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# MODERATION OF DYNAMIC CAPABILITIES IN THE RELATIONSHIP BETWEEN INTELLECTUAL CAPITAL AND INNOVATIVE PERFORMANCE IN CHAPECÓ COMPANIES

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## Abstract

**Purpose:** The purpose of this study is to investigate the relationship between intellectual capital, dynamic capability, and innovative performance in micro and small enterprises located in the municipality of Chapecó (SC), Brazil.
**Methodology:** A descriptive quantitative approach was used, applying a structured *survey* with a five-point Likert scale. The questionnaire was distributed to financial managers and/or owner-partners of micro and small enterprises in Chapecó, resulting in 121 valid responses. The data were analyzed using correlation tests, multiple linear regression analysis, and ANOVA test.
**Originality:** This study stands out for its specific approach in a regional context, exploring the relationship between intellectual capital, dynamic capability, and innovative performance in micro and small enterprises in Chapecó (SC), Brazil, thus filling an identified knowledge gap in the literature.
**Results:** The results indicate that the innovative performance of companies is positively influenced by close relationships with suppliers, the use of technology to integrate internal processes, and the ability of employees to anticipate economic changes and make strategic decisions. Technology, when moderated by dynamic capability, proved particularly effective in improving efficiency and speed in innovation.
**Theoretical Contributions:** The study reinforces the importance of human capital and technology in innovation. It also demonstrates that close relationships with suppliers and the effective use of technology are crucial for innovative performance, offering new insights into how these dynamics apply in a specific regional context.

**Keywords:** intellectual capital, innovative performance, dynamic capabilities, companies, Chapecó (SC)

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## Moderação das capacidades dinâmicas na relação entre o capital intelectual e o desempenho inovador em empresas chapecoenses

### Resumo

**Propósito**: O propósito deste estudo é investigar a relação entre capital intelectual, capacidade dinâmica e desempenho inovador em micro e pequenas empresas situadas no município de Chapecó (SC), Brasil.
**Metodologia**: Utilizou-se uma abordagem quantitativa descritiva, aplicando um *survey* estruturado com uma escala *Likert* de cinco pontos. O questionário foi disseminado para gerentes financeiros e/ou sócios-proprietários de micro e pequenas empresas chapecoenses, resultando em 121 respostas válidas. Os dados foram analisados utilizando testes de correlação, análise de regressão linear múltipla e teste ANOVA.
**Originalidade**: Este estudo se destaca pela abordagem específica em um contexto regional, explorando a relação entre capital intelectual, capacidade dinâmica e desempenho inovador em micro e pequenas empresas do município de Chapecó (SC), Brasil, preenchendo uma lacuna de conhecimento identificada na literatura.
**Resultados**: Os resultados indicam que o desempenho inovador das empresas é positivamente influenciado por estreitamento de relações com fornecedores, uso de tecnologia para integrar processos internos e a capacidade dos funcionários em antecipar mudanças econômicas e tomar decisões estratégicas. A tecnologia, quando moderada pela capacidade dinâmica, mostrou-se particularmente eficaz na melhoria da eficiência e rapidez na inovação.
**Contribuições teóricas**: O estudo reforça a importância do capital humano e da tecnologia na inovação. Demonstra também que relações estreitas com fornecedores e o uso eficaz da tecnologia são cruciais para o desempenho inovador, oferecendo novas ideias sobre como essas dinâmicas se aplicam em um contexto regional específico.

**Palavras-Chave:** capital intelectual, desempenho inovador, capacidades dinâmicas, empresas, Chapecó (SC)

## Moderación de las capacidades dinámicas en la relación entre el capital intelectual y el desempeño innovador en empresas chapecoenses

### Resumen

**Propósito:** El propósito de este estudio es investigar la relación entre el capital intelectual, la capacidad dinámica y el desempeño innovador en micro y pequeñas empresas situadas en el municipio de Chapecó (SC), Brasil.
**Metodología:** Se utilizó un enfoque cuantitativo descriptivo, aplicando una encuesta estructurada con una escala *Likert* de cinco puntos. El cuestionario se distribuyó a gerentes financieros y/o socios-propietarios de micro y pequeñas empresas en Chapecó, resultando en 121 respuestas válidas. Los datos fueron analizados utilizando pruebas de correlación, análisis de regresión lineal múltiple y prueba ANOVA.
**Originalidad:** Este estudio se destaca por su enfoque específico en un contexto regional, explorando la relación entre el capital intelectual, la capacidad dinámica y el desempeño innovador en micro y pequeñas empresas en Chapecó (SC), Brasil, llenando así una laguna de conocimiento identificada en la literatura.
**Resultados:** Los resultados indican que el desempeño innovador de las empresas está influenciado positivamente por relaciones cercanas con proveedores, el uso de tecnología para integrar procesos internos y la capacidad de los empleados para anticipar cambios económicos

y tomar decisiones estratégicas. La tecnología, cuando es moderada por la capacidad dinámica, resultó ser particularmente efectiva en la mejora de la eficiencia y rapidez en la innovación. **Contribuciones Teóricas:** El estudio refuerza la importancia del capital humano y la tecnología en la innovación. También demuestra que las relaciones cercanas con proveedores y el uso efectivo de la tecnología son cruciales para el desempeño innovador, ofreciendo nuevas ideas sobre cómo se aplican estas dinámicas en un contexto regional específico.

**Palabras-Clave:** capital intelectual, desempeño innovador, capacidades dinámicas, empresas, Chapecó (SC)

## 1 Introduction

With the emergence of the knowledge economy, the corporate dynamics aimed at survival and growth have undergone deep transformations, elevating the role of the intellectual capital in the achievement of superior performance (Serenko & Bontis, 2013). Much research has discussed intellectual capital and its effects. However, it has not yet been fully elucidated why some organizations, equipped with exemplary business processes and efficient information systems, and with experienced teams and solid ties with customers and suppliers, do not achieve satisfactory innovative performance (Hsu & Wang, 2012).

Companies with similar intellectual capital can reap different benefits, varying according to their ability to perceive, learn and reconceptualize this capital (Hsu & Wang, 2012). This domain is one of the pillars of strategic management, known as dynamic capability (Teece, Pisano & Shuen, 1997). Dynamic capability refers to an advanced competence that guides the company's ability to integrate, build and reconfigure resources, both internal and external, adapting to changing environments or shaping them (Teece, 2012).

Although there is a vast literature on intellectual capital and dynamic capacity, the two concepts are rarely analyzed concomitantly (Jácome, Medina-Tovar, Rodríguez-Herás, Vásquez-Peñaloza, Gómez-Charris, 2022). Arshad, Arshad, Lamsali, Alshuaibi, Albashar, Shakoor and Chuah (2023) examined how the innovation capacity, intellectual capital and performance of small and medium-sized companies with the external environment as a moderating role are related. The results indicate that performance is significantly impacted by their innovation capacity and intellectual capital.

Ahmed, Bhatti, Gölgeci and Arslan (2022) examined the relationship between digital platform capability and organizational agility in small and medium-sized enterprises, investigating the mediating role of intellectual capital and the moderating role of environmental dynamism. The results reveal that digital platform capability is positively associated with companies' agility and that the three dimensions of intellectual capital (human, organizational

and relational capital) mediate this relationship; in addition, environmental dynamism has a negative moderating role on digital platform capability and intellectual capital.

Few researchers have examined the interaction of dynamic capability in the link between intellectual capital and innovative performance, with studies such as that by Wu, Lin and Hsu (2007) identifying a moderating effect. The results show that structural capital and relationship capital fully mediate the effects of human capital on innovative performance.

Studying municipalities in inland areas has unique specificities that differ significantly from the analyses focused on large industrial centers (Hossain, Islam, Sayeed & Kauranen, 2016). The authors add that the economies of these municipalities often depend on a smaller number of dominant sectors and may be more subject to local resource fluctuations and limitations. In addition, Fernandez-Pinto, Duarte, Villamizar and Suarez (2024) comment that companies in inland regions tend to have distinct organizational structures and relationship networks, which can influence the application and development of intellectual capital and dynamic capacity differently.

Much of the research in this area focuses on companies located in large industrial centers, leaving gaps in the study of more inland economies (Kaya, Abubakar, Behravesh, Yildiz & Mert, 2020). The municipality of Chapecó, which stands out among the main economies in the interior of the state of Santa Catarina, according to data from the Chapecó City Hall (2022), provides a favorable environment for analyzing intellectual capital and dynamic capability, and their interrelationships with innovative performance outside of large industrial centers.

The South Region of Brazil has been gaining prominence on the national economic scene (Montibeller Filho & Gargioni, 2014). The municipality of Chapecó, located in Santa Catarina, represents one of the pillars of the state's economy, serving as a real laboratory for investigating the correlation between resources and business performance, considering that organizations create resources and strategies aligned with their specific context (Sequeira, 2008).

These gaps can be addressed through the lens of knowledge-based dynamic capability. Therefore, this research aims to broaden the understanding of the role of intellectual capital. It also seeks to clarify the debate on the influence of dynamic capability in different national contexts.

In this context, the central question arises: What is the relationship between intellectual capital, innovative performance and dynamic capabilities in micro and small companies in the municipality of Chapecó? To answer this question, this study aims to investigate the

relationship between intellectual capital, innovative performance and dynamic capabilities in micro and small companies in the municipality of Chapecó.

This study finds its relevance in the notable lack of research focused on inland economies (Kaya et al., 2020). In addition, it is aligned with the Sustainable Development Goals (SDGs), a global initiative proposed by the UN to tackle a variety of global challenges, including poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. Within the SDGs, this work focuses specifically on SDG 8, which aims to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all, and on SDG 9, which emphasizes building resilient infrastructure, promoting inclusive and sustainable industrialization and promoting innovation.

The expected results aim to support managers in strategic decisions, reinforcing intellectual capital and dynamic capability as vectors of innovative performance. Based on the evidence, organizations that have qualified teams, that strengthen ties with stakeholders and that adopt an integrative stance in relation to technology tend to have an increased capability to adapt and innovate.

It is therefore important to analyze scenarios such as Chapecó, in the State of Santa Catarina, where traits of growth are evident, making this study a unique contribution to the field of research.

The article is organized as follows: literature review, formulation of the research hypotheses, presentation of the methodology, explanation of the empirical results and, finally, discussion, conclusions, contributions, limitations and suggestions for future research.

## 2 Literature Review

Organizations have progressively adopted an amalgam of resources and capabilities in the search for a sustainable competitive advantage (Makadok, 2001; Chang, Wannamakok & Lin, 2023). This movement is in line with the theory of dynamic capabilities, which suggests that companies must constantly renew their competencies in order to remain competitive in rapidly changing environments (Teece et al., 1997). The focus of this paper lies on the interrelationship between intellectual resources and innovative performance, exploring how these resources can be leveraged to promote innovation and competitive advantage.

In the context of organizations, resources are broadly categorized as human, physical and financial, while capabilities refer to the company's competence in employing these resources effectively (Jácome et al., 2022). According to the theory of dynamic capabilities, a capability is a non-transferable business characteristic that is intrinsically linked to its

organizational structure, with the aim of optimizing the productivity of available resources (Makadok, 2001; Chang et al., 2023). The authors add that these capabilities are fundamental for adapting and reconfiguring business strategies in response to changes in the external environment).

This study's conceptual model is based on the interaction between intellectual capital and dynamic capabilities and their influence on innovative intellectual performance (Wu et al., 2007; Bechtel, Kaufmann & Kock, 2023; Lu, Meng, Su, Ming, Wu & Wang, 2023). Intellectual capital is comprised of human, relational and structural capital, which together represent the intellectual resources accumulated by the organization (Subramaniam & Youndt, 2005; Zhang, Wang & Chun, 2022). Dynamic capabilities, in turn, reflect the company's ability to sense, seize and reconfigure knowledge, facilitating adaptation and innovation (Teece et al., 1997). The central hypothesis is that knowledge-based dynamic capabilities moderate the relationship between intellectual capital and innovative performance, amplifying the positive effects of intellectual capital on intellectual organizational innovation (Wu et al., 2007; Bechtel et al., 2023; Lu et al., 2023).

## 2.1 Intellectual Capital

Intellectual capital represents the accumulation of all the intellectual resources, such as experience, skills, talents and relationships that organizations employ to achieve high performance. This set can provide a competitive advantage or add market value to the company (Subramaniam & Youndt, 2005; Zhang et al., 2022).

Several perspectives are presented in the academic literature on the structure of intellectual capital, with various typologies and terminologies (Curado, 2008; Martín-de-Castro, Delgado-Verde, López-Sáez, & Navas-López, 2011; Zhang et al., 2022). However, it is the prevailing understanding that intellectual capital is divided into human capital, relational capital and structural capital, thus consolidating the triple essence of intellectual capital (Curado, 2008; Martín-de-Castro et al., 2011; Zhang et al., 2022) - a perspective adopted in this study.

Human capital refers to the knowledge, experience, skills, innovative capability and knowledge reserves incorporated and mobilized by business teams (Ozgun, Tarim, Delen, & Zaim, 2022; Zhang et al., 2022). Relational capital, in turn, refers to the knowledge that is built and accessed through interactions with stakeholders such as customers, suppliers, government entities and other institutions (Hsu & Wang, 2012; Zhang et al., 2022; Van Vo & Nguyen, 2023). Structural capital encompasses institutional knowledge and systematized experiences

present and operationalized in databases, patents, manuals, systems and processes. This category can be understood in terms of organizational processes, information systems, business standards and related infrastructures (Hsu & Wang, 2012; Zhang et al., 2022).

Given the relevance of intellectual capital, as pointed out by Hsu and Wang (2012) and Zhang et al. (2022), it plays a key role in stimulating innovation, broadening its conceptualization and effectiveness. Thus, the first hypothesis of this study is proposed:

***H1. Intellectual capital positively and significantly influences innovative performance.***

## 2.2 Dynamic Capability

Dynamic capability alludes to the ability of companies to incorporate, build and reconfigure internal and external competencies to face rapidly changing environments (Teece et al., 1997; Jácome et al., 2022). Contemporary studies on dynamic capability mainly emphasize its definition, antecedents, nature, processes and relationship with innovative performance (Vogel & Güttel, 2013; Li & Liu, 2014; Bayu, Berhan, & Ebinger, 2022; Jácome et al., 2022; Li, Wu, Zhang & Yang, 2023; El Maalouf & Bahemia, 2023; Dwivedi, Balakrishnan, Das & Dutot, 2023).

From a knowledge-based perspective, Teece (1998) defines dynamic capability as the ability to identify and subsequently seize new opportunities, reconfigure and protect knowledge assets, competencies, complementary assets and technologies to achieve sustainable competitive advantages. Zahra and George (2002) redefine absorptive capacity as a dynamic capability centered on the acquisition, assimilation, transformation and exploitation of knowledge. Nielsen (2006) suggests that dynamic capability can be interpreted as a set of knowledge management activities that modify, renew and utilize the company's knowledge-based resources.

Barreto (2010) states that a dynamic capability is characterized by its ability to perceive opportunities and threats, make timely and market-oriented decisions, and modify its resource base. Landroguez, Castro and Cepeda-Carrion (2011) propose that the interaction and transfer of knowledge between market orientation, knowledge management and customer relationship management constitutes a dynamic capability centered on knowledge.

Thus, in the light of the literature and adopting a process perspective, dynamic knowledge-based capability is defined as a company's ability to approach problems systematically through dynamic applications and adjustments of its knowledge base. This capability unfolds into: knowledge sensing capability, knowledge seizing capability and

knowledge reconfiguration capability (Teece, 2007; Wang, Klein, & Jiang, 2007; Denford, 2013; Li & Liu, 2014; Chang et al., 2023).

Knowledge sensing capability refers to the ability to effectively identify and interpret valuable knowledge, both internal and external, which allows companies to assess external opportunities and threats, as well as recognize advantages and disadvantages of their internal knowledge base. Seizing knowledge capability relates to the ability to actively and accurately decide how to allocate and integrate knowledge resources into opportunities. Finally, the reconfiguration of knowledge capability refers to the ability to effectively recombine and transform knowledge resources and organizational structures as the company evolves and the environment changes.

Therefore knowledge-based dynamic capability, as described by Teece et al. (1997) and Hsu and Wang (2012), is shaped by intellectual capital and determines the company's ability to adapt and adjust to the demands of the environment. On this basis, the second research hypothesis is established:

***H2. Dynamic capability positively and significantly influences innovative performance.***

## 2.3 Moderation of dynamic capability in the relationship between intellectual capital and innovative performance

The Resource-Based View (RBV) postulates that the competitive advantage comes from heterogeneous resources that are valuable, rare, inimitable and irreplaceable (Barney, 1991). Unlike tangible resources such as land, raw materials and financial capital, intellectual capital is constituted as a strategic resource and unique knowledge system, molded into operational processes with VRII characteristics, enabling a company to obtain sustainable competitive advantage (Curado, 2008).

Human capital is crucial to promoting innovative performance in a dynamic and changing business environment. The knowledge, experience and skills of the team become decisive (Subramaniam & Youndt, 2005; Hsu & Wang, 2012). The presence of qualified professionals with solid academic backgrounds and advanced skills boosts the organization's cognitive capacity, increasing productivity and efficiency. Such qualifications lead to more assertive decisions and consequent improvements in innovative performance (Martín-de-Castro et al., 2011).

Subramaniam and Youndt (2005) highlight relational capital as a concept centered on the mobilization of resources via social structure, which is crucial in creating value. Nahapiet and Ghoshal (1998) argue that companies can obtain vital information and support from

stakeholders such as customers and suppliers. Relational capital has a direct impact on the combination and exchange of resources, facilitating access to networks. Robust business and government relationships provide economic and operational performance (Luo, Huang, & Wang, 2012). Bonner and Walker (2004) and Fávero, Pereira, Gomes, and Carvalho (2020) emphasize the importance of close and integrated relationships with customers and suppliers, highlighting the accelerated and cost-effective development of new products.

Structural capital comprises organizational processes and information systems (Martín-de-Castro et al., 2011; Hsu & Wang, 2012). Advanced information systems are crucial in decision-making, while clear procedures and robust systems are potential sources of innovative performance (Bontis, 1998; Widener, 2006).

The literature recognizes innovation as essential for competitive advantage (Day & Wensley, 1988; Hunt & Morgan, 1995). Innovation is the means by which organizations use their assets to generate performance (Reed & DeFillippi, 1990; Barney, 1991). Chang et al. (2023) assert the importance of employees' innovative performance for sustainability and competitive advantage, especially in technology.

Knowledge-based dynamic capability facilitates effective adjustments, strengthening the relationship between human capital and innovative performance (Cohen & Levinthal, 1990; Zahra & George, 2002). Companies that are well structured in this capability are able to integrate accumulated relational capital, promoting external knowledge to develop innovative products (Tsai, 2001; Wu et al., 2007; Lu et al., 2023). In an uncertain business environment, it is essential to strengthen knowledge-based dynamic capabilities to address environmental issues. This capability enhances the relationship between structural capital and organizational performance.

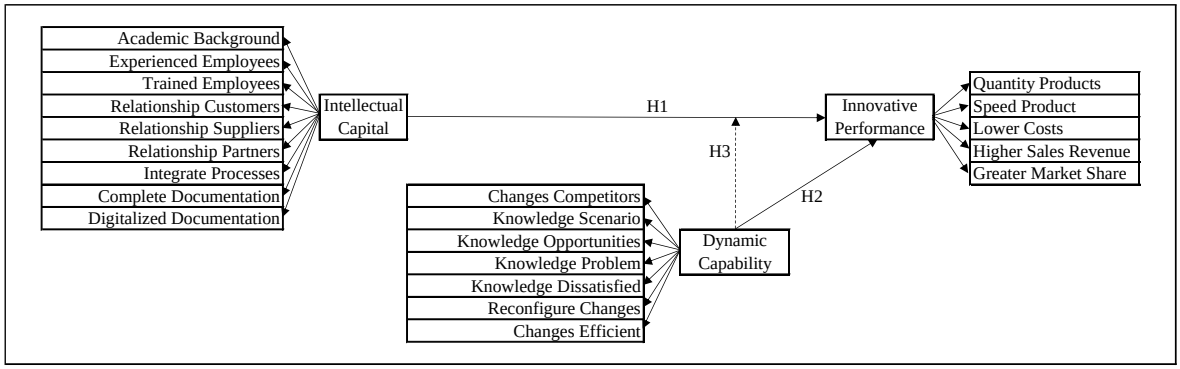
In short, companies with a high knowledge-based dynamic capability are able to effectively exploit their intellectual capital. Thus, this capacity can have a positive impact on innovative performance and intellectual capital (Wu et al., 2007; Bechtel et al., 2023; Lu et al., 2023). The third research hypothesis is therefore proposed:

***H3. Dynamic capability moderates the relationship between intellectual capital and innovative performance.***

For a better understanding of the research hypotheses, Figure 1 shows the research design, elucidating the study's three hypotheses. It can be seen that the variables "intellectual capital" and "dynamic capability" influence "innovative performance", with "dynamic capability" acting as a moderator of this relationship.

**Figure 1**

*Research design*




## 3 Methodological Procedures

This descriptive research used data collection to understand managers' perceptions and to reveal the relationships between the variables involved in the study. Adopting a quantitative approach, the survey method was used to obtain primary data, using a five-point Likert scale to measure responses. The data was analyzed using correlation tests, multiple linear regression analysis and the ANOVA test. The main objective was to analyze the relationship between intellectual capital, dynamic capabilities and innovative performance in micro and small companies in Chapecó.

### 3.1 Data collection

Data collection was performed using a questionnaire consisting of 21 questions, translated and adapted from Han and Li (2015), and electronically sent to 150 financial managers and/or owner-partners of companies located in the municipality of Chapecó. During the month of April 2023, 121 forms were duly completed, ensuring a representative sample of the target population.

### 3.2 Scales

A structured questionnaire (available in Appendix A of this article) was used, with a five-point Likert scale, where point 1 represents the answer “totally disagree” and point 5 “totally agree”. This tool was translated and adapted from Han and Li (2015), subjected to content validation and a pre-test with two specialist teachers and then a pre-test with three respondents from the sample.

### 3.3 Sample

In addition to the questions structured on a Likert-type scale, the questionnaire also included four questions to determine the profile of the respondents who were financial managers and/or owner-partners of companies located in Chapecó (SC). In the sample collected, the age of the participants ranged from 22 to 75, with the highest concentration in the 37-48 age group (62 responses, 51.24%). The length of time they had worked at the company ranged from 1 to 51 years, with a predominance in the 5-to-17-year range (70 responses, 57.85%). As for gender, 63.6% of respondents were male (77 responses) and 36.4% female (44 responses). In terms of schooling, complete graduation degrees prevailed with 37.2% (45 responses), followed by postgraduate degrees with 29.8% (36 responses).

### 3.4 Data analysis

Data analysis was prepared using SPSS software version 22.0 and took into consideration the frequency of the companies' general information, descriptive analyses of the variables, correlation matrices of the constructs, the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy, and Bartlett's test of sphericity of the construct samples. The rotated component matrices of the constructs were analyzed using the Varimax rotation method with Kaiser normalization and the principal component extraction method. The percentage of variance of the components and the reliability test using Cronbach's alpha were calculated. Multiple linear regression analysis, ANOVA test of analysis of variance, F index, coefficient of determination $R^2$, t test, B coefficient, multicollinearity by variance inflation factor (VIF) and Durbin-Watson statistic were also conducted. These results will be detailed in the data analysis section.

### 3.5 Research construct

The three variables used in the study, as well as their components, are presented in detail in Table 1.

**Table 1**

*Research construct*

| | | |
|---|---|---|
| **Intellectual Capital** | CI1 | Our employees have an academic degree in the area in which they work |
| | CI2 | Our employees are experienced |
| | CI3 | Our employees are well-trained |
| | CI4 | We have a close relationship with our clients |
| | CI5 | We have a close relationship with our suppliers |
| | CI6 | We have a close relationship with our partners |
| | CI7 | We use technology to integrate internal work processes |
| | CI8 | We keep complete documentation of work processes |
| | CI9 | Most of our documentation is digitalized |
| **Dynamic Capabilities** | CD1 | Our knowledge helps us to perceive economic changes before our competitors do |
| | CD2 | Our knowledge helps us to fully understand the impact of the economic scenario |
| | CD3 | Our knowledge helps us to perceive the main opportunities and potential threats |
| | CD4 | Our knowledge helps us make timely decisions to deal with strategic problems |
| | CD5 | Our knowledge helps us to quickly understand dissatisfied customers |
| | CD6 | We can reconfigure our knowledge resources in time to cope with economic changes |
| | CD7 | Our strategic changes can be executed efficiently |
| **Innovative Performance** | DI1 | Quantity of new products |
| | DI2 | Speed of new product launch |
| | DI3 | Lower operational costs of new products |
| | DI4 | Higher sales revenue from new products |
| | DI5 | Greater market share of new products |

*Source:* Adapted from Han and Li (2015)

Table 1 shows the components of the constructs: in the "intellectual capital" construct, nine components are identified: CI1 to CI9; in "dynamic capability", seven components: CD1 to CD7; and finally, in the "innovative performance" construct, five components: DI1 to DI5.

Intellectual capital is derived from human capital, structural capital and relational capital (Urban & Joubert, 2017). In order to measure human capital, based on Subramaniam and Youndt (2005), three items were developed addressing employee education, work experience and training. With regard to relational capital, three items were created focusing on

relationships with customers, suppliers and partners, following the guidelines of Bollen, Vergauwen and Schnieders (2005). As for structural capital, three items describing organizational processes and information systems were used, according to Wu et al. (2007). According to Urban and Joubert (2017), intellectual capital was measured as the aggregation of these three dimensions.

The variable dynamic capability, conceived as the ability to sense, seize and reconfigure knowledge, was measured using seven items, reflecting the acquisition, interpretation, implementation and reconfiguration of knowledge, based on the contributions of Wang et al. (2007), Zheng, Zhang and Du (2011) and Roberts and Grover (2012).

Innovative performance, in turn, was quantified by five items designed to portray the number of new products, the speed of launch, operational cost, sales revenue and market share compared to competitors, according to studies by Wu et al. (2007) and Roberts and Grover (2012).

In the analytical phase, arithmetic averages of the components for each variable were used, as well as factor analysis and reliability tests for each construct. Standard deviation and variance calculations were also considered, in which a standard deviation within acceptable standards was found. Correlation matrices were developed for the constructs, which were significant at 10%, as well as the Kaiser-Meyer-Olkin (KMO) test with a minimum value of 0.5 and Bartlett's test of sphericity. Reliability was assessed by Cronbach's alpha, with 0.7 being the minimum acceptable value.

As for the results, the constructs related to intellectual capital achieved a Cronbach's alpha of 0.862; those related to dynamic capacity, 0.888; and those related to innovative performance, 0.914. To assess the hypotheses, multiple linear regression was used, fulfilling all the necessary assumptions to validate the regressions: normality of residuals, homoscedasticity, absence of autocorrelation of residuals, non-multicollinearity and linearity of parameters.

## 4 Analysis and Discussion of the Results

To ensure the reliability and internal validity of the data collected, the means, standard deviations and variance of the intellectual capital, dynamic capability and innovative performance constructs were examined. Table 2 shows the mean, standard deviation and variance of each variable.

**Table 2**

*Descriptive analysis of variables*

| Variables | Mean | Standard deviation | Variance |
|---|---|---|---|
| CI1 Academic background | 3,025 | 1,1140 | 1,241 |
| CI2 Experienced employees | 3,868 | 0,7521 | 0,566 |
| CI3 Trained employees | 3,975 | 0,7007 | 0,491 |
| CI4 Relationship with customer | 4,124 | 0,7020 | 0,493 |
| CI5 Relationship with suppliers | 4,066 | 0,6920 | 0,479 |
| CI6 Relationship with partners | 3,785 | 0,8186 | 0,670 |
| CI7 Integrating processes | 3,587 | 0,9888 | 0,978 |
| CI8 Complete documentation | 3,868 | 0,8558 | 0,732 |
| CI9 Digitalized documentation | 3,926 | 0,9501 | 0,903 |
| CD1 Competitors' changes | 3,959 | 0,7348 | 0,540 |
| CD2 Scenario knowledge | 3,917 | 0,8225 | 0,676 |
| CD3 Opportunities knowledge | 3,884 | 0,9237 | 0,853 |
| CD4 Problem knowledge | 3,669 | 0,9865 | 0,973 |
| CD5 Dissatisfied knowledge | 3,876 | 0,8423 | 0,710 |
| CD6 Reconfiguring changes | 3,273 | 1,0646 | 1,133 |
| CD7 Changes efficiencies | 3,240 | 1,0569 | 1,117 |
| DI1 Product quantity | 3,537 | 1,0412 | 1,084 |
| DI2 Product speed | 3,339 | 1,0996 | 1,209 |
| DI3 Lower costs | 3,397 | 0,9616 | 0,925 |
| DI4 Higher revenue | 3,860 | 1,0190 | 1,038 |
| DI5 Largest share | 3,876 | 1,0212 | 1,043 |

The "intellectual capital" construct, made up of 9 variables (CI1 to CI9), had a mean of between 3.025 and 4.124, a standard deviation between 0.6920 and 1.1140 and variance between 0.491 and 1.241. The "dynamic capacity" construct, made up of 7 variables (CD1 to CD7), showed a mean between 3.240 and 3.959, a standard deviation between 0.7348 and 1.0646 and variance between 0.540 and 1.133. Finally, the "innovative performance" construct, made up of 5 variables (DI1 to DI5), had a mean of 3.339 to 3.876, a standard deviation of 0.9616 to 1.0996 and variance between 0.925 and 1.209.

All the constructs were developed using a Likert scale of 1 to 5. The mean, standard deviation and variance values of the variables shown in Table 2 fit the proposed model.

The variables showed a high communality index (above 0.500) and KMO measure (above 0.700), as well as a high degree of significance (0.0000). Both the KMO measure and

Bartlett's test showed satisfactory results. The KMO index values show that the factor analysis is relevant. Bartlett's test of sphericity assesses the hypothesis that there is no correlation between the variables in the population. In this context, the correlation matrix of the sample corroborates the suitability of the factor model. Both measures attest to the relevance of the factor analysis.

## 4.1 Analysis of hypotheses

The presentation of the multiple linear regressions relating to the hypotheses established follows, with the aim of answering the research objectives and problems. Table 3 illustrates the multiple linear regressions between the constructs of intellectual capital, dynamic capability and innovative performance, in order to answer the three proposed hypotheses.

**Table 3**

*Multiple linear regressions of the hypotheses*

| Independent | Dependent | $R^2$ | $R^2$ Adj | F | DW | ANOVA | B | t | Sig |
|---|---|---|---|---|---|---|---|---|---|
| CI1 | DI1 | 0,214 | 0,150 | 3,360 | 1,915 | 0,001 | 0,177 | 1,746 | 0,084 |
| CI7 | DI1 | 0,214 | 0,150 | 3,360 | 1,915 | 0,001 | 0,235 | 1,686 | 0,095 |
| CI5 | DI2 | 0,280 | 0,222 | 4,801 | 1,798 | 0,000 | 0,383 | 1,835 | 0,069 |
| CI7 | DI2 | 0,280 | 0,222 | 4,801 | 1,798 | 0,000 | 0,429 | 3,044 | 0,003 |
| CI5 | DI3 | 0,290 | 0,233 | 5,048 | 1,801 | 0,000 | 0,269 | 2,065 | 0,041 |
| CI7 | DI3 | 0,290 | 0,233 | 5,048 | 1,801 | 0,000 | 0,354 | 2,807 | 0,006 |
| CI5 | DI4 | 0,342 | 0,289 | 6,420 | 1,669 | 0,000 | 0,304 | 2,420 | 0,017 |
| CI7 | DI4 | 0,342 | 0,289 | 6,420 | 1,669 | 0,000 | 0,365 | 3,012 | 0,003 |
| CI9 | DI4 | 0,342 | 0,289 | 6,420 | 1,669 | 0,000 | 0,298 | 1,980 | 0,050 |
| CI5 | DI5 | 0,331 | 0,277 | 6,100 | 1,830 | 0,000 | 0,227 | 1,796 | 0,075 |
| CI7 | DI5 | 0,331 | 0,277 | 6,100 | 1,830 | 0,000 | 0,470 | 3,842 | 0,000 |
| CI5 | M DI | 0,349 | 0,296 | 6,613 | 1,698 | 0,000 | 0,265 | 2,120 | 0,036 |
| CI7 | M DI | 0,349 | 0,296 | 6,613 | 1,698 | 0,000 | 0,417 | 3,458 | 0,001 |
| CD4 | DI1 | 0,193 | 0,143 | 3,849 | 1,788 | 0,001 | 0,295 | 2,235 | 0,027 |
| CD4 | DI2 | 0,224 | 0,175 | 4,647 | 1,567 | 0,000 | 0,268 | 2,070 | 0,041 |
| CD5 | DI2 | 0,224 | 0,175 | 4,647 | 1,567 | 0,000 | 0,220 | 2,045 | 0,043 |
| CD1 | DI3 | 0,267 | 0,221 | 5,872 | 1,460 | 0,000 | 0,241 | 1,746 | 0,083 |
| CD7 | DI3 | 0,267 | 0,221 | 5,872 | 1,460 | 0,000 | 0,291 | 1,954 | 0,053 |
| CD1 | DI4 | 0,308 | 0,265 | 7,182 | 1,371 | 0,000 | 0,325 | 2,424 | 0,017 |
| CD3 | DI4 | 0,308 | 0,265 | 7,182 | 1,371 | 0,000 | 0,271 | 2,068 | 0,041 |
| CD1 | DI5 | 0,325 | 0,283 | 7,777 | 1,455 | 0,000 | 0,305 | 2,305 | 0,023 |
| CD3 | DI5 | 0,325 | 0,283 | 7,777 | 1,455 | 0,000 | 0,243 | 1,878 | 0,063 |

| Independent | Dependent | $R^2$ | $R^2$ Adj | F | DW | ANOVA | B | t | Sig |
|---|---|---|---|---|---|---|---|---|---|
| CD1 | M DI | 0,323 | 0,281 | 7,690 | 1,360 | 0,000 | 0,248 | 1,868 | 0,064 |
| CD4 | M DI | 0,323 | 0,281 | 7,690 | 1,360 | 0,000 | 0,210 | 1,740 | 0,085 |
| MCI5 MCD | DI2 | 0,287 | 0,229 | 4,962 | 1,795 | 0,000 | 0,412 | 1,681 | 0,096 |
| MCI7 MCD | DI2 | 0,287 | 0,229 | 4,962 | 1,795 | 0,000 | 0,554 | 2,611 | 0,010 |
| MCI7 MCD | DI3 | 0,294 | 0,237 | 5,143 | 1,760 | 0,000 | 0,514 | 2,436 | 0,016 |
| MCI5 MCD | DI4 | 0,359 | 0,308 | 6,922 | 1,666 | 0,000 | 0,493 | 2,123 | 0,036 |
| MCI7 MCD | DI4 | 0,359 | 0,308 | 6,922 | 1,666 | 0,000 | 0,519 | 2,583 | 0,011 |
| MCI7 MCD | DI5 | 0,357 | 0,304 | 6,836 | 1,832 | 0,000 | 0,659 | 3,271 | 0,001 |
| MCI5 MCD | M DI | 0,373 | 0,322 | 7,327 | 1,680 | 0,000 | 0,418 | 1,819 | 0,072 |
| MCI7 MCD | M DI | 0,373 | 0,322 | 7,327 | 1,680 | 0,000 | 0,586 | 2,946 | 0,004 |

It can be seen that the number of new products launched by a company is positively influenced when employees have an academic degree in the field (Sig. 0.084); the company uses technology to integrate internal work processes (Sig. 0.095); and the knowledge of employees contributes to making timely decisions when faced with strategic problems (Sig. 0.027).

These data suggest that the companies in Chapecó have specialized knowledge acquired through formal education and enable employees to contribute more effectively to the development of new products. There is technology and this facilitates communication, coordination and operational efficiency, creating an environment that is conducive to innovation. Employees have the ability to apply their knowledge in a practical way to solve strategic problems, and the company is able to adapt more quickly to market changes and identify new product opportunities.

These findings are in line with the studies by Martín-de-Castro et al. (2011), which emphasize that highly qualified talents, with robust educational backgrounds and advanced skills, expand their cognitive capacities, resulting in more productive and efficient activities. This favors sound corporate decisions, providing smoother business management and, consequently, optimizing innovative performance.

It can be seen that the speed with which a company launches new products is positively influenced by the company's closer relationship with its suppliers (Sig. 0.069), the use of technology to integrate internal work processes (Sig. 0.003), the ability of employees to apply their knowledge to decision-making when faced with strategic problems (Sig. 0.041), the rapid understanding of dissatisfied customers, attributed to the discernment of employees (Sig. 0.043), the company's proximity to suppliers, moderated by dynamic capacity (Sig. 0.096) and

the use of technology to align internal work procedures, also moderated by dynamic capacity (Sig. 0.053).

This shows that there is a close and collaborative relationship with suppliers, facilitating access to necessary materials and components, reducing the development and production time of new products. Employees are able to use their knowledge effectively to solve strategic problems, allowing the company to respond quickly to challenges and opportunities, speeding up the process of launching new products. There is technology and when it is used, it aligns internal procedures and is even more effective when the company has a robust dynamic capability, allowing for quick adjustments and efficient coordination, thus speeding up the launch of new products.

This evidence is consistent with the studies by Bonner and Walker (2004) and Fávero et al. (2020). Companies with close and integrated relationships, especially those in the manufacturing sector that have close links with suppliers, tend to develop new products more quickly and at lower cost. Additionally, Tsai (2001), Lu et al. (2023) and Wu et al. (2023) point out that companies with well-developed dynamic knowledge-based capabilities are better able to assimilate and integrate accumulated relational capital, promoting external knowledge for innovations.

It can be seen that a company's ability to present lower operating costs when launching new products is positively influenced by several factors: its close relationship with suppliers (Sig. 0.041); the use of technology to integrate internal work processes (Sig. 0.006); the discernment of employees in anticipating economic changes in relation to competitors (Sig. 0.083); and the efficiency in executing strategic changes (Sig. 0.053). 0.006); employees' ability to anticipate economic changes in relation to competitors (Sig. 0.083); efficiency in executing strategic changes (Sig. 0.053); and the use of technology to integrate internal processes, when moderated by dynamic capability (Sig. 0.016).

This finding shows that there is a close and collaborative relationship between the Chapecó organizations and their suppliers, leading to more favorable negotiations, better prices for materials and components, and a more efficient supply chain, resulting in lower operating costs. There is an implementation of technologies that integrate internal work processes and this increases efficiency, reducing waste and optimizing resources, which in turn lowers operating costs. Employees are able to predict economic changes ahead of competitors and this contributes to adjusting the company's strategies proactively, avoiding unnecessary costs and taking advantage of opportunities to reduce costs.

These results are in line with Cohen and Levinthal (1990) and Zahra and George (2002). They state that knowledge-based dynamic capability favors appropriate adjustments. Prior business knowledge and continuous training enhance the ability to acquire internal and external competencies, adapting to environmental changes. Consequently, this robust capability strengthens the positive influence of human capital on innovative performance. Furthermore, Bonner and Walker (2004) and Luo et al. (2012) corroborate that such relationships and business alliances are determinants of economic and operational performance.

In addition, it can be seen that a company's ability to obtain higher sales revenue as a result of launching new products is positively influenced by the following variables: closer relationships with suppliers (Sig. 0.017); use of technology to integrate internal work processes (Sig. 0.003); extensive digitization of its documentation (Sig. 0.050); employees' ability to anticipate economic changes in relation to competitors (Sig. 0.017); employees' ability to promptly identify the main opportunities and threats (Sig. 0.041); closeness of relationships with suppliers, moderated by dynamic capacity (Sig. 0.036); and application of technology for the purpose of aligning internal work procedures, also moderated by dynamic capability (Sig. 0.011).

It can be observed that there is technology in Chapecó companies, and that it integrates internal processes, making them more efficient and agile, facilitating the development and launch of new products with superior quality and in less time, attracting more customers and generating more sales. There is the ability to quickly identify the main opportunities and threats, allowing the company to respond effectively to the business environment, adjusting the launch of new products and maximizing its attractiveness and success in the market. There is a close relationship with suppliers and this is complemented by the company's dynamic capability, managing to quickly adjust its processes and resources in response to changes and opportunities, maximizing the positive impact on the launch of new products.

The aforementioned results are in line with the propositions of Barreto (2010), who suggests that a dynamic capability is formed by its ability to perceive opportunities and threats, make market-oriented decisions and change its resource base. Corroborating this understanding, Bontis (1998) and Widener (2006) state that organizational processes improve operational efficiency, while advanced information systems provide support for decision-making, increasing profitability.

In addition, it is observed that the expansion of market share resulting from the launch of new products is positively influenced by the following variables: strengthening the company's relationship with its suppliers (Sig. 0.075); application of technology with the aim

of aligning internal work procedures (Sig. 0.000); employees' ability to anticipate economic changes in relation to competitors (Sig. 0.023); employees' ability to promptly identify the main opportunities and threats (Sig. 0.063); and the use of technology to integrate internal processes, when this is moderated by dynamic capability (Sig. 0.001).

This result suggests that organizations in Chapecó maintain a close and collaborative relationship with suppliers, resulting in more favorable supply conditions, better inputs and a more efficient supply chain, contributing to the creation of more competitive products, improving the company's offer in the market and increasing its market share. There is the use of technology to align and integrate internal procedures, which makes the company more efficient and agile, facilitating the development and launch of new products with greater quality and speed, making the company more competitive and attractive to customers, increasing its market share.

These findings are in line with the conclusions of Tsai (2001), Wu et al. (2007), Lu et al. (2023) and Chang et al. (2023), who highlight the positive relationship between the innovative performance of employees and the continued viability of the organization, especially when adopting technology in work processes, and also with Wu et al. (2007), Bechtel et al. (2023) and Lu et al. (2023), who point out that companies with a high knowledge-based dynamic capability are able to effectively exploit their intellectual capital, so this capability can have a positive impact on innovative performance and intellectual capital.

In conclusion, it can be seen that the average innovative performance of companies is positively influenced by the following variables: closer relationships with suppliers (Sig. 0.036); the use of technology to integrate internal work processes (Sig. 0.001); employee discernment in anticipating economic changes in relation to competitors (Sig. 0.0672); the ability to circumvent strategic problems through timely decisions (Sig. 0.0672); and the application of technology, moderated by dynamic capability (Sig. 0.0672). 0.064); ability to circumvent strategic problems through timely decisions (Sig. 0.085); close relationship with suppliers, moderated by dynamic capacity (Sig. 0.072); and application of technology to integrate internal processes, when this is moderated by dynamic capability (Sig. 0.004).

It is clear that the organizations in Chapecó have the capacity to make quick and effective decisions when faced with strategic problems, keeping the innovation process continuous and adaptable, which allows them to navigate challenges and continue innovating. They also have dynamic capabilities and the ability to adapt and reconfigure their resources in response to changes, and this enhances the benefits of a close relationship with suppliers. Companies can quickly adjust their innovations based on new inputs or conditions supplied.

These results are consistent with research by Teece (2007), Wang et al. (2007), Denford (2013), Li and Liu (2014) and Chang et al. (2023). These authors point out that, from a process perspective, dynamic capability can enable organizations to solve problems through adjustments to the knowledge base. Subramaniam and Youndt (2005) and Zhang et al. (2022) also highlight the role of intellectual capital in competitive advantage and value creation. Finally, Wu et al. (2007), Bechtel et al. (2023) and Lu et al. (2023) suggest that companies with high dynamic capabilities are more strategically adaptable.

In short, the proposed hypotheses were corroborated by the results obtained. Hypothesis 1 (H1) showed that intellectual capital has a positive and significant influence on innovative performance. This evidence indicates that the higher an organization's intellectual capital, the more likely it is to have high innovative performance.

Hypothesis 2 (H2) was also confirmed, showing that dynamic capability has a positive and significant influence on innovative performance. Therefore, companies with more robust dynamic capabilities are more likely to achieve high innovative performance.

The third hypothesis (H3) highlighted that dynamic capability acts as a moderator in the relationship between intellectual capital and innovative performance. This finding suggests that dynamic capability can amplify the influence of intellectual capital on innovative performance, establishing itself as a crucial element for companies' innovative success.

## Final Considerations

The aim of this study was to investigate the relationship between intellectual capital, dynamic capability and innovative performance in micro and small companies located in the municipality of Chapecó (in the State of Santa Catarina), Brazil. Some conclusions emerge from the analysis conducted.

### 1 Theoretical Contributions

This study offers theoretical contributions to the field of business management and innovation. Firstly, it highlights the importance of human capital and of specialized knowledge in promoting innovation. Employees' academic training in their field and their ability to anticipate economic changes and make strategic decisions demonstrate that formal and practical knowledge is important for innovative performance. Secondly, the research reaffirms the central role of technology in integrating internal processes and facilitating communication and coordination within organizations. The application of technology not only improves operational efficiency, but also enhances innovation capacity, especially when moderated by a robust

dynamic capability. Finally, the study contributes to the existing body of knowledge by relating dynamic capability to strategic adaptability and innovative performance, supporting the theories presented in the theoretical framework which highlight the importance of adaptability and intellectual capital in competitive advantage.

## 2 Contributions to Management

For managers, this study offers ideas on how to improve the innovative and operational performance of their companies. The main managerial contribution is the confirmation that investing in close, collaborative relationships with suppliers can result in substantial benefits, such as lower operating costs and faster new product launches. In addition, the use of technologies to integrate internal work processes is essential not only for efficiency, but also for innovation. Managers should therefore prioritize the adoption of technologies that facilitate internal communication and coordination. Another important managerial contribution is the need to develop the company's dynamic capabilities, which involves the ability to reconfigure resources quickly in response to changes and opportunities. This can be achieved through continuous training and the development of employee skills to anticipate and respond to changes in the market.

## 3 Limitations and future paths

Despite its contributions, this study has some limitations that should be acknowledged. Firstly, the research was conducted in a specific context, focusing on companies in the municipality of Chapecó (SC), which may limit the generalizability of the results to other regions or sectors. In addition, the sample of 121 respondents, although representative, may not capture the entire diversity of business practices in different contexts. Future lines of research could explore the application of the theoretical model in other regions and sectors in order to validate and expand the findings. In addition, future studies could investigate the impact of other moderating variables, such as organizational culture and leadership style, on the relationship between dynamic capabilities and innovative performance. Finally, a longitudinal approach can offer deeper insights into how the relationships between the variables studied evolve over time and in response to changes in the external environment.

In conclusion, this study not only reinforces the importance of human capital, technology and dynamic capabilities for innovation, but also offers practical guidelines for

managers seeking to improve the performance of their companies in a competitive and dynamic environment.

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## Appendix A - Research Questionnaire

Intellectual capital

Human capital

- Our employees have an academic degree in the area in which they work
- Our employees are experienced
- Our employees are well-trained

Relational capital

- We have a close relationship with our clients
- We have a close relationship with our suppliers
- We have a close relationship with our partners

Structural capital

- We use technology to integrate internal work processes
- We keep complete documentation of work processes
- Most of our documentation is digitalized

Knowledge-based dynamic capabilities

- Our knowledge helps us to perceive economic changes before our competitors do
- Our knowledge helps us to fully understand the impact of the economic scenario
- Our knowledge helps us to perceive the main opportunities and potential threats
- Our knowledge helps us make timely decisions to deal with strategic problems
- Our knowledge helps us to quickly understand dissatisfied customers
- We can reconfigure our knowledge resources in time to cope with economic changes
- Our strategic changes can be executed efficiently

Innovative performance compared to our competitors

- Greater number of new products
- Increased speed of new product launches
- Lower operating costs for new products
- Higher sales revenue from new products
- Greater market share of new products