




## Does the Deployment of the ISO 9001 Standard Have an Effect on Intellectual Capital?

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### Abstract

**Purpose:** The objective of this paper is to verify whether the ISO 9001 standard has an impact on the three components of intellectual capital, namely: human, structural, and relational capital.

**Design/methodology:** Drawing on the absorptive capacity theory, the knowledge creation theory, and the socio-technical systems theory, we developed a conceptual model that was tested on a sample of 100 Moroccan companies certified under ISO 9001.

**Findings:** The results indicate a direct impact of the ISO 9001 standard on human capital, an indirect impact on structural capital through human capital, and finally, the ISO 9001 standard influences relational capital through a serial mediation of human and then structural capital.

**Originality/value:** This paper is a response to the current international debate on the importance of intellectual capital for value creation. Indeed, for intellectual capital to create value, it must be developed, and ISO 9001 standard precisely enables this development, as demonstrated by the results. Considering that more than a million organizations hold ISO 9001 certification worldwide, this aligns with the international scope of the debate on intellectual capital.

**Keywords:** ISO 9001, Intellectual capital, Human, Structural, Relational

**Jel Codes:** E22, O34

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### 1. Introduction

Intangible assets, once considered less important, have now become the element that ensures the success of organizations in the 21st century (García-Merino, García-Zambrano & Rodríguez-Castellanos, 2014). Intellectual capital is a source of sustainable competitive advantage for organisations (Paramba, Salamzadeh, Karuthedath & Rahman, 2023). The material goods are no longer the driving forces of the economy (Zoheir & El-Arabi, 2022).

Intellectual capital is the most valuable asset and the most formidable competitive weapon that organizations possess (Wang & Chang, 2005). Intangible assets often represent up to 80% of a company's value (Petkovic, 2019).

According to the literature reviews dedicated to the different stages of research on intellectual capital, between the late 1980s and the early 1990s, studies were focused on raising awareness about its importance for creating a sustainable competitive advantage. This phase marked the construction and legitimization of the “intellectual capital” discipline as a research field. The main objective during this time was to bring visibility to intellectual capital, which is inherently invisible. Most of these researches simply asserted that intellectual capital is significant, it should be measured, and subject to reporting (Guthrie, Ricceri & Dumay, 2012). The period from the second half of the 1990s until 2003 was marked by the development of measurement models. It also saw the beginning of empirical studies and the disclosure of information about intellectual capital. In addition to the traditional financial reporting, companies were required to provide information about intellectual capital to give comprehensive insights to external stakeholders about the organization. During this time, various classifications of the components of intellectual capital emerged. Nowadays, the dominant taxonomy considers intellectual capital to be composed of human, structural, and relational capital. Intellectual capital is considered the sum of all the knowledge that the company utilizes to gain a competitive advantage (Subramaniam & Youndt, 2005). However, there is no universally accepted definition of intellectual capital (Lee & Wong, 2019). From 2004 to the present day, research has generally focused on the practical implications of intellectual capital management. This research is precisely in line with the practical implications of managing intellectual capital, in particular taking measures to strengthen it. Like any asset, intellectual capital can be subject to depreciation, and therefore needs to be monitored and controlled. Organisations must therefore take action to implement programmes to safeguard, conserve and expand intellectual assets (Martín-de-Castro, Emilio Navas-López, López-Sáez & Alama-Salazar, 2006). Each aspect of intellectual capital requires specific investment (Youndt, Subramaniam & Snell, 2004). Human capital requires the recruitment, development and retention of staff, etc. Relational capital requires the implementation of procedures to facilitate exchange, cooperation and relationships, and structural capital requires the implementation of systems to store knowledge and structure operations (Subramaniam & Youndt, 2005).

In this context, our objective is to show that the ISO (International Organization for Standardization) 9001 standard can be a tool for developing and strengthening intellectual capital. The ISO 9001 standard defines the requirements for establishing a quality management system. Although this standard is primarily focused on the quality of products and services, it can also contribute to the development of an organization's intellectual capital through the implementation of certain requirements. The ISO 9001 standard and the management of intellectual capital are not two concepts that are foreign to each other, hence the possible association. Compliance with the requirements of ISO 9001 enables companies to improve their quality management systems, with the expected result of increased customer satisfaction, a prerequisite for profitability and growth (Milovanović, Paunović & Casadesus, 2023). This same vision is shared by the management of intellectual capital, because although the discipline was initially developed to make hidden value visible, the ultimate objective is to maximise the company's value. Many aspects of quality management: skills, training, communication, leadership, operational processes, improvement (innovation) and relations with external stakeholders (customers, suppliers, and partners) influence the elements of intellectual capital (Živojinović & Stanimirović, 2009). Since the ISO 9001 standard is applied inside the organization, it should have a direct influence on the internal intellectual capital consisting of human and structural capital. Internal intellectual capital, nurtured through ISO 9001 practices, serves as a foundation for the development of relational capital. Among the different intellectual capitals, relational capital is the one on which the company has the least direct control, because it depends on external actors (Benevene, Buonomo, Kong, Pansini & Farnese, 2021). We briefly discuss below the elements of the ISO 9001 standard which suggest that it could influence intellectual capital. ISO 9001 stipulates that to ensure the effectiveness of their quality management system and control of their processes, organizations must identify and provide the necessary human resources (clause 7.1.2). It requires the organization to commit to providing necessary training to its personnel when needed. By creating an environment conducive to employee development as required by ISO 9001, the organization can gain their commitment, engagement, and motivation. The management of knowledge within the organization, which constitutes the structural capital, is

also addressed in the ISO 9001 standard. Formalization is a significant requirement of the quality management system. The standard emphasizes the importance of maintaining and providing the necessary knowledge for process implementation in the form of documented information. The standard also addresses the organization's relationships with its environment, dictating several measures regarding the management of this relationship. It could be considered the ultimate goal of the quality management system. Indeed, the other requirements of the standard, such as process determination, updating documented information, assigning responsibilities, and providing resources, can be seen as stepping stones toward customer satisfaction and the effective management of relationships with other stakeholders. Before reaching external stakeholders, the quality approach transforms the organization internally, as mentioned above (human and structural capital), in order to equip them with capabilities that will enable better management of relations with external stakeholders. In this respect, the organization must be vigilant in staying informed about relevant requirements of interested parties as required by the ISO 9001 standard. Indeed, the management of any relationship requires knowledge of the parties involved. This knowledge is taken on by competent, motivated employees, who act accordingly. Logically, the influence of ISO 9001 on relational capital should be indirect, via human and structural capital. Especially since human capital is the basis of the development of the two other components of intellectual capital (Nuñez, Nunez, Banegas-Rivero & Sánchez-Bañuelos, 2017). Employees' individual knowledge, the company's structural arrangements and valuable relationships are mutually supportive (Inkinen, 2015). In order to verify whether ISO 9001 has an influence on the components of intellectual capital, we carried out a quantitative study on a sample of 100 companies with ISO 9001 certification. The expected contribution, in line with the practical implications of intellectual capital management, is to offer people concerned by the development of their intellectual capital a means of achieving this objective. Since research cannot be evaluated without taking into account the epistemological premises on which it is based, we specify that we adopt the post-positivist epistemological paradigm. This paradigm postulates that reality exists independently of people. The use of theories enables us to anticipate how the real world works by formulating hypotheses. Statistical analysis enables data to be processed objectively, while confirming the existence of a certain reality by establishing convergent and discriminant validity. In the next sections, we will present a literature review, propose a theoretical framework, formulate our research hypotheses and present the empirical study.

## 2. Literature Review

Studies on the organizational effects of the ISO 9001 standard can be classified into two categories. The first category is based on the assumption that organizations implement an ISO 9001-compliant quality management system in a similar way (homogeneous adoption) and only investigates elements that could be influenced by the implementation of the quality management system. The second category, referred to as a heterogeneous perspective, on the contrary, considers that organizations apply the ISO 9001 standard in diverse ways, and it is necessary to study the level of internalization of the ISO 9001 standard before judging its effects. Indeed, it is only when the certification renewal is approaching that some companies dust off the quality management documents to make it seem like they continuously apply the ISO 9001 standard (Ramesh & Jain, 2012). Hence, the need to adopt a heterogeneous perspective during studies. Reference (Tari, Molina-Azorín, Pereira-Moliner & López-Gamero, 2020b) identifies more than 800 studies in the first category and only about twenty-six in the second. One of the reasons for the low number of studies in the second category could be the difficulty of measuring the degree of implementation of the ISO 9001 standard (Chountalas, Magoutas & Zografaki, 2019). The heterogeneous perspective of the ISO 9001 standard is stimulating and has a clear lack of knowledge (Cai & Jun, 2018; Heras-Saizarbitoria, 2011). There is no unanimity in measuring the level of implementation of the ISO 9001 standard (Sfreddo, Vieira, Vidor & Santos, 2021; Tari et al., 2020b). Therefore, there is a significant gap to be filled at this level in terms of numbers, but also because the so-called heterogeneous method is more advanced than the homogeneous method (Heras-Saizarbitoria, 2011; Naveh & Erez, 2004). Conducting research by adopting a heterogeneous perspective of the ISO 9001 standard is a fruitful and, at the same time, useful research direction, given the wide spectrum covered by the ISO 9001 standard (Nair & Prajogo, 2009). Due to the elements presented previously, we will, therefore, focus exclusively on studies that adopt a heterogeneous perspective. There is a lack of research examining the benefits of the ISO 9001 standard concerning employees,

customers, and social impact (Tari et al., 2020b). There are lingering questions regarding the contribution of the ISO 9001 standard to customer satisfaction (Santos & Millán, 2013).

The framework of intellectual capital, divided into human, structural, and relational capital, is almost non-existent in the literature of ISO 9001 standard. However, corresponding indicators can be found therein; these indicators often belong to scales that measure other phenomena such as performance or the internal and external environment of the company. The present research that we are conducting is indeed an attempt to bridge the gap between two distinct fields of research: the ISO 9001 standard and intellectual capital. We have been able to establish a connection between the two disciplines due to the presence of identical indicators found in both research fields. Only a few studies in the literature of the ISO 9001 standard exclusively use items belonging solely to human, structural, or relational capital in their measurement scales. In order to broaden the literature review, we have therefore included studies that measure the impact of the ISO 9001 standard on other phenomena (organizational impact, internal impact, external impact, performance) but which also contain items related to the components of intellectual capital (human, structural, and relational). Thus, we consider that the ISO 9001 standard has an impact on a component of intellectual capital, if the study shows an impact on the measurement scale containing items related to the specific component in question.

The impact of the ISO 9001 standard on performance has been the subject of multiple studies, while its effect on employees has only been studied sporadically (Milovanović et al., 2023). Regarding human capital, the following studies find a relationship between ISO 9001 standard and employees' morale and skills (Arauz & Suzuki, 2004; Feng, Terziovski & Samson, 2007; Jang & Lin, 2008). Other studies find that the ISO 9001 standard has an impact on employees' knowledge, skills, and motivations (Ataseven, Prajogo & Nair, 2014; Jain & Singh-Ahuja, 2012; Tari, Heras-Saizarbitoria & Pereira, 2013). The ISO 9001 standard allows for the reduction of employee absenteeism and complaints while increasing their satisfaction and motivation (Molina-Azorín, Tari, Pereira-Moliner, López-Gamero & Pertusa-Ortega, 2015; Tari, Molina-Azorín, Pereira-Moliner & López-Gamero, 2020a; Tari, Pereira-Moliner, Molina-Azorín & López-Gamero, 2022). Loyalty, commitment, satisfaction, and motivation of employees would also be improved by the ISO 9001 standard (Bello-Pintado, Heras-Saizarbitoria & Merino-Díaz-de-Cerio, 2018). Reference (Lin & Jang, 2008) do not find any relationship between the ISO 9001 standard and employees' morale. Moreover, for the following studies, some dimensions of ISO 9001 adoption are associated with employee satisfaction, motivation, and productivity, while others are not (Prajogo, Huo & Han, 2012; Tari et al., 2020a; Tari, Pereira-Moliner, Molina-Azorín & López-Gamero, 2019a). Employee satisfaction is positively influenced by the ISO 9001 standard (Bekele & Zewedie, 2017). The ISO 9001 standard does not promote employee retention (Milovanović et al., 2023). The ISO 9001 standard has a positive influence on employee productivity, participation and efficiency (Kakouris & Sfakianaki, 2018).

Concerning structural capital, the ISO 9001 standard enables the reduction of process variance (Arauz & Suzuki, 2004; Tari et al., 2013; Vetchagool, Augustyn & Tayles, 2021) and improves the functioning of procedures (Feng et al., 2007; Jang & Lin, 2008; Lee, To & Yu, 2009). The standard also induces an enhancement of the information system and better documentation of procedures (Ataseven et al., 2014; Ismyrlis & Moschidis, 2015; Jain & Singh-Ahuja, 2012). However, according to Lin and Jang, (2008), the ISO 9001 standard does not lead to an improvement in procedures. Reference (Prajogo et al., 2012) found a relationship between certain dimensions of ISO 9001 adoption and process rationalization and coherence, but this is not the case for other dimensions. Some dimensions of ISO 9001 absorption have a positive influence on the documentation and dissemination of knowledge within the organization, while others do not (Huo, Han & Prajogo, 2014).

Finally, concerning the third dimension of intellectual capital, which is relational capital, its dimensions have also been investigated. The ISO 9001 standard would have a positive impact on customer satisfaction (Arauz & Suzuki, 2004; Naveh & Marcus, 2004; Naveh & Marcus, 2005; Nurcahyo, Zulfadlillah & Habiburrahman, 2021; Tari et al., 2013). Better relationships with suppliers would result from the implementation of the ISO 9001 standard (Arauz & Suzuki, 2004; Ataseven et al., 2014; Jain & Singh-Ahuja, 2012). The ISO 9001 standard would also have a positive impact on organizations' image (Allur, Heras-Saizarbitoria & Casadesús, 2014; Ismyrlis & Moschidis, 2015; Tari et al., 2013; To, Lee & Yu, 2011). However, other studies find that the ISO 9001 standard does not improve the company's image (Feng et al., 2007) or customer satisfaction (Jang & Lin, 2008; Lin & Jang,

2008). For the following studies, some dimensions of ISO 9001 internalization are associated with customer satisfaction, while others are not (Prajogo et al., 2012; Tari et al., 2020a, 2019a). ISO 9001 impacts customer satisfaction and retention (Milovanović et al., 2023). The ISO 9001 standard improves the image of the organization (Kakouris & Sfakianaki, 2018).

### 3. Theoretical Framework and Formulation of Hypotheses

The objective of this study is to analyze how the internalization or absorption of the ISO 9001 standard translates for organizations in terms of intellectual capital, which is made up of human, structural and relational capital. There are many definitions of human capital, some of which simply refer to the knowledge and skills of employees (Bollen, Vergauwen & Schnieders, 2005; Cohen & Kaimenakis, 2007). Other definitions go beyond competence alone, also incorporating attitudes such as satisfaction (Moon & Kym, 2009), commitment (Yang & Lin, 2009), motivation (Djekic, Dimitrijevic & Tomic, 2017). Structural capital is formalized knowledge, processes, organizational structure, information systems information system, databases (Bollen et al., 2005; Bontis, 1998; Chen, Zhu & Yuan-Xie, 2004; Subramaniam & Youndt, 2005). Relational capital is the ability of a company to establish positive relationships with stakeholders in the business community with the aim of creating value (Johnson, 1999). As for the internalization of the ISO 9001 standard, it refers to how organizations integrate the requirements of a quality system into their daily practices and introduce continuous improvement (Tari et al., 2020a). In order to achieve the research objective, we draw upon the theory of absorptive capacities (Cohen & Levinthal, 1990), the theory of knowledge creation (Nonaka, 1994) and the theory of sociotechnical systems (Griffith & Dougherty, 2001). The use of the theory of absorptive capacities allows us, first and foremost, to justify that organizations do not adopt the ISO 9001 standard to the same extent. According to this theory, the ability of organizations to absorb knowledge differs; it varies from one organization to another, and the same applies to the effects (Zahra & George, 2002). It is, therefore, entirely legitimate to measure the level of implementation (heterogeneous adoption) of the ISO 9001 standard, which indicates to what extent it has been absorbed by the organization. This absorption of knowledge leads to the creation of new knowledge, skills, routines, and organizational forms; this corresponds to knowledge exploitation (Todorova & Durisin, 2007; Zahra & George, 2002). There is no consensus on the definition of intellectual capital. However, the literature review by (Pedro, Leitão & Alves, 2018) shows that one of the definitions that tops the occurrences is the one that considers intellectual capital to be the body of knowledge used by an organization to gain competitive advantage. It is with this in mind that we have mobilized this theoretical framework. In fact, it makes it possible to justify that once the ISO 9001 standard has been assimilated, it influences the company's knowledge, skills, processes and operations, which are none other than its intellectual capital. This capital is divided into three categories: human capital, which is the knowledge of employees; structural capital, which is institutionalized organizational knowledge; and relational capital, which is knowledge relating to relationships with external partners (Inkinen, 2015; Subramaniam & Youndt, 2005). Relational capital is also defined as the quality of the relationship between a company and its external partners. While the use of the ISO 9001 standard makes it possible to extend individual knowledge (human capital) and organizational knowledge (structural capital), it actually improves the quality of the relationship (relational capital) between a company and its external partners. Later on, we will use the theory of sociotechnical systems to show that the impact of ISO 9001 on relational capital is indirect. The general idea behind the theory of absorptive capacities is that external information that is acquired, assimilated and exploited can have an impact on performance. Exploitation is an organizational capacity to refine, extend and take advantage of existing skills and knowledge, or to create new ones by incorporating acquired knowledge (Zahra & George, 2002). Adopting the theory of absorptive capacities in our study, the external information in question is the ISO 9001 standard, its acquisition is certification, its assimilation is measured by the degree of its implementation and its exploitation is the translation of this assimilation in terms of intellectual capital. The exploitation of the ISO 9001 standard is capable of inducing an improvement in intellectual capital because it includes requirements whose implementation contributes to the development of this capital, as shown at the end of the introduction section. "Exploitation is the application of the acquired knowledge" (Mokhlis, Soudi, Lahmini & Elmortada, 2020). The application of the ISO 9001 standard involves the implementation of its requirements. These requirements are concrete measures dictated by

the ISO 9001 standard that will enhance each of the three components of intellectual capital. This provides an initial theoretical explanation of the positive influence of ISO 9001 on intellectual capital.

Reference (Nonaka, 1994) theory of knowledge creation sheds further light on the way in which ISO 9001 influences the company's knowledge. According to this theory, tacit knowledge, which relates to employees' know-how and skills, is developed through two mechanisms: socialization and internalization. Socialization is when employees learn from each other through observation, imitation and practice. To achieve this, employees need to be able to interact. A quality management system that is implemented in accordance with the requirements of the ISO 9001 standard creates the conditions for this interaction, thus facilitating the sharing of tacit knowledge between employees. In other words, employees develop their knowledge by learning from each other. This empirical study also shows that the ISO 9001 standard encourages interaction between employees (Melão & Guia, 2015). One of the mechanisms in the ISO 9001 standard that can promote social integration is the creation of an environment conducive to employee fulfillment. A favorable working environment may refer to the social climate, which according to the standard should be non-discriminatory, non-confrontational, calm and non-stressful, and should ensure the emotional protection of employees. ISO 9001 emphasizes communication, which is also a factor in socialization. The process approach also ensures that employees feel part of a whole, which is a factor in cohesion and socialization. Indeed, the inputs of one process are generally the outputs of another. This link between processes can create a social bond that facilitates the sharing of tacit knowledge. Important features of a social system include: organizing work in such a way that employees cooperate rather than compete with each other (Fox, 1995). This creates a team spirit and trust, enabling tacit knowledge to be shared (Nonaka, 1994). The second mechanism for creating tacit knowledge according to the theory of knowledge creation is internalization. This is the conversion of explicit knowledge into tacit knowledge. ISO 9001 is an explicit body of knowledge describing the requirements for implementing a quality system. The ISO 9001 standard is applied on a daily basis by the organization's employees, and as the theory of knowledge creation states, internalization occurs through practice (Nonaka, 1994). It is impossible to talk about the ISO 9001 standard without mentioning the personnel, as their involvement is one of its principles. The commitment of individuals is one of the most important components in promoting the formation of new knowledge within an organization (Nonaka, 1994). This is precisely what ISO 9001 emphasises. The employees of an ISO 9001-certified company therefore learn through the application of the ISO 9001 standard: a management philosophy that makes it possible to manage stakeholder relations optimally, which is in fact a development of their tacit knowledge. The mere deployment of a quality management system in an organization is in itself training for the people who implement it. The requirements of ISO 9001 are internalized by the employees and exercised by them. When new explicit knowledge is shared within an organization, employees begin to internalize it. They use it to broaden, extend and reframe their own tacit knowledge (Nonaka, 1994).

Combination is the mode of knowledge creation that consists of adding explicit knowledge. It is facilitated by the documentation of knowledge and coordination between team members (Nonaka, 1994). In other words, the more formalized a company's knowledge is, the more likely it is to create more explicit knowledge. This is achieved by combining already formalized knowledge. The application of ISO 9001 makes it possible to create the conditions for a better combination, because the documentation of knowledge, the culture of writing, is one of its cornerstones. Indeed, the organization must control and keep up to date the documented information necessary for the operation of its processes (ISO 9001 Chapter 7.5). Documentation is a key component of a quality management system. By formalizing procedures, certain knowledge can be made explicit, enabling the organization to build up a memory (Canard, 2009). Similarly, coordination is ensured through the process approach, which enables an organization to plan its processes and their interaction. Once knowledge has been formalized, it is easier to combine, generating more explicit knowledge, which is none other than structural capital. To sum up, the ISO 9001 standard has a positive influence on intellectual capital through the application of its requirements, which we outlined in the introductory section. This involves the exploitation or application of knowledge acquired according to the theory of absorptive capacities. In addition, the ISO 9001 standard has a positive influence on structural capital, because it creates the conditions for combination (knowledge creation theory). By encouraging knowledge to be written down, it can be more easily combined with other knowledge, thus creating more explicit knowledge. Implementing ISO 9001 requires organizations to document and standardize their processes, leading to greater

consistency and efficiency in operations. As for human capital, it is positively influenced by the ISO 9001 standard because it creates the conditions for socialization, enabling tacit knowledge to be shared between employees. Through the application of the ISO 9001 standard, employees internalize it, which also leads to an extension of their tacit knowledge. In the light of these theories, we formulate the following hypotheses:

*H1: The absorption of the ISO 9001 standard positively influences human capital.*

*H2: The absorption of the ISO 9001 standard positively influences structural capital.*

According to the theory of absorptive capacities, an organization's ability to absorb knowledge depends on the absorptive capacity of its employees (Cohen & Levinthal, 1990). "The creation of organizational knowledge must therefore be understood in terms of a process that 'organizationally' amplifies the knowledge created by individuals, and crystallizes it as part of the organization's knowledge network. The process of organizational knowledge creation is initiated by the expansion of individual knowledge" (Nonaka, 1994). In light of this, we can say that the influence of the ISO 9001 standard on structural capital, which corresponds to organizational knowledge, can pass through human capital, which corresponds to the employees. Similarly, according to the theory of knowledge creation, Nonaka, (1994) teaches us that tacit knowledge can be converted into explicit knowledge through externalization. ISO 9001, through its knowledge documentation requirements, provides a mechanism for extracting employees' experience and tacit knowledge and transforming it into structural capital (Peppard & Rylander, 2001; Tóth & Kövesi, 2008). At a fundamental level, knowledge is created by individuals; without individuals, an organization cannot create knowledge (Nonaka, 1994). Explicit knowledge is always based on tacit knowledge (Nonaka & von Krogh, 2009). As for the theory of sociotechnical systems, it teaches us that the organization is an open system interacting with the environment, mainly composed of two interacting subsystems (social and technical) (Griffith & Dougherty, 2001). The social system pertains to employees, their skills, attitudes, values, and relationships they maintain, while the technical system relates to processes and related knowledge, as well as the organization of work (El-Manzani, Sidmou & Cegarra, 2019). The environment is general and concerns everything external to the company. Given that we endorse this theory for the analysis of intellectual capital, the environment in our case corresponds to relational capital, which is the quality of the relationship between a company and its external partners. The social system, therefore, includes the knowledge and skills found in the theories of absorptive capacities and knowledge creation (tacit knowledge), corresponding to human capital. The technical system also encompasses the knowledge, routines, and organizational forms found in the theories of absorptive capacities and knowledge creation (explicit knowledge). The action of the social system on the technical system also provides a theoretical basis for understanding the impact of human capital on structural capital. Various comments in the literature on intellectual capital may suggest that human capital could play a mediating role between the ISO 9001 standard and structural capital. Human capital is the main component of intellectual capital (Ali, Hussin, Haddad, Al-Araj & Abed, 2021). Employees are the foundation for building and developing structural capital through the creation of business processes and routines, as well as the intellectual assets owned by the organization (Al-Ali, 2003). Transforming human capital into structural capital must be management's primary objective (Cohen & Kaimenakis, 2007). Human capital plays an important role in the creation of knowledge and influences the other two components of intellectual capital (Ahmed, Guozhu, Mubarik, Khan & Khan, 2019). Documenting processes and procedures facilitates knowledge sharing and transfer within the organization, reducing reliance on individual expertise and promoting organizational learning. In the light of these theories, we formulate the following hypothesis:

*H3: The absorption of the ISO 9001 standard positively influences structural capital through the mediation of human capital.*

Given the organization's openness to the environment and the interaction of its two subsystems (social and technical) with it, the theory of socio-technical systems therefore makes it possible to justify the effect of the ISO 9001 standard on external relations, through the influence of the social system and the technical system on the environment. The ISO 9001 standard can influence relational capital through the social (human capital) or technical (structural capital) system (separately or simultaneously). The people within the organization, the technical system they use and the external entities with which they interact form a complex dynamic. Like the theory of socio-technical systems, ISO 9001 itself is two-dimensional, comprising a "soft" part concerned with human issues and a "hard" part concerned with process optimization (Tarí, Claver-Cortés & García-Fernández, 2021).

Implementing ISO 9001 therefore has a joint effect on human and structural capital. Socio-technical systems theory teaches us that this is precisely what needs to be done. Indeed, one system cannot be optimized without taking an interest in the other, as this would lead to deficiency and imbalance. Performance therefore requires joint optimization of the social and technical systems (El-Manzani, 2019). Laallam, Kassim, Engku and Saiti (2020) also emphasize that the three components of intellectual capital work in synergy. More competent and capable people develop better structural capital for an organization, improved human and structural capital helps create more productive external capital (Knight, 1999). Albertini and Berger-Remy (2019) also suggest that studying the various possible combinations of intellectual capital components could be a fruitful area of research. Before reaching external stakeholders, the quality approach transforms the organization's internal structure, as mentioned in the section on the impact of ISO 9001 on human and structural capital, in order to equip it with the capabilities needed to satisfy external stakeholders. ISO 9001 implementation requires training and development of employees to ensure they understand the quality management system requirements and their roles within it. Management ensures that the requirements of the quality management system are communicated within the organization's business processes, and encourages, guides and supports people to participate in the effectiveness of the quality management system (chapter 5.1.1). To a large extent, the quality management system is designed to ensure better management of relations with external entities. By virtue of the principle of managing relations with interested parties, the quality management system goes beyond the perimeter of the organization and must therefore consider the external people and bodies that it may influence. According to ISO 9001, the organization must adopt a monitoring strategy, so that it is always aware of the requirements of relevant interested parties, whose understanding is essential for a fluid relationship with them. The most important stakeholder is undoubtedly the customer. By virtue of the application of the customer orientation principle, the customer must guide the company's actions. Chapter 5.1.2 of ISO 9001 states that: management must demonstrate its leadership in customer orientation by ensuring that, customer requirements and legal and regulatory requirements are identified and met on an ongoing basis. It must also "ensure the promotion of customer orientation at all levels of the organization" (chapter 5.3). Customer requirements must be taken into account, and even anticipated, by all members of the organization. From those who are in direct contact with the customer to those who are further away. Customer satisfaction is paramount. ISO 9001 implementation enhances human capital by training employees to better understand customer needs and expectations. This, coupled with the standardized processes and procedures facilitated by structural capital, enables organizations to deliver products and services that consistently meet or exceed customer requirements. Consequently, customer satisfaction and loyalty increase, strengthening relational capital. The choice of suppliers must be made judiciously after numerous analyses of suitability. A well-implemented ISO 9001-based quality system ensures that suppliers are selected, evaluated and managed on the basis of predefined criteria and processes. Robust structural capital ensures supply chain consistency and reliability, fostering trust and collaboration with suppliers. Strict compliance with legal and regulatory requirements is also essential. By investing in employee competence and standardized processes, organizations can build strong relationships with external stakeholders, leading to enhanced trust, collaboration, and reputation in the marketplace. Learning and applying the ISO 9001 standard by employees, means that they systematically take into account the requirements of external partners, document the related information, and organize processes accordingly. By establishing robust quality management systems, organizations can better adapt to changes in the business environment. On the basis of the theory, we formulate the following hypotheses:

*H4: The absorption of the ISO 9001 standard positively influences relational capital through the mediation of human capital.*

*H5: The absorption of the ISO 9001 standard positively influences relational capital through the mediation of structural capital.*

*H6: The absorption of the ISO 9001 standard positively influences relational capital through the serial mediation of human capital and then structural capital.*

The Figure 1 below represents the conceptual model of the research



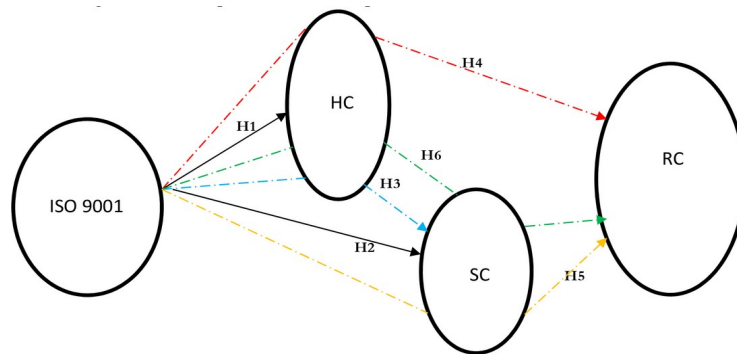


Figure 1. Conceptual model

## 4. Empirical Study

### 4.1. Sampling and Data Collection

This study focused on ISO 9001 certified companies in Morocco which is the population of the study. According to the International Organization for Standardization, there are approximately one thousand such companies in the country. Given this small number compared to the total number of Moroccan companies, we used convenience sampling. In other words, we administered our questionnaire to the available cases. We collected the data online by contacting individuals working in ISO 9001 certified companies. Given the absence of an exhaustive official list of these companies, we began by collecting partial lists of ISO 9001-certified companies from various websites. We then consolidated these lists to form our own database. Once the database was established, we used the LinkedIn professional network to contact people working in these companies, sending them invitations to take part in the study and submitting the questionnaire to interested parties. Data collection took place between May and October 2022. We contacted approximately 2000 individuals and received 147 responses. The first 47 responses were used for the questionnaire pre-test, and the subsequent 100 responses correspond to the final version of the questionnaire. We therefore used the data corresponding to the last 100 responses to test the hypotheses.

#### 4.1.1. The Measurement Scales

All variables were measured using a 5-point Likert scale. We developed new measurement scales for human, structural and relational capital from the sources below, while the ISO 9001 internalization measurement scale has been taken unchanged.

##### 4.1.1.1. Absorption of the ISO 9001 Standard

In order to measure the degree of implementation of the ISO 9001 standard, we opted for the scale developed by (Tari et al., 2019a). This scale is used in the works of (Tari et al., 2020a; Tari, Pereira-Moliner, Molina-Azorin & López-Gamero, 2019b; Tari et al., 2022). It consists of 9 items.

##### 4.1.1.2. Human Capital

The measurement scale for human capital consists of 10 items taken from the following studies (Bollen et al., 2005; Chen et al., 2004; Djekic et al., 2017; Kamukama, Ahiauzu & Ntayi, 2010; Kianto, Hurmelinna-Laukkanen & Ritala, 2010; Lekic, Carić, Soleša, Vapa-Tankosić, Rajaković-Mijailović, Bogetić et al., 2021).

##### 4.1.1.3. Structural Capital

The measurement scale for structural capital consists of 10 items taken from the following studies (Ataseven et al., 2014; Bontis, 2001; Chen et al., 2004; Hussinksi, Ritala, Vanhala & Kianto, 2017; Meyer, Skaggs & Youndt, 2014; Reed, Lubatkin & Srinivasan, 2006; Wu, Chang & Chen, 2008).

##### 4.1.1.4. Relational Capital

The measurement scale for relational capital consists of 14 items taken from the following studies (Bontis, 1998; Bueno, Salmador & Longo-Somoza, 2014; Chen et al., 2004; Isaac, Herremans & Kline, 2010; Kianto et al., 2010; Moon & Kym, 2009; Shih, Chang & Lin, 2010; Tseng & Goo, 2005).

## 4.2. Validation of the Measurement Model

### 4.2.1. Reliability and Convergent Validity

The data analysis was conducted using SmartPLS 3. The reliability of indicators refers to the “factor loading.” It is recommended to be at least 0.7. In case results lower than this value are obtained, those between 0.4 and 0.7 should only be removed if their exclusion allows the composite reliability and average variance extracted to reach the minimum required, which are respectively 0.7 and 0.5. An item with a score below 0.4 must be systematically removed (Hair, Hult, Ringle, Sarstedt, Danks & Ray, 2021). In our present case, although some items of human and structural capital do not reach 0.7; the minimum required threshold for composite reliability and average variance extracted is achieved by considering all the indicators. However, we decided to delete a human capital item that had a factor loading of 0.452. The results of the reliability and validity analysis below are subsequent to the deletion of this item from the human capital scale. Tables 1, 2, 3, and 4 respectively present the reliability and convergent validity parameters of the measurement scales for the absorption of the ISO 9001 standard, human capital, structural capital, and relational capital.

The absorption of the ISO 9001 standard measurement scale	Loadings Reliability	Composite Reliability	AVE
The documents created for certification are used in daily practice	0.878	0.969	0.775
The quality system becomes part of daily work routines	0.906		
All employees are trained in the notions of quality and the requirements of the quality standard	0.913		
The quality policy and the quality system procedures are updated to adapt them to daily organizational practices	0.810		
The development of the quality system makes it possible to introduce new improvement practices	0.924		
The quality standard has led the organization to discover improvement opportunities	0.903		
Investing time and resources in the quality standard is a starting point towards the implementation of other more advanced practices	0.827		
Investing time and resources in the quality standard helps to reflect on the way work is done in the firm and improve our work	0.892		
Investing time and resources in the quality standard is seen as an opportunity to innovate in our organization	0.864		

Table 1. Reliability and validity of the ISO 9001 standard's absorption scale

Scale of measurement of human capital (HC)	Loadings Reliability	Composite Reliability	AVE
Employees' knowledge and skills	0.760	0.922	0.568
Good at problem handling	0.805		
Our employees are highly skilled in their tasks	0.776		
Competences of employees are in accordance with the requirements and responsibilities of the workplace	0.704		
The company encourages the upgrade and development of knowledge and skills of employees	0.732		
Employees in the company, when performing work tasks, give their maximum	0.781		
Identification with corporate values	0.781		
Employees are overall satisfied in our company	0.697*		
Employees are proud to work in the firm	0.739		

Table 2. Reliability and validity of the human capital measurement scale

Measurement scale of structural capital (SC)	Loadings Reliability	Composite Reliability	AVE
Our company has a great deal of useful information in documents and databases	0.523*	0.910	0.506
Our organization embeds much of its knowledge and information in structures, systems, and processes.	0.563*		
Construction and utilization of company repository	0.703		
Features of our information systems capture the knowledge that exists in this organization	0.661*		
Validity of enterprise controlling system	0.795		
The consistency of the way processes is performed	0.767		
The overall operation procedure is very efficient	0.817		
Business process period	0.746		
Systems allow easy info access	0.682*		
Availability of enterprise information	0.794		

Table 3. Reliability and validity of the measurement scale of structural capital

Measurement scale of relational capital (RC)	Loadings Reliability	Composite Reliability	AVE
Longevity of relationships	0.786	0.968	0.683
Customers' loyalty	0.773		
Customers' satisfaction	0.824		
Customer complaint	0.730		
Customer feedback	0.860		
Brand and trademark reputation/ Corporate image/	0.862		
Negotiation power against partners	0.831		
Our business partner does not do anything that would harm our firm's goals and interests	0.866		
Possibility of preserving relationships with partners	0.826		
Negotiations and cooperation with the business partner go smoothly, because we understand each other well and 'speak the same language' with each other	0.802		
Relationships with another external group	0.899		
We maintain appropriate communication with our stakeholders.	0.812		
Relationships with public administrations	0.872		
Corporate reputation	0.815		

Table 4. Reliability and validity of the measurement scale of relational capital

#### 4.2.2. Discriminant Validity

To establish discriminant validity, two parameters are used: the Fornell-Larcker criterion and the heterotrait-monotrait ratio (HTMT). To satisfy the Fornell-Larcker criterion, the square root of the average variance extracted from a construct must be greater than the correlations between that construct and all other constructs. The heterotrait-monotrait ratio (HTMT) should be less than 0.85 (Hair et al., 2021). Table 5 shows the satisfaction of the Fornell-Larcker criterion. The numbers on the upper diagonal represent the square root of the average extracted variances. They are all greater than the other numbers in their respective columns.

Fornell-Larcker criterion	HC	RC	SC	ISO
HC	0.754			
RC	0.434	0.827		
SC	0.734	0.490	0.711	
ISO	0.658	0.432	0.509	0.881

Table 5. Establishing discriminant validity between constructs (FLC)

The heterotrait-monotrait ratio (HTMT) compares the variables of the model pairwise. The result obtained from these various comparisons should be less than 0.85 to establish that the different variables are indeed distinct from each other. It is possible to tolerate an HTMT ratio up to 0.90 if the concepts are closely related (Hair et al., 2021). In our current case, all HTMT values are below 0.85, as shown in Table 6 below. Discriminant validity is therefore established.

HTMT	CH	CR	CS	ISO
CH				
CR	0.457			
CS	0.810	0.516		
ISO	0.695	0.446	0.546	

Table 6. Establishing discriminant validity between constructs (HTMT)

### 4.3. Validation of the Structural Model

The Table 7 below presents the results of the hypothesis testing and the parameters associated with the structural model.

Hypothesis	B	t-value	p-value	R <sup>2</sup>	f <sup>2</sup>	Is the hypothesis supported?	95% confidence interval
H1: ISO 9001 → CH	0.658	11.447	0.000	0.432	0.762	Yes	0.541;0.760
H2: ISO 9001 → CS	0.047	0.446	0.656	0.539	0.003	No	-0.158;0.267
H3: ISO 9001 → <u>CH → CS</u>	0.462	6.007	0.000			0.608	Yes
H4: ISO 9001 → <u>CH → CR</u>	0.105	1.048	0.295	0.252	0.016	No	-0.083;0.321
H5: ISO 9001 → CS → CR	0.018	0.405	0.685			No	-0.063;0.120
H6: ISO 9001 → CH → <u>CS → CR</u>	0.172	2.259	0.024			0.086	Yes

HC\*human capital / SC\*structural capital / RC\*relational capital;  $-1 < \beta < 1$ ;  
 $t > 1.96$  ;  $p < 0.05$ ;  $R^2$  ( $> = 0.67$  substantial;  $> = 0.33$  moderate;  $> = 0.19$  weak);  
 $f^2$  ( $> = 0.02$  weak;  $> = 0.15$  moderate;  $> = 0.35$  substantial)

Table 7. Results of hypothesis testing

The hypothesis testing is performed using the Bootstrapping procedure, which allows evaluating the significance of path coefficients ( $\beta$ : path coefficient) to conclude whether the associated hypothesis is accepted or rejected. The resampling was done with 5000 iterations. The decision to use the structural equation method is justified by the observation made in the literature on intellectual capital, which highlights the strong interdependence between its various components. The value of intellectual capital components lies in their combination rather than in their individual characteristics (Wang, Wang & Liang, 2014). The conceptual separation of intellectual capital into human, structural and relational capital must not obscure the interdependence that exists between them (Giuliani, 2013). Thus, when testing the hypotheses relating to these elements, it is crucial to consider all three components of intellectual capital simultaneously, and thus to test the model as a whole, rather than focusing on the hypotheses individually. This approach allows us to take into account the interrelation between these components, which is essential for a thorough understanding of intellectual capital. The first hypothesis regarding the influence of ISO 9001 on human capital is validated. The path coefficient of 0.658 is significant ( $p$ -value  $0.000 < 0.05$ ) with an effect size of  $0.762 > 0.35$ , indicating a strong impact of ISO 9001 on human

capital. ISO 9001 influences structural capital through the full mediation of human capital, validating hypothesis H3 with a path coefficient of 0.462 ( $p$ -value  $0.000 < 0.05$ ) and rejecting hypothesis H2, as its path coefficient of 0.047 is not significant ( $p$ -value= $0.656 > 0.05$ ). Human capital has a substantial impact on structural capital, with an effect size of  $0.608 > 0.35$ . Therefore, the explained variance of structural capital ( $R^2 = 0.539$ ) is solely attributable to human capital and not to ISO 9001, which has no direct effect on structural capital ( $f^2 = 0.003$ ). As for the influence of ISO 9001 on relational capital, it occurs through the serial mediation of human and structural capital, validating hypothesis H6 and rejecting hypotheses H4 and H5. Only the path coefficient of hypothesis H6 is significant, with 0.172 ( $p$ -value  $0.024 < 0.05$ ). The overall index to evaluate the model's fit to the data is the Standardized Root Mean Square Residual (SRMR), which should be less than 0.08 (Hu & Bentler, 1999). The SRMR of our model is 0.079, which is below 0.08, indicating a good fit of our model to the data. The figure 02 below presents the conceptual model created using the software SmartPLS3.

## 5. Discussion and Conclusion

This research aimed to verify whether the adoption of ISO 9001 standard by organizations could lead to the development of their intellectual capital, which consists of human, structural, and relational capital according to the dominant taxonomy. We adopted a deductive research method based on the theory of absorptive capacities, the theory of knowledge creation and the theory of socio-technical systems. Hypothesis H1 regarding the influence of ISO 9001 on human capital was validated. Two hypotheses were formulated regarding the influence of ISO 9001 on structural capital. One hypothesis proposed a direct influence of ISO 9001 on structural capital, and the other suggested partial mediation through human capital. However, the mediation turned out to be complete, meaning that the influence of ISO 9001 on structural capital occurs exclusively through human capital, thus validating hypothesis H3. As for the influence of ISO 9001 on relational capital, it is neither exclusively through human capital nor through structural capital, but through the joint contribution of both capitals, hence validating hypothesis H6.

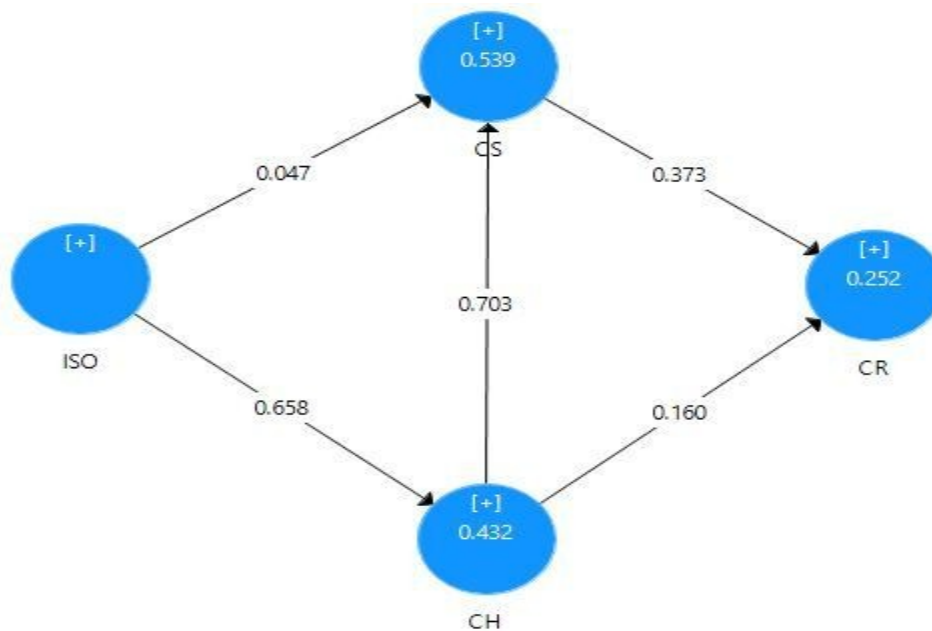


Figure 2. Conceptual model (SmartPLS 03)

### 5.1. Theoretical Implications

This study falls within the literature on the internalization of ISO 9001, which it contributes to strengthening. Indeed, many researchers call for conducting more studies by measuring the degree of ISO 9001 absorption by organizations and not just relying on the fact that the company possesses ISO 9001 certification. The mere implementation of a given system only demonstrates compliance with basic requirements but says nothing about the organization's progress in terms of quality management processes (Wolniak, 2019). Researchers must

acknowledge that the assumption that organizations adopt ISO 9001 in an identical manner is a limitation, and they should assess how different levels of implementation impact their results (Allur et al., 2014). The measurement of ISO 9001 internalization is a stimulating research area with a clear lack of knowledge, particularly in quantitative studies are needed (Heras-Saizarbitoria & Boiral, 2013). Therefore, our study is a response to the concerns raised in the literature. Furthermore, due to its interdisciplinary nature, it facilitates a connection between research focused on ISO 9001 and research focused on intellectual capital. In accordance with our findings, other studies also find a positive impact of the ISO 9001 standard on employees' knowledge and skills (Allur et al., 2014; Arauz & Suzuki, 2004; Ataseven et al., 2014; Jain & Singh-Ahuja, 2012) as well as their attitudes (motivation, satisfaction) (Feng et al., 2007; Jang & Lin, 2008; Molina-Azorín et al., 2015; Tarí et al., 2013). Lin and Jang (2008) did not find a relationship between ISO 9001 standard and employees' morale or procedure improvement. Our study represents an extension of previous work, as it employs measurement scales exclusively composed of items related to human, structural, and relational capital. The conceptual separation of intellectual capital into human, structural, and relational capital should not overshadow the interdependence that exists between these capitals (Bontis, 1998; Giuliani, 2013; Subramaniam & Youndt, 2005). Hence, it is important to study them simultaneously while establishing connections between them. Consistent with our hypothesis H3, other studies find a positive impact of ISO 9001 adoption on structural capital (Arauz & Suzuki, 2004; Feng et al., 2007; Ismyrlis & Moschidis, 2015; Lee et al., 2009; Vetchagool et al., 2021). Our study extends these previous works by showing that the influence of the ISO 9001 standard on structural capital occurs through the complete mediation of human capital. Finally, some studies find a positive impact of the ISO 9001 standard on relational capital (Allur et al., 2014; Arauz & Suzuki, 2004; Ataseven et al., 2014; Naveh & Marcus, 2005; Nurcahyo et al., 2021; To et al., 2011). Other studies do not find that the ISO 9001 standard improves the company's image (Feng et al., 2007) or customer satisfaction (Jang & Lin, 2008). A set of other studies find that the influence of the ISO 9001 standard on relational capital occurs only within the context of continuous improvement (Prajogo et al., 2012; Tarí et al., 2019a, 2020a). Previous studies generally analyze the direct effect of ISO 9001 on relational capital. The validation of our hypothesis H6 complicates the influence of the ISO 9001 standard on relational capital by showing that it occurs through the serial mediation of human and structural capital. Tarí et al., (2022) find that the ISO 9001 standard influences relational capital through the mediation of human capital. In this research, we adopted the heterogeneous method to study the effects of the ISO 9001 standard. Since few studies have proceeded in this way, this research is first and foremost a numerical contribution. This method is considered by researchers to be more advanced than the homogeneous method, and our results show an impact of ISO 9001 on all three components of intellectual capital. This is further evidence in support of studies adopting the homogeneous method that have found similar results. Our results therefore help to resolve contradictions in homogeneous studies, by tipping the balance in favor of studies that found a positive influence of ISO 9001 on the components of intellectual capital, since the heterogeneous method is considered to be more reliable. Heterogeneous studies can help resolve contradictions raised in homogeneous studies (Heras-Saizarbitoria, 2011). Beyond the numerical contribution, our study refines the mechanism by which the ISO 9001 standard influences structural and relational capital. Our results show that the ISO 9001 standard influences structural capital through the mediation of human capital. It influences relational capital through the serial mediation of human and structural capital. Previous studies generally only measured the direct relationship between ISO 9001 and structural and relational capital. If the impact of the ISO 9001 standard on structural capital is the subject of almost unanimity in the literature, the inclusion of human capital in this relationship shows that it fully mediates the relationship between ISO 9001 and structural capital. The impact of ISO 9001 on relational capital is the subject of numerous contradictions. Integrating human and structural capital into this relationship may help to overcome these contradictions.

## 5.2. Practical Implications

Given the validation of our hypotheses H1, H3, and H6, in terms of managerial implications, we can affirm that organizations can adopt the ISO 9001 standard for the development of each component of intellectual capital. The widespread adoption of ISO 9001 worldwide will only increase the practical significance of our research. Although there is a trend away from ISO 9001 certification, there are still over a million ISO 9001-certified organizations worldwide.

Human capital is at the heart of ISO 9001's influence on intellectual capital. The literature already affirms that human capital is the basis for the development of the other two capitals. The implementation of ISO 9001 enables the development of human capital itself, while putting it in the best possible position to effectively develop the other two capitals. As far as human capital is concerned, organizations need to focus on ISO 9001 requirements relating to the recruitment of qualified employees and their ongoing training. They should also rigorously implement requirements for creating physical and psychological conditions for employee well-being, as this will strengthen their motivation and engagement. These conditions can refer to the social climate, which, according to ISO 9001, should be non-discriminatory, non-conflicting, calm, non-stressful, and attentive to the emotional well-being of employees. Implementing these provisions fosters a sense of camaraderie among the staff, leading to the development of tacit knowledge through mutual learning. The process approach, emphasis on communication, and implementation of the principle of employee involvement are all mechanisms that facilitate socialization and, consequently, the sharing of tacit knowledge. Following this, employees must be trained in the requirements of the quality management system in relation to structural and relational capital. They must then rigorously apply these requirements. As for structural capital, it develops through knowledge documentation and process rationalization. Employees must therefore document their tacit knowledge into explicit knowledge and manage processes efficiently, as dictated by the ISO 9001 standard. An organization could encourage its employees to formalize their knowledge. However, without continuous learning at individual level, organizational knowledge would not be consistent and could not be renewed. Thus, ISO 9001, through its measures to develop employee knowledge, will enable the effective development of structural capital. Regarding relational capital, its development, which involves improving relationships with external partners, will come through considering their needs and expectations, as required by ISO 9001. Employees, being aware of what is necessary to satisfy external entities, internalize this knowledge within the company and organize processes and organizational structures accordingly. This is how ISO 9001 will contribute to the development of relational capital. Therefore, ISO 9001 constitutes a comprehensive tool for managing intellectual capital. Specific details can be found in the ISO 9001 document.

### **5.3. Limitations and Future Studies**

Despite the comprehensive analysis presented in this study, it is essential to recognize certain limitations. Firstly, variations in quality management system maturity in different countries may introduce differences in the accumulation of intellectual capital, which may impact on the generalizability of our results. The sample consists of 100 firms, which may be considered relatively small in scale and the presence of selection bias cannot be entirely ruled out. Therefore, it is important to acknowledge that the findings of this study may not be fully representative of all organizations implementing the ISO 9001 standard in the country. The limited sample size may affect the statistical power of the analyses conducted. Furthermore, it is imperative to recognize that the accumulation of intellectual capital under the influence of the ISO 9001 standard may evolve over time, with distinct patterns emerging between the initial stage of certification and organizations where the system has been operational for an extended period. Introducing a moderating variable such as the time elapsed since obtaining certification can provide valuable insights to refine the results. This would allow for a more nuanced understanding of how the impact of ISO 9001 certification on intellectual capital creation varies over time. Including such a variable can help delineate the temporal dynamics of intellectual capital development, thereby enhancing the depth and accuracy of the study findings. The determinants that can explain the variables (human, structural and relational capital) are multiple. Thus, the variances of the endogenous variables cannot be attributed exclusively to the exogenous variables. A multitude of factors, both internal and external to the organization, may contribute to the development and dynamics of these capital components. The introduction of control variables such as company size could strengthen the internal validity of future studies. Our study also suffers from the fact that the various variables are measured on the basis of a questionnaire submitted to individuals. The levels of the variables reflect the perceptions of these people, and are therefore subjective. We have measured the level of ISO 9001 implementation using a scale, in order to avoid criticism of studies which are simply satisfied with ISO 9001 certification (homogeneous study). A better approach would be to monitor activities within an ISO 9001-certified organization on a daily basis, to judge for oneself the effective application of the standard, in order to analyze its possible effects on other variables. Within this framework, this study can

be continued by carrying out action research in an ISO 9001-certified company, which will consist of monitoring and rigorously implementing the standard's requirements relating to the three components of intellectual capital, in order to verify whether these elements are improving over time, using objective data.

### Declaration of Conflicting Interests

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