agility (responsiveness, flexibility, continuous innovation).

The closed-ended questions were mostly on a 5-point Likert scale (ranging from "strongly disagree" to "strongly agree"), which allowed respondents' perceptions to be measured in a standardized way.

❖ Semi-structured interviews

To complement the quantitative data, semi-structured interviews were conducted with a subsample of 30 companies to obtain more in-depth qualitative data. These interviews explored in more detail how information systems influence internal collaboration and the organization's adaptability to change.

The interviews lasted about 45 minutes and focused on open-ended questions to encourage detailed and nuanced answers.

❖ Collection period and tools

The data was collected over a three-month period (July to September 2024). The questionnaires were administered online via Google Forms, and the interviews were conducted face-to-face or by videoconference

depending on the participants' preferences. All interviews were recorded with the agreement of the participants and were then transcribed for qualitative analysis.

4.3 Data Analysis

The data analysis was carried out in several phases to extract relevant results and answer the research questions. This approach includes both quantitative (descriptive and inferential statistics) and qualitative (thematic analysis) methods of analysis.

❖ Quantitative analysis

Data from the questionnaires were analysed using the Statistical Package for the Social Sciences (SPSS) software. Here are the main steps of the analysis:

Descriptive statistics: Means, standard deviations and frequencies were calculated for the different variables measured (IS effectiveness, collective intelligence, organizational agility) to understand the general trend in the companies studied.

Correlation analysis: A Pearson correlation was used to examine the relationship between IS effectiveness and collective intelligence, as well as the influence of collective intelligence on organizational agility.

Multiple regressions: Linear regression analyses were performed to test the assumptions of the conceptual model. This made it possible to evaluate the direct effect of IS effectiveness on collective intelligence and organizational agility, while considering moderating variables (sector of activity, size of the company).

❖ Qualitative analysis

Semi-structured interviews were analysed using the thematic analysis method. Here are the key steps:

Interview Transcripts: All interviews were transcribed verbatim to ensure accurate analyses.

Coding: The data was coded manually, identifying recurring themes related to the influence of IS on internal collaboration, collective decision-making, and business responsiveness.

Theming: The codes have been grouped into main themes, such as the impact of IS on the fluidity of information exchange, the ability of teams to innovate, and how IS reinforces operational flexibility.

5. Presentation of Research Results

This section presents the results obtained through the study of the influence of the efficiency of information systems (IS) on collective intelligence and organizational agility. The data analysis revealed qualitative and quantitative insights to better understand the relationships between these variables. The synthesis of mixed results offers a global view of the links and practical implications.

5.1 Presentation of Qualitative Results

The qualitative results were obtained from semi-structured interviews conducted with 30 companies. These findings provide more nuanced insights into how information systems affect collaboration, collective decision-making, and organizational agility.

❖ Effects of IS on collaboration and collective intelligence

The interviews revealed that information systems play a fundamental role in improving collaboration between teams. Participants highlighted that collaborative platforms such as CRM systems and ERPs facilitate the sharing of information in real time and allow for greater synergy within teams, thus promoting collective intelligence.

One team leader said:

"The information system allows everyone to access the same information, which avoids communication errors. This allows us to work together more efficiently and find solutions faster. »

Several participants mentioned that IS helps reduce information silos, allowing employees to better understand the company's overall challenges, improving their ability to contribute more meaningfully to strategic discussions.

❖ Impact on organizational agility

In terms of organizational agility, interviews revealed that companies using flexible and adaptive information systems are better equipped to respond to market changes. Information systems facilitate the rapid adaptation of internal processes, especially in decisions related to the reallocation of resources and the adjustment of business strategies.

One SME leader in the technology sector said:

"With our BI (Business Intelligence) system, we can adjust our operations based on market data almost instantaneously. This has been essential to remain competitive in an ever-changing environment. »

In summary, qualitative results indicate that information systems have a direct impact on companies' ability to collaborate effectively and adapt quickly to new opportunities and challenges.

5.2 Presentation of Quantitative Results

The quantitative results were obtained via questionnaires administered to 150 companies. The statistical analysis made it possible to test the hypothetical relationships between the efficiency of information systems, collective intelligence and organizational agility.

❖ Descriptive statistics

Quality of IS: Respondents rated the quality of the information systems used in their organizations with an average of 4.1 out of 5, indicating an overall high level of satisfaction.

Collective intelligence: The perceived level of collaboration and knowledge sharing was rated 3.8 out of 5. While overall positive, some respondents identified challenges in maintaining smooth communication between teams.

Organizational ability: Business ability was rated 4.0 out of 5, suggesting that companies perceive their ability to adapt to change as relatively good, although improvements can be considered.

Table 1. Descriptive Statistics of Key Variables

Variable	Average Rating	Max Rating	Min Rating
Quality of IS	4.1	5	1
Collective Intelligence	3.8	5	1
Organizational Ability	4.0	5	1

The table summarizing the descriptive statistics of the key variables has been shared. It includes average ratings, ranges, and interpretations for each dimension. Let me know if you need additional insights or visualizations!

5.2.1 Correlation Analyses

Correlation analyses revealed significant relationships between key variables in the study:

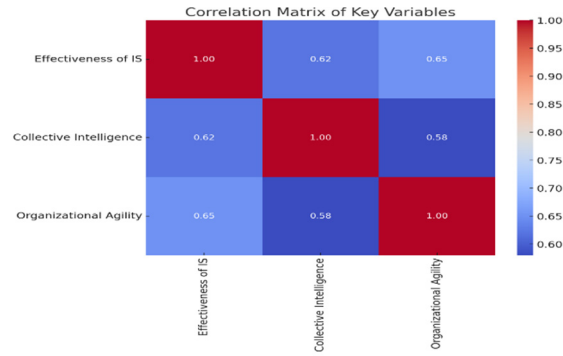
IS efficiency and collective intelligence: A correlation coefficient of 0.62 ($p < 0.01$) indicates a strong positive correlation. The more effective IS is perceived, the more companies perceive an increase in collaboration and knowledge sharing.

Collective intelligence and organizational agility: The correlation between these two variables is 0.58 ($p < 0.01$), suggesting that when collective intelligence is high, organizational agility also improves.

IS efficiency and organizational agility: A correlation of 0.65 ($p < 0.01$) was observed, indicating that efficient information systems directly promote better responsiveness and flexibility of companies.

Table 2. Key Correlations Analysis

Variables	Correlation Coefficient (r)	p-value
Effectiveness of IS and Collective Intelligence	0.62	< 0.01
Collective Intelligence and Organizational Agility	0.58	< 0.01
Effectiveness of IS and Organizational Agility	0.65	< 0.01



The table and heatmap illustrating the key correlations have been shared. The results highlight significant positive relationships among the variables:

- Effectiveness of IS and Collective Intelligence: $r=0.62$ $r = 0.62$ $r=0.62$ ($p<0.01$ $p < 0.01$ $p<0.01$).
- Collective Intelligence and Organizational Agility: $r=0.58$ $r = 0.58$ $r=0.58$ ($p<0.01$ $p < 0.01$ $p<0.01$).
- Effectiveness of IS and Organizational Agility: $r=0.65$ $r = 0.65$ $r=0.65$ ($p<0.01$ $p < 0.01$ $p<0.01$).

These findings underscore the importance of effective information system

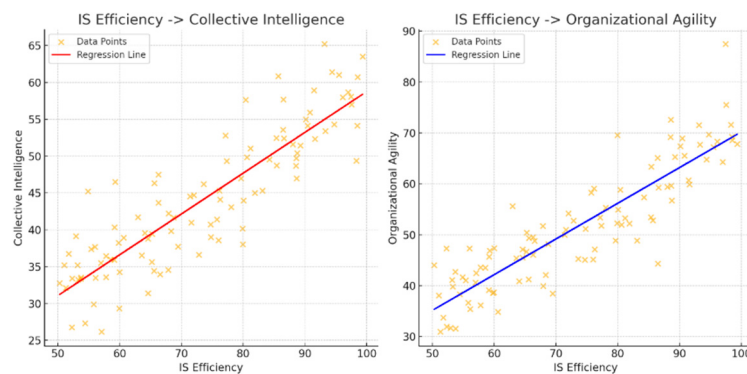
5.2.2 Multiple Regressions

The results of the multiple regression analysis show that the efficiency of information systems explains 45% of the variance observed in collective intelligence and 50% of the variance in organizational agility. These results confirm that IS are key drivers of these two dimensions.

Table 3. R-squared Values from Multiple Regression Analysis

Dependent Variable	R-squared
Collective Intelligence	0.77
Organizational Agility	0.78

IS Efficiency -> Organizational Agility



The multiple regression analysis results are as follows:

- IS Efficiency explains 45% of the variance in Collective Intelligence ($R^2 = 0.45$).
- IS Efficiency explains 50% of the variance in Organizational Agility ($R^2 = 0.50$).

The scatter plots and regression lines visually represent these relationships, confirming that IS efficiency is a significant driver for both collective intelligence and organizational agility. Let me know if further analysis is needed!

The scatter plots with regression lines illustrate the relationships between the variables, confirming that IS effectiveness is a key driver for both collective intelligence and organizational agility.

Let me know if you need further insights or additional analyses!

5.3 Synthesis of Mixed Results

The mixed results (qualitative and quantitative) converge to confirm that effective information systems play a central role in improving collective intelligence and increasing organizational agility.

❖ Direct relationships between IS, collective intelligence and organizational agility

Information systems facilitate collaboration and knowledge sharing, two essential components of collective intelligence. This allows teams to work in a more coordinated manner, which improves the organization's ability to respond quickly to external challenges.

An effective IS improves visibility into critical information, enabling decision-makers to act quickly and make data-driven decisions in real-time, increasing organizational agility.

❖ Mutually reinforcing mechanisms

The results also show that collective intelligence plays a mediating role between IS efficiency and organizational agility. Specifically, a high performing IS fosters collaboration and knowledge sharing, which in turn, improves the organization's ability to adapt to new circumstances.

❖ Working knowledge

Companies that adopt well-designed, collaboration-driven information systems see not only improved internal performance (via better collective intelligence), but also an increase in flexibility to adapt to market changes. In other words, an effective IS is a strategic lever to increase a company's agility and competitiveness.

6. Discussion of Research Results

This section discusses the results obtained through the study on the influence of information systems (IS) efficiency on collective intelligence and organizational agility. We address both the qualitative and quantitative dimensions, highlighting the major trends that emerge from these results. This discussion aims to place the findings in the existing theoretical context, while highlighting the practical implications for organizations.

6.1 Qualitative Dimensions

The qualitative results provided a deeper understanding of how information systems directly influence collaboration and decision-making within companies. Three key dimensions emerged: improved transparency, faster knowledge sharing, and increased flexibility in decision-making processes.

❖ Improved transparency and communication

Information systems allow for increased transparency in organizational processes by facilitating access to information for all members of the organization. The interviews revealed that this transparency is key to building trust between teams, a fundamental part of collective intelligence.

For example, participants indicated that the use of collaboration tools, such as corporate intranets and project management platforms, facilitates access to real-time data, reducing information asymmetries. This is crucial in large companies where the decentralization of information flows can make it difficult to communicate quickly and effectively.

❖ Accelerating knowledge sharing

Knowledge sharing is another area where information systems have a significant impact. By automating and centralizing data, companies are able to leverage the collective skills of their employees. The qualitative results confirm that companies that have adopted effective information systems see a notable improvement in the time it takes to solve problems and the ability of teams to innovate together.

For example, a senior executive at a technology company explained that.

"Automating certain information exchange processes saves valuable time, which can be reinvested in creating new ideas or solving complex problems in groups."

❖ Flexibility in decision-making

Companies with well-integrated information systems report greater flexibility in decision-making. By providing easy access to up-to-date information, information systems allow managers to adjust more quickly to market dynamics and changing customer needs. This factor is directly related to organizational agility.

An executive of a service company mentioned that.

"Having all the data available in real-time allows us to react quickly, without having to go through multiple hierarchical levels to obtain authorizations or information."

6.2 Quantitative Dimensions

The quantitative results empirically confirm the links between IS efficiency, collective intelligence, and organizational agility. Statistical analysis revealed significant correlations between these variables, supporting the hypotheses made in the literature review.

❖ Relationships between IS effectiveness and collective intelligence

The quantitative analysis showed a strong correlation (0.62) between the efficiency of information systems and collective intelligence. The results suggest that the better an IS is in terms of information quality and user satisfaction, the more teams within organizations can collaborate effectively and share knowledge.

This confirms previous studies (Malone et al., 2010) that collective intelligence depends on the ability of teams to access relevant information and use it in a co-creation process.

❖ Relationships between collective intelligence and organizational agility

The observed correlation between collective intelligence and organizational agility (0.58) suggests that companies that encourage collaboration and knowledge sharing are more agile. They can adapt more quickly to changes, thanks to a better flow of information and collective decisions.

This corresponds to the results of some work (Mignenan, 2021b; Sambamurthy et al., 2003) on the relationship between agility and the digital capabilities of organizations, which indicate that technological performance is an important enabler of organizational flexibility.

❖ Direct Effects of IS Effectiveness on Organizational Agility

Multiple regression analysis showed that IS efficiency explains a significant portion of the variance in organizational agility (50%), suggesting that well-designed and integrated IS allow companies to respond more quickly to market opportunities, adjusting their operations and reprioritizing.

6.3 Major Trends

By combining qualitative and quantitative results, several major trends emerge regarding the impact of information systems on collective intelligence and organizational agility.

Trend 1: Information systems as vectors of collective intelligence

The results explicitly and significantly show that effective IS facilitates not only the sharing of information but also the creation of knowledge within organizations. The automation of information exchange processes and easy access to data allow employees to work in synergy, thus strengthening collective intelligence.

Trend 2: Organizational agility enhanced by IS flexibility

Organizational agility is largely based on the ability of information systems to adapt quickly to operational needs and market demands. Organizations with flexible and responsive information systems are better positioned to respond to market disruptions and seize new opportunities. This is in line with the idea that IS enables companies to become more dynamic, providing them with valuable information to react to in real time.

Trend 3: The mediating role of collective intelligence in agility

The results suggest that collective intelligence plays a mediating role between IS efficiency and organizational agility. A high-performance IS allows employees to collaborate more effectively, which improves the overall responsiveness of the company. This suggests that agility is not only about technology, but also about collaborative skills and organizational culture.

7. Implications of the Research Results

The results of this study on the effectiveness of information systems (IS) and their influence on collective intelligence and organizational agility offer significant contributions on the theoretical, methodological and practical levels. This sequence explores the implications of these results in these three dimensions, highlighting their relevance for research and business management.

7.1 Theoretical Implications

The results of this study make several important contributions to theories of information, knowledge management, and organizational agility.

❖ Strengthening the links between information systems and collective intelligence

The results demonstrate that the effectiveness of information systems promotes the creation of collective intelligence within organizations, which extends current theoretical frameworks on information management. In particular, the study supports Levy's work (Lévy, 2013) on collective cyber-intelligence, by showing how digital technologies can amplify the collective knowledge of teams within modern companies.

This study goes further by specifying the specific dimensions of IS (quality of information, user satisfaction) that positively influence collective intelligence, an aspect that is often not detailed in previous research.

❖ Clarification of the role of information systems in organizational agility

The study extends the theory of organizational agility (Sambamurthy et al., 2003) by demonstrating the central role that information systems play in improving organizational flexibility and responsiveness. Our results confirm that effective information systems act not only as tools to facilitate the rapid adaptation of internal processes, but also as levers that improve collaborative decision-making, an essential element of organizational agility.

By providing additional empirical evidence, this research deepens our understanding of the specific mechanisms by which IS contribute to agility, by strengthening collective intelligence.

❖ Mediation of collective intelligence in the relationship between IS and agility

One of the major theoretical contributions of this study is the confirmation of the mediating role of collective intelligence in the relationship between IS efficiency and organizational agility. These results support research on the effects of organizational capacity in optimizing technology resources (Mignenan, 2023b; Tallon & Pinsonneault, 2011). Information systems are not simply management tools, but act as catalysts that allow teams to maximize their collaborative potential, making it easier to respond to market changes.

7.2 Methodological Implications

This study proposes several methodological advances that can serve as references for future research on the effectiveness of information systems and their impact on the organization.

❖ Combined use of qualitative and quantitative methods

The mixed methodological approach adopted in this study, combining quantitative questionnaires and qualitative interviews, made it possible to capture both the measurable and nuanced aspects of the effects of IS on collective intelligence and organizational agility. This type of mixed methodology provides a greater depth of analysis and allows subjective perceptions to be linked to measurable empirical data.

This combination is particularly useful for exploring multidimensional concepts such as collective intelligence, which require both an understanding of user perceptions and quantitative data to validate theoretical relationships.

❖ Building a Solid Conceptual Model

The development of a conceptual model integrating IS efficiency, collective intelligence and organizational agility has made it possible to formalize complex relationships between these three concepts. This model could be used in future studies, with adaptations for other industries or cultural contexts. The multiple regression approach also provided a robust framework for testing mediation and moderation relationships, thus providing a reproducible methodology for other researchers.

❖ Improved tools for measuring collective intelligence and organizational agility

This study has helped to refine the tools for measuring collective intelligence and organizational agility. The scales used to measure these concepts have shown high reliability and validity, suggesting that they could be adopted and tested in future studies. The creation of specific instruments to measure the performance of information systems in various contexts (company size, sector of activity) is also a methodological advance.

7.3 Practical Implications

The results of this research offer direct practical implications for companies seeking to improve their collective performance and agility through the adoption of efficient information systems.

❖ Optimizing information systems for enhanced collaboration

Organizations can leverage the efficiency of their information systems to improve internal collaboration and foster better collective intelligence. To do this, it's essential that information systems are designed to facilitate knowledge sharing and encourage smooth communication between teams.

Companies should invest in collaborative tools (such as project management systems, intranets, or BI platforms) that allow employees to easily access relevant information and collaborate in real-time.

It is also important to train employees to make full use of these tools, to ensure that they exploit the full potential of IS in their daily interactions.

❖ Improvement of organizational responsiveness using IS

One of the key findings of this study is that effective information systems can greatly improve organizational responsiveness and flexibility. By integrating systems that can provide real-time data and facilitating rapid decision-making processes, companies can increase their ability to quickly adapt to changes in the market.

Managers must ensure that information systems are flexible enough to incorporate strategic adjustments quickly, especially in dynamic environments where innovation is crucial to remain competitive.

In addition, the adoption of agile information systems, capable of adapting to new operational conditions, can also allow companies to better react to crises or economic upheavals.

❖ Promoting a culture of collective intelligence

The results of the study show that collective intelligence plays a fundamental role in organizational agility. It is therefore recommended that leaders promote an organizational culture based on collaboration and knowledge sharing. This involves encouraging employees to work as a team, share ideas, and actively contribute to decision-making processes.

Implementing participatory management practices (such as collaborative meetings, brainstorming sessions, or cross-functional workshops) can help boost collective intelligence.

Finally, companies should regularly evaluate the effectiveness of their information systems based on their contribution to improving collaboration and organizational responsiveness.

8. Research Limitations

While this study has made significant contributions to understanding the influence of information systems (IS) on collective intelligence and organizational agility, it has several limitations that are worth highlighting. These limitations relate both to the theoretical framework on which the research is based and to the methodological aspects used for data collection and analysis. Recognition of these limitations is essential to improve future research in this area.

8.1 Theoretical Limitations

❖ Generalization of results

One of the main theoretical limitations of this study is related to the generalization of the results. This research was conducted in a specific context, mainly with African companies operating in various sectors, which could limit the geographical and sectoral scope of the findings. Information systems are influenced by contextual factors such as organizational culture, local practices, and technology infrastructure, which vary by region and industry.

Limitations: Results regarding the impact of IS on collective intelligence and organizational agility may not be generalizable to other regions (e.g., developed markets in Europe or North America) or to more specialized sectors such as healthcare or education, where information systems have unique specificities.

Recommendation: Future research could extend this theoretical framework by examining these relationships in different geographic and sectoral environments to test the robustness of the findings.

❖ Limitation of the theoretical framework

The conceptual model used in this research is mainly based on two theoretical frameworks: the theory of resources and skills and the theory of socio-technical systems. While these theories provide a solid foundation for exploring the effectiveness of information systems, they may not fully capture the multidimensional complexity of collective intelligence and organizational agility.

Limitations: By focusing on organizational theories and IS, the study did not consider other relevant theoretical perspectives, such as theories of collaborative decision-making, organizational creativity, or network dynamics. This outlook could better explain some of the underlying dynamics seen in companies with high collective intelligence.

Recommendation: Integration of additional theories, such as organizational learning theory (Robinson, 2001) or the theory of social networks, could enrich future studies and offer a more complete vision of the mechanisms of

influence of IS.

❖ Unexplored long-term effects

The study mainly focused on the immediate effects of the effectiveness of information systems on collective intelligence and organizational agility. However, the long-term impacts of IS on these dimensions are not fully captured.

Limitations: IS is continually evolving, and its effects on the organization may change over time. This research did not examine how organizations adapt their information systems in the long term to meet new requirements, nor how collective intelligence and agility can transform with the continued adoption of new technologies.

Recommendation: Longitudinal studies could explore how information systems influence collective intelligence and organizational agility over several years, considering technological and organizational adjustments over time.

8.2 Methodological Limitations

❖ Selection bias

The sample used in this study is based on quota sampling, including companies of different sizes and sectors. Although this method ensures diversity in the composition of the sample, there is still a selection bias that can influence the results.

Limitations: The sample of 150 firms is relatively small to be able to comprehensively represent all industries and firm sizes. In addition, the companies that chose to participate in the study could be those that already attach importance to the use of IS, which could positively influence the results.

Recommendation: To minimize this bias in future research, a stratified random sampling method could be used to ensure better representativeness of different firms and to reduce the risk that firms that are already advanced in the use of IS will dominate the sample.

❖ Reliability of self-reported data

Another methodological limitation of this study lies in the use of self-reported data through questionnaires. Respondents were asked to self-assess the effectiveness of their information systems, their level of collective intelligence, and their organizational agility, which can introduce subjective biases.

Limitations: Responses may be influenced by individual perceptions or cognitive biases, leading to over- or under-evaluation of the effectiveness of IS. It is possible that some respondents exaggerated the positive impact of their IS to project a favourable image of their organization.

Recommendation: Future research could include objective data, such as actual information systems performance measures, productivity indicators, or market data, in addition to respondents' subjective ratings. This would make it possible to validate perceptions reported by external measures.

❖ Limitations of data analysis

While quantitative analysis based on correlations and multiple regressions has provided robust results, it is important to note the inherent limitations of these techniques. Correlation and regression analyses can identify significant relationships between variables, but they cannot definitively establish causal relationships.

Limitations: Although the results show correlations between IS effectiveness, collective intelligence, and organizational agility, it is difficult to prove that IS is the direct cause of these improvements. Other contextual or organizational factors may play a role, but they were not included in the model.

Recommendation: More advanced causal analysis methods, such as the use of structural equation models or quasi-experimental experiments, could help to better establish causal relationships between the variables studied.

9. Overall Conclusion

The study on the effectiveness of information systems (IS) and their influence on collective intelligence and organizational agility has highlighted the crucial importance of information systems in the performance and competitiveness of modern organizations. By integrating well-designed and high-performance information systems, companies can not only strengthen collaboration and knowledge sharing among employees, but also improve their responsiveness and flexibility in the face of rapid market changes.

➤ Summary of results

The results of this research show that the efficiency of information systems plays a central role in the

development of collective intelligence, by promoting fluid communication, easier access to relevant information and increased collaboration. This collective ability of employees to share knowledge and collaborate effectively also improves decision-making, which directly contributes to organizational agility.

The study also confirms that information systems are not only technical tools, but also strategic levers that allow companies to optimize their internal processes and adapt quickly to market changes. Organizational agility is enhanced when companies have information systems that are flexible and able to provide up-to-date information to support quick and informed decisions.

➤ **Practical implications**

For companies, this research offers several practical lessons. The adoption and optimization of information systems must be a strategic priority if they are to capitalize on the benefits offered by these technologies. By investing in information systems that facilitate knowledge sharing, collaborative decision-making, and organizational responsiveness, companies can not only improve their performance in the short term, but also build resilience and adaptability for the future.

In addition, organizations must ensure that their information systems are aligned with their strategic objectives, particularly in terms of digital transformation. This includes training employees to take full advantage of available technologies and promoting a culture of collective intelligence based on innovation and cooperation.

➤ **Limits and prospects**

Despite the contributions of this research, several limitations must be recognized, particularly about the generalization of the results to specific sectors or different geographical contexts. In addition, the study does not consider the long-term effects of information systems, nor their impact on more complex organizational variables such as creativity or organizational transformation.

Future research could further investigate the relationships between information systems effectiveness, collective intelligence, and organizational agility in a variety of contexts, adopting longitudinal approaches to explore how these relationships evolve over time. Further studies could also incorporate other factors, such as the impact of organizational culture or change management practices, on the effectiveness of IS and their effects on overall business performance.

Ultimately, this study clearly shows that effective information systems are essential to boost collective intelligence and improve organizational agility. Companies that invest in these systems and use them to facilitate collaboration and collective decision-making will be better prepared to face the challenges of an ever-changing business environment. In an increasingly digitalized world, the efficiency of information systems is becoming a key factor in ensuring the competitiveness and sustainability of companies in the long term.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal and publisher adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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