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CORPORATE FORESIGHT AND INTELLECTUAL CAPITAL ROBUSTNESS: A LITERATURE REVIEW

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ABSTRACT

Purpose: This study aims to identify the evolution of the field of corporate foresight over the last decade and its association with the theme of intellectual capital to capture factors that aid organizations succeed in the long term.

Originality/value: When it refers to foresight and resource-based management, the effect of dynamic capabilities on intangible assets has already been discussed, but there has been no direct mention of futures studies and intellectual capital.

Method: An initial systematic literature review was conducted to investigate studies published in the *Web of Science* database between January 2015 and June 2024. This review was then supplemented using this database and the *Scopus* platform, covering the period between January 2015 and August 2025.

Results: The relationship with intellectual capital was predominant in structural capital factors of product and process innovations, advanced technologies and management tools. Besides that, anticipatory studies about human and relational capital factors seemed to be relevant for decision-making in future.

Conclusions: This study demonstrated that through corporate foresight analysis it was possible to identify the changes needed to improve key intellectual capital factors that can be responsible for differentiating products and services in the market in terms of innovation and competitive advantage.

Keywords: Corporate foresight. Intellectual capital. Dynamic capabilities. Innovation. Competitive advantage

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FORESIGHT CORPORATIVO E ROBUSTEZ DO CAPITAL INTELECTUAL: UMA REVISÃO DE LITERATURA

RESUMO

Objetivo: Este estudo visa identificar a evolução do campo sobre *foresight* corporativo na última década e sua associação à temática sobre capital intelectual com o intuito de capturar fatores que auxiliem a organizações a serem bem-sucedidas em um futuro a longo prazo.

Originalidade/Relevância: Quando relacionamos *foresight* e gestão baseada em recursos, tem se abordado o efeito das capacidades dinâmicas sobre os ativos intangíveis, mas ainda não há uma menção direta a respeito dos estudos de futuro e o capital intelectual.

Método: Uma revisão sistemática de literatura inicial foi conduzida para investigar os trabalhos publicados na base de dados *Web of Science* entre janeiro de 2015 e junho de 2024. Na sequência, esta revisão foi complementada utilizando esta base e a plataforma *Scopus*, considerando o período entre janeiro de 2015 e agosto de 2025.

Resultados: A relação com o capital intelectual se apresentou predominantemente nos fatores de capital estrutural de inovação de produtos e de processos, tecnologias avançadas e ferramentas de gestão. Além disso, estudos antecipatórios sobre fatores de capital humano e relacional, pareceram ser relevantes para a tomada de decisão no futuro.

Conclusões: Este estudo demonstrou que por meio de análises de *foresight* corporativo é possível identificar mudanças necessárias para melhoria de fatores-chave do capital intelectual que podem ser responsáveis pela diferenciação de produtos e serviços no mercado em termos de inovação e vantagem competitiva.

Palavras-chave: Foresight corporativo. Capital intelectual. Capacidades dinâmicas. Inovação. Vantagem competitiva

LA PROSPECTIVA EMPRESARIAL Y LA SOLIDEZ DEL CAPITAL INTELECTUAL: UNA REVISIÓN DE LA LITERATURA

RESUMEN

Objetivo: Este estudio pretende identificar la evolución del campo de la prospectiva empresarial en la última década y su asociación con el tema del capital intelectual para captar los factores que ayudan a las organizaciones a tener éxito en el futuro a largo plazo.

Originalidad/Relevancia: Al relacionar la prospectiva y la gestión basada en los recursos, se ha abordado el efecto de las capacidades dinámicas en los activos intangibles, pero no se ha hecho mención directa de los estudios prospectivos y el capital intelectual.

Método: Se llevó a cabo una revisión sistemática de la literatura inicial para investigar los trabajos publicados en la base de datos Web of Science entre enero de 2015 y junio de 2024. A continuación, esta revisión se complementó utilizando esta base y la plataforma Scopus, teniendo en cuenta el período comprendido entre enero de 2015 y agosto de 2025.

Resultados: La relación con el capital intelectual se presentó predominantemente en los factores de capital estructural de innovación de productos y procesos, tecnologías avanzadas y herramientas de gestión. Además, los estudios anticipatorios sobre los factores de capital humano y relacional parecieron ser relevantes para la toma de decisiones futuras.

Conclusiones: Este estudio ha demostrado que mediante el análisis de la prospectiva empresarial es posible identificar los cambios necesarios para mejorar los factores clave del capital intelectual que pueden ser responsables de la diferenciación de productos y servicios en el mercado en términos de innovación y ventaja competitiva.

Palabras clave: Previsión empresarial. Capital intelectual. Capacidades dinámicas; innovación. Ventaja competitiva

1 INTRODUCTION

In times of uncertainty, resilience is essential to overcome environmental threats and risks, maintaining an organization's performance in regular conditions to anticipate future trends or even survive crises (Fathi et al., 2021). Unexpected events like this, or health emergencies, or disasters, which represent low probability and high impact that occur suddenly, and are known as wild cards (Bengston, 2023; Czakon et al., 2023; Krausmann & Necci, 2021;

Nikolova & Todorova, 2023; Petersen, 1999) often disrupt vulnerable institutions that do not prioritize robust intellectual capital. On the other hand, those that invest in resilience recover quickly.

Future research can anticipate part of these events, such as through a foresight process, which helps corporate managers to analyze the ideal resources so that the organization is prepared to face adverse situations. This requires identifying capabilities from a peripheral viewpoint (Day & Schoemaker, 2005). Although Foresight is also linked, but not restricted, to a resource-based view(Innes, 2024; Rohrbeck et al., 2015; Yoon et al., 2018) which would limit the analysis to anticipating future trends focused on an intrainstitutional core competences perspective (Prahalad & Hamel, 1990), it is recommended that managers use a broader and more balanced perception of the organization's internal and external environments (Meyer et al., 2022).

In addition, combining this internal resource's view with the necessities of incorporating of external resources, as measured by dynamic capabilities analysis (Teece, 2007), can highlight the competencies the organization needs to adapt, maintain itself, and achieve competitive advantage. This is only possible, because dynamic capabilities analysis investigates the context of rapid changes in the external environment and managers identify by scanning the environmental impacts to the business. Such anticipation practices are beneficial for increasing organizational learning (Aldehayyat, 2015; Choo, 2008; Højland & Rohrbeck, 2018; Kaivo-oja & Lauraeus, 2018; YahiaMarzouk & Jin, 2023) and its performance (Rohrbeck, 2012; Rohrbeck & Schwarz, 2013; Yoon et al., 2018).

These resources will make up the intellectual capital of companies, which can be subdivided into three dimensions - human capital, structural capital and relational capital (Dzinkowski, 2000; Mertins et al., 2003, 2009), similar to scanning the environment in a foresight process, mapping this intellectual capital also contributes to organizational learning (Bornemann et al., 2021). Investigating and acting proactively to improve the factors of all three dimensions of intellectual capital, to adopt a multi-level perspective, is a strategy for achieving organizational resilience (Khuan, 2024). Therefore, by associating foresight with the processes of measuring intellectual capital maturity through anticipatory studies on the resources available and needed by an organization, in addition to fostering resilience, it also contributes to preparing for unforeseen events and mitigating possible risks.

There is still a gap in literature on approaching both themes concurrently in a direct and explicit way, but it is possible to find indirect mentions of the use of foresight in one or more

dimensions of intellectual capital. In the context of the human capital dimension, mentions about aspects of leadership, training and others has been frequently reported (Gold et al., 2024; Kanzola & Petrakis, 2024; Malewska et al., 2021; Marcovitch & Wilner, 2024; Schulte et al., 2022). Both address aspects of the adoption of emerging technologies, innovation or improving management tools (Ali Almansoori & Asmai, 2021; AlMalki & Durugbo, 2023; Calof et al., 2018; Gershman et al., 2016; Gordon et al., 2019; Muhlroth & Grottke, 2022; Pinto & Medina, 2020; Ruff, 2015; Tiberius et al., 2021; Wiener et al., 2020; Yoon et al., 2018; Zhang et al., 2024), characteristics present in the structural capital dimension, which appear as the major topics when dealing with IC and CF subjects together. The investigation of literature also presented benefits of organizational or extra-organizational interpersonal relationships in the context of specific partnerships or involving an ecosystem for innovation (AlMalki & Durugbo, 2023; Chulok, 2022; Fritzsche, 2018; Rindova & Martins, 2021; Schulte et al., 2022; Wiener et al., 2018) provided by the relational capital dimension.

Given the relevance of these aspects for increasing organizational resilience in readiness for the various scenarios that may permeate the corporate future, it is important to consider them constantly when gauging the availability and need for increases in intellectual capital resources and their maturity to achieve the expected results.

In this context, the proposed research intends to identify how *corporate foresight* thematic had evolute in the last decade associated with *intellectual capital* theme. To accomplish that a systematic literature review about those themes and analyses for identification of theoretical and practical contributions, besides research limitations were conducted. Considering this, it will be possible to identify guidelines related to intellectual capital factors that enable organizations to be prepared for transformations which affect management models, relations between stakeholders, competences and capacities necessary for the future of jobs.

The aim of this study is therefore to identify how corporate foresight can contribute to strengthening the dimensions of intellectual capital, increasing the resilience of organizations.

1.1 Intellectual Capital

Intellectual capital comprises the resources of a business that transcend beyond financial, material, or equipment assets, as well as simply the cognitive abilities of its experts. It is a comprehensive notion that includes all intangible assets utilized in the advancement of corporate activities. The concept can be categorized into three dimensions: human capital (skills

and tacit knowledge), organizational capital (structures, functions, processes, explicit knowledge), and relational capital (consumers, suppliers, partners, employees, and investors) (Dzinkowski, 2000)

Considering the significance of this concept, the European Community has formulated and ratified the intellectual capital statement (InCaS), a declaration which establishes a direct link to future value creation. This initiative aims to enhance competitiveness and optimize resource utilization in public sector institutions, thereby improving the development and application of knowledge to generate value in future society.

The InCaS declaration serves as a tool for evaluating, enhancing, or documenting an organization's Intellectual Capital while systematically monitoring essential success factors, aimed at improving their capacity to develop and utilize knowledge for value creation in future society (Mertins et al., 2003).

This statement offers several advantages, including strategic support, knowledge updates, systematic information sharing, implementation of systematic knowledge management, identification of control indicators, management and consolidation of competencies, and facilitation of innovation. In addition, it aims to link intellectual capital and institutional objectives, business processes, and organizational success, utilizing measurable indicators for these factors. The structure implies system feedback by stakeholder contributions, assessed through observations of external impacts, specifically the public value added and competitive advantages relative to market rivals. Figure 1 briefly illustrates this system and how knowledge creation and generation yield insights can continuously enhance organizational strategies and internal processes.

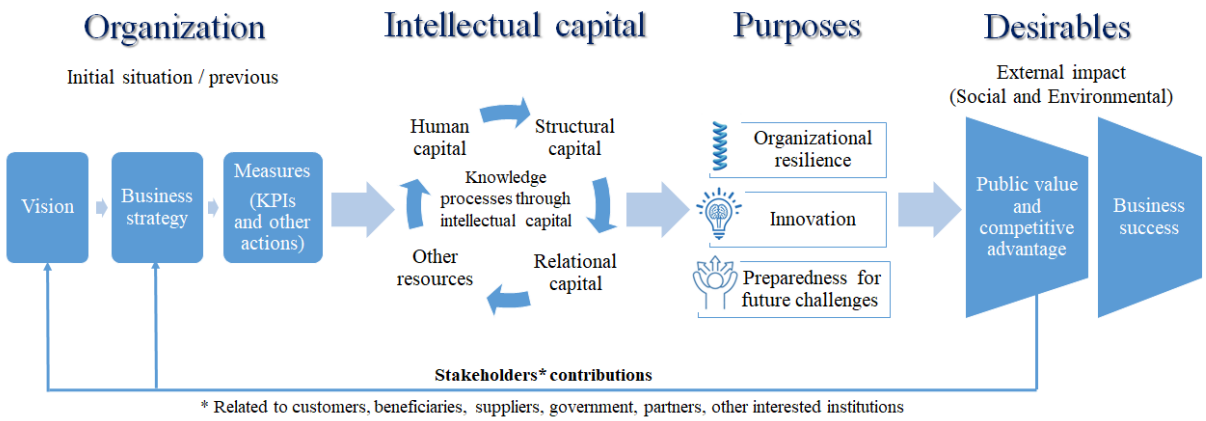

Figure 1 – Intellectual capital, strategy and business success relationship
Source: Adapted from Mertins et al. (2003)

A multilevel modeling study examining the relationship between intellectual capital and value creation across 12,331 organizations in 26 developing countries, including Brazil, identified multiple factors contributing to intellectual capital that influence institutional value and performance (Bilgin, 2021). The resources that generate value are diverse, and the intellectual capital involved includes intangible assets such as skills, explicit knowledge (know-how), employee innovation (human capital); brands, corporate reputation; organizational capabilities (pertaining to structural capital); relationships with customers, suppliers, and partners (relational capital); and other identifiable intangible assets like patents and royalties (Lin et al., 2014).

In this sense, intellectual capital has been viewed as a converging issue in several fields that institutions are interested in, particularly in the past ten years, including innovation, strategic organizational development, and organizational learning (Bornemann et al., 2021). Due to its significance in international studies for evaluating institutional conditions to identify opportunities for enhancing competitiveness and value creation, which align with objectives of corporate foresight, we recognize the necessity to analyze the unfavorable conditions affecting organizational strategies over both short and long terms.

2 METHODOLOGY

The method adopted for this study was a systematic literature review, using PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) as a guide, a regulation that ensures that all the recommended information is captured during the planning and conduct of the method (Page et al., 2021) To conduct the literature search, a five-step approach - going through planning, scoping, searching, appraising and synthesizing - ensured the completeness of the analysis for a successful systematic review (Booth et al., 2021).

The database consulted was *Web of Science*, as per planning systematic phase. The justification for choosing this database lies in the fact that it is reliable, multidisciplinary, with international scientific recognition, comprehensive coverage of citation indexing, providing the most complete scientific publication data. In terms of numbers, the *Web of Science* covers more than 92 million papers (Mathews, 2023). Furthermore, this was the same database used on studies carried out about strengthening the field of corporate foresight over the last three decades (Rohrbeck et al., 2015). To delimit the scope involved, some guiding questions make up the object of this study:

- Q1: How much has the field of corporate foresight been organized over the last decade?
- Q2: What are the main elements of the intellectual capital dimensions of large organizations covered in publications on foresight?
- Q3: What opportunities and strategies link the themes of foresight and intellectual capital that would be beneficial to large organizations in the long term?

The period defined for research was between 2015 and 2024, complementing Rohrbeck's studies, using the same search string: "corporate foresight" OR "strategic foresight". Given the difficulty in finding publications involving foresight and intellectual capital directly, the latter term was not included in the string, so the solution was to improve the author's studies by carrying out an indirect identification of the link between these two themes through the description made in the published works. The search conducted in December 2024 returned the amount of 395 articles.

Since the focus of this study is to investigate the contributions, opportunities or strategies involving the terms foresight and intellectual capital for large organizations in general, without specifying the sectors involved, the inclusion (IC) and exclusion (EC) criteria considered for the adequacy of the search were the following:

- IC1: Open access publications;
- IC2: Publications of articles, review articles and conferences;
- EC1: Expected use by third parties - regional or political levels;
- EC2: Related to education;
- EC3: Related to small and medium-sized enterprises (SMEs);
- EC4: Related to specific sectors.

After consolidating the papers using these filters, the final number of articles included in the analysis was 106, 104 of which came from the *Web of Science* database and 2 articles were collected externally through a process known as "snowballing". Figure 2 below shows a schematic of this process based on the PRISMA guidelines.

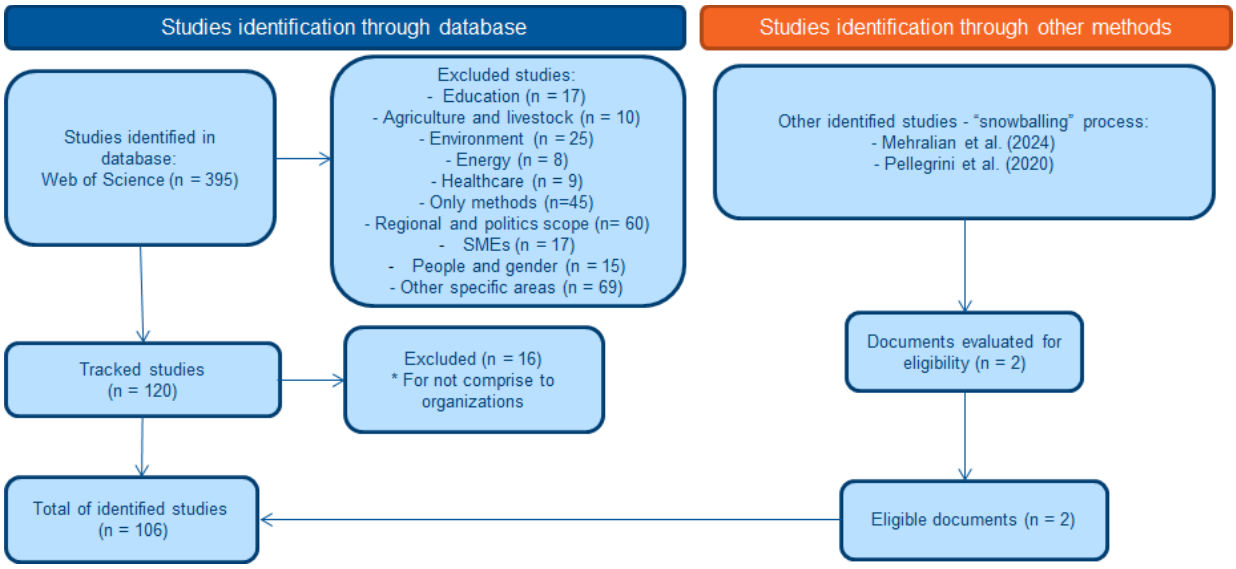

Figure 2 - Schematic process of searching database and other methods
Source: Adapted from Page et al. (2021)

During the evaluation stage, the research team read the title and abstract fields of the selected papers to understand the relationships between the terms of interest and to identify patterns, divergences, opportunities and strategies for answering the research questions mentioned earlier in this section. We registered this systematic literature review protocol in the Open Science Framework (OSF) repository: https://osf.io/ps27b.

The final synthesis provided an update on Rohrbeck's studies, assessing the progression of the field of foresight, and of this theme in relation to strategic management and innovation management, and extended the study by analyzing the interest of the theme in the organizational sphere and the association with the elements and respective dimensions of intellectual capital.

It is important to note that this initial strategy sought to reproduce Rohrbeck's studies, which used string's descriptors corporate foresight and strategic foresight. On the other hand, at the end of this search, we observed the need to conduct a new string search including descriptors corporate foresight and intellectual capital, also considering the last 10 years of research. This research resulted in five articles available on the *Web of Science* platform and 76 articles on the *Scopus* platform.

These articles were read and evaluated in terms of their scope, contributions, and limitations. In the end, 08 articles relevant to the scope of this article-study were identified, and one more through the snowballing process. These articles, together with the others identified in PRISMA, contributed to the development of the following sections.

3 RESULTS AND DISCUSSIONS

The impressions derived from the examined works, which address the guiding questions and facilitate reflection on organizational implications and research for further studies, are our findings, which we will discuss in the subsequent subsections.

3.1 The evolution of corporate foresight in recent decades

Foresight is a strategic prospecting technique used for various areas of interest in observing and planning for the long-term future. The field emerged approximately in 1950 and was refined to adapt to the era of scenarios between 1960 and 1970. The focus on methods and processes emerged between 1980 and 1990, but it was not until 2000 those publications integrated foresight into organizations (Rohrbeck et al., 2015).

Figure 3 shows that based on Rohrbeck's study of the evolution of the field in relation to previous decades, from the first publication in the 1984-1994 decade to the present, which is also the subject of this study, there has been an exponential increase in the last decade (2015-2024).

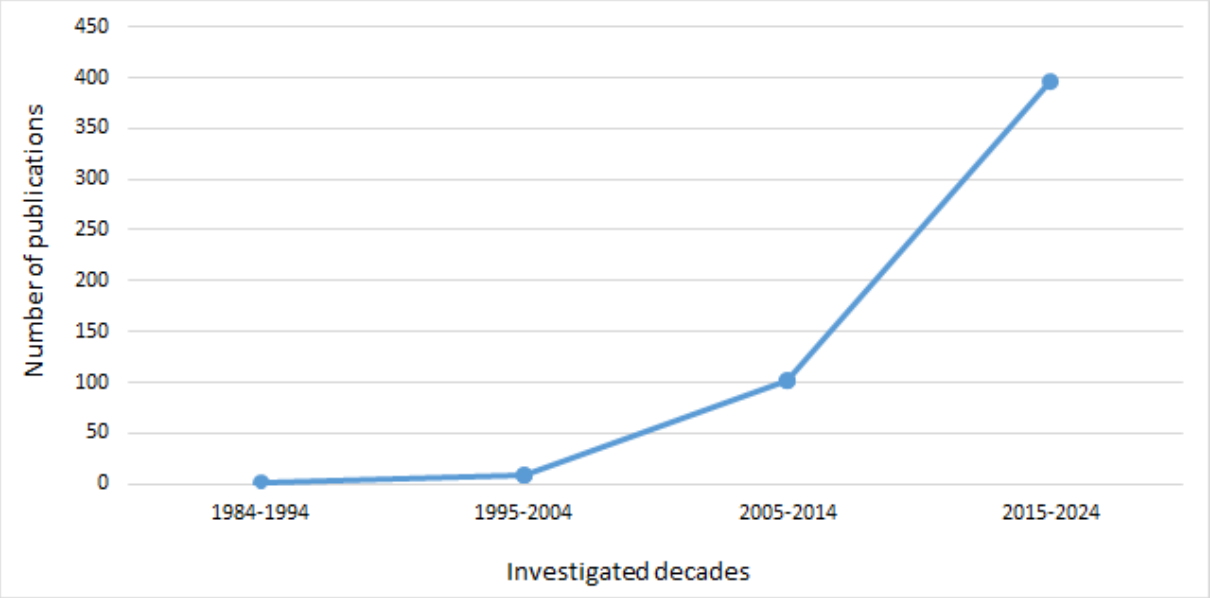

Figure 3: Evolution of publications in the field of foresight
Source: Prepared by the authors based on Rohrbeck (2015) and *Web of Science* (2024).

Stratifying the works published in the last decade, it revealed that among the 395 articles or reviews, approximately 96% focused on studies in the organizational sphere. Since this

process has been linked to decision-making and integrated organizational practice since 2000 in published works, has improved company's performance and its strategic and innovation management, the two main areas of knowledge in which foresight has contributed comparatively between the decades 2005-2014 and 2015-2024.

Table 1 shows how the area of strategic management has seen a more than fourteen-fold increase in the number of publications found in specialized journals compared with the previous decade.

Table 1 - Publications in strategic management 2005-2014 versus 2015-2024

Scientific Journal	2005-2014	2015-2024
European Management Journal	1	1
MIT Sloan Management Journal	1	0
Scandinavian Management Journal	1	0
Technology Analysis Strategic Management	0	11
IEEE Transactions on Engineering Management	0	10
Public Management Review	0	2
Journal of Engineering and Technology Management	0	4
Academy of Management Perspectives	0	3
E M Ekonimie A Management	0	1
Journal of Advances in Management Research	0	1
Journal of Environmental, Planning and Management	0	1
Journal of Knowledge Management	0	1
Journal of Modeling in Management	0	2
Management Learning	0	1
Management Research Review	0	1
Philosophy of Management	0	1
Problemy Zaradzania Management Issues	0	1
Rossiiskii Zhurnal Menedzhmenta Russian Management Journal	0	1
Strategic Management Journal	0	1
Total observed	**3**	**43**

Source: *Web of Science* (2024)

If we focus specifically on the area of innovation management, there was a six-fold increase in publications compared with the previous decade, as shown in Table 2 below.

Table 2 - Publications on innovation management 2005-2014 versus 2015-2024

Scientific Journal	2005-2014	2015-2024
Research Technology Management	1	1
Creativity and Innovation Management	1	2
RD Management	1	0
Technology Innovation Management Review	0	4
International Journal of Innovation Management	0	3
Asian Journal of Technology Innovation	0	1
Innovation the European Journal of Social Science Research	0	1
International Journal of Innovation and Technology Management	0	1
Journal of Innovation Knowledge	0	3
Journal of Product Innovation Management	0	1
She Ji The Journal of Design Economics and Innovation	0	1
Total observed	**3**	**18**

Source: *Web of Science* (2024)

We also noticed a much better organization in the foresight field, given the emergence of new journals publishing on the subject. To identify some of them, we have highlighted the top ten journals with the highest number of publications in Table 3.

Table 3 - Organization in the field: 2005-2014 versus 2015-2024

Scientific Journal	2005-2014	2015-2024
Technological Forecasting and Social Change	25	63
Futures	16	32
Technology Analysis Strategic Management	4	10
Futurist	6	0
Foresight	0	15
European Journal of Futures Research	0	18
IEEE Transactions on Engineering Management	0	10
Journal of Future Studies	0	8
Foresight and STI Governance	0	7
Sustainability	0	6
Total observed	**51**	**169**

Source: *Web of Science* (2024)

Some areas of research stood out in the period, and among the top five are business economics, public administration, environmental sciences and ecology, technologies and social sciences. This demonstrates a particular interest by organizations in carrying out future studies focused on concerns about financial aspects, the market and competitive advantage, improving the state apparatus and public institutions to increase efficiency, identify uncertainties and reduce risks, or interest in more environmentally sustainable organizational practices, changes in society and possible technological trends that could impact business. Table 4 compares the number of publications on these topics between the last decade and the present.

Table 4 - Research areas of interest: 2005-2014 versus 2015-2024

Research area	**2005-2014**	**2015-2024**
Business Economics	69	206
Public Administration	43	125
Environmental Sciences Ecology	5	38
Science Technology Other Topics	4	36
Social Sciences Other Topics	2	36
Engineering	9	30
Computer Sciences	4	8
Government Law	0	8
Forestry	0	7
Social Issues	6	3
Total observed	**142**	**497**

Source: *Web of Science* (2024)

3.2 Corporate foresight and intellectual capital in organizations

A literature review showed that there are still several exploration approaches related to the term's foresight and intellectual capital, as the association of these terms directly and jointly by academia is still very scarce. However, by isolating the dimensions of intellectual capital and analyzing them from a more specific perspective at the level of the factors related to each of these dimensions, it is possible to find some characteristics or themes addressed in relation to these factors. Therefore, it is appropriate to infer that there is a correlation between foresight and intellectual capital in the works tracked, even if it is indirect.

The publications analyzed mentioned a single dimension of intellectual capital (IC), two dimensions or even all three dimensions of intellectual capital. The most mentioned dimension was structural capital (69%), followed by relational capital (43%) and human capital (38%) in descending order of percentage of approaches (Figure 4).

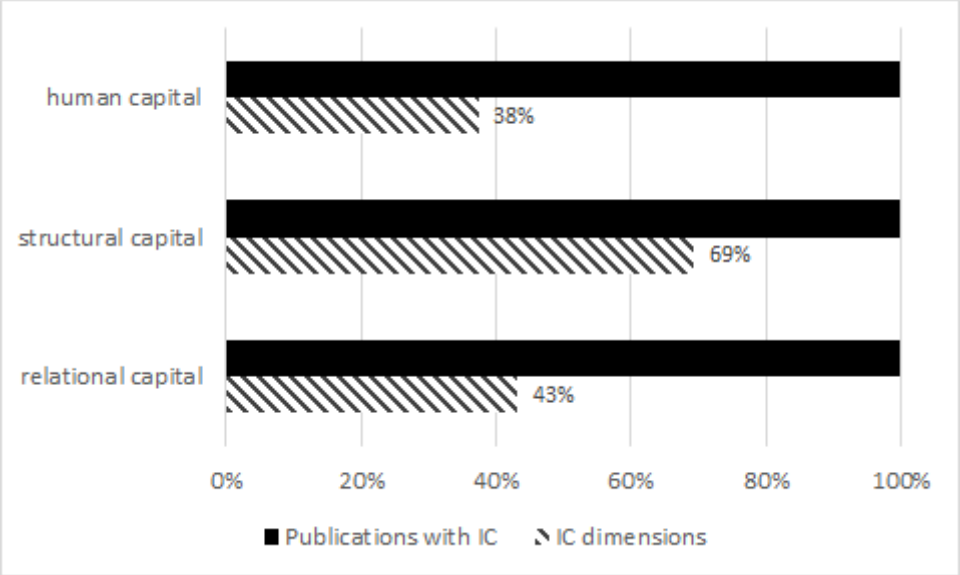

Figure 4: Dimensions of intellectual capital (IC) in publications on corporate foresight (CF)
Source: Prepared by the authors based on data from *Web of Science* (2024)

3.3 Human capital factors in foresight publications

Human capital, as one of three dimensions of intellectual capital, is perceived as a significant kind of resource responsible for organizations growth, increasing of productivity and innovation strategy (Abuzyarova et al., 2019; Chatterji & Kiran, 2023). Besides this, some studies had proved its relevance through how this dimension reinforces structural capital and relational capital for being well-succeed in processes evaluation (Bellucci et al., 2021; Vaz et al., 2019).

The following factors are part of the human capital dimension: professional competence, social competence, professional motivation and leadership skills (Mertins et al., 2009). Those factors are interconnected causing a virtuous chain reaction demonstrating that competence and skills are converted in knowledge, motivation in research, research provokes emerging of career experiences or tacit knowledge, and research also can stimulate performance enhancing (Chatterji & Kiran, 2023). Among these factors, the human capital issues most addressed in

publications over the last decade appeared under the respective themes: professional competence (training and improving knowledge); social competences (especially relating to workers' well-being, concern for the environment and sustainability); and leadership skills (with an emphasis on global issues, entrepreneurship and competence of a leader of the future).

Within the scope of professional competence, some themes were highlighted and assigned subfactor statuses: Knowledge in anticipatory studies and future literacy; Individual and collective knowledge; Qualification/ Requalification; and Tacit knowledge. As per World Economic Forum's global human capital index 2017, the level of human capital in organizations is measured by four criteria: *capacity* (related to formal education), *deployment* (application of accumulated value at work), *development* (prospection of improvement by upskilling and reskilling, life-long learning), and *know-how* (skills required for activities) (Abuzyarova et al., 2019) proving that a continuous observation of competence and training alignment is necessary for human capital improvement.

In terms of preparedness to act in the long term, with a view to operational sustainability and competitive advantage, some points can highlight the interest of organizations and their managers in the search for greater robustness to institutional resilience. People constitute a significant part of this mindset. The subjects in which people are involved such as future literacy, either individual or team professionals' capabilities, intending to provide better results from the production of innovation (Jokinen et al., 2023) are a concern of future trends discussion. In addition, professional qualification or retraining needs to enable workers to reach new positions or readapt existing functions due to abrupt changes in the external environment and the dynamic capacities identified by the organization are strategic for planning the future. Those initiatives would contribute for incorporating skills or readjusting processes, especially driven by constant technological transformations in a short period of time (Kanzola & Petrakis, 2024; Malewska et al., 2021; Schulte et al., 2022). This would enable the amplification of intangible assets for value creation, and it is in line with trends and needs forecast for the future of work (World Economic Forum, 2023).

Regarding the social competencies factor, the most frequently addressed topics were social competencies / human relations; worker well-being practices; and developing sustainable environments and world / green technology.

Social competencies have become prominent as one of the criteria of importance in terms of preparedness and resilience for the future due to straight connections between organizations and the public in general nowadays. In recent years, improvements such as

proximity through social media, consumers searching for brands turned to a social or environmental purpose or social control, and other interactions with social capital reinforce the need to invest in more strategies of human relationships (Fuller, 2017; Innes, 2024). Worker well-being practices shall not be neglected by organizations, as human capital resilience performance is also dependent on criteria such as quality of work life, employee retention and equal employment opportunity (Chatterji & Kiran, 2023). Another contributor is the concern about the effects of environmental and economic changes on workers (Schulte et al., 2022), already identified in future studies as megatrends capable of having a major impact(Insight & Foresight, 2024).

The purpose and sense of belonging of workers as a driver for effectiveness and the manifestation of collaborative practices in institutions (Mabille & Steenkamp, 2021) represented the actual context of professional motivation in the observed studies.

The leadership skills presented in corporate foresight studies involve global leadership, entrepreneurial leadership and leadership itself. Global leadership is a way of managing and stimulating innovation in matters of interest to the planet. Entrepreneurial leadership as a practice that uses entrepreneurship and the behavioral characteristics of leaders to encourage transformational and innovative processes in organizations. While leadership itself focuses on aspects of the future, committed to taking more risks, and attentive to disruptions resulting from external changes.

Table 5 lists the intellectual capital factors focused on the human capital dimension, together with the themes identified in this regard in the literature on corporate foresight, organized in the form of subfactors and related references.

Table 5 - Human capital factors and subfactors related to corporate foresight

Human capital			
Factor (Descriptions from Mertins et al., 2009)	**Categories**	**Subfactor**	**References**
Professional competence	Future literacy	Knowledge in anticipatory studies and future literacy	(Fuller, 2017; Gold et al., 2024; Jokinen et al., 2023)
	Individuals explicit knowledge	Individual and collective knowledge (teams) – internal stakeholders (diverse expertise – avoid biased visions	(Rohrbeck et al., 2015; Tiberius et al., 2021)
	Training	Upskilling/Reskilling	(Kanzola & Petrakis, 2024; Malewska et al., 2021; Schulte et al., 2022)
	Professional experience	Tacit knowledge	(Innes, 2024)
Social competences	Social relations	Social competences / human relations (social capital interactions)	(Fuller, 2017; Innes, 2024)
	Human being concern	Worker welfare practices	(Schulte et al., 2022)
	Environmental concern	Developing sustainable environments and world/ green technology	(Kanzola & Petrakis, 2024; Mabille & Steenkamp, 2021; Tantiyaswasdikul, 2023; Wiener et al., 2020)
Professional motivation	Professional motivation	Purpose and sense of belonging	(Mabille & Steenkamp, 2021)
Leadership abilities	Global scope interest	Global leadership	(Mabille & Steenkamp, 2021)
	Market interest	Entrepreneurial leadership	(Malewska et al., 2021)
	Internal routine interest	Leadership	(Gold et al., 2024; Innes, 2024; Malewska et al., 2021; Marcovitch & Wilner, 2024)

Source: Elaborated by the authors

In terms of human capital factors' categories identified, there are no hierarchical connection among variables, but there is an expected maturity process evolution related to *leadership abilities* categories. In practice, organizations should invest primarily in category of *internal routine interest*, to reinforce next the *market interest* and when they assess more robustness, they should evolve to a worldwide actuation, solely or through partnerships, investing in a *global scope interest*.

Since human capital has a considerable influence on the other dimensions of intellectual capital, it is possible to infer its level of importance for organizational resilience. And if this is also impacted by disruptive influences from the external environment, to overcome adversities, strengthening human capital through its factors and subfactors should be paramount for stability and leveraging opportunities.

Thus, in adverse conditions such as a BANI scenario, human capital can be challenged on a personal level. In relation to the individual, the agility of change and uncertainty can have an impact on psychological health, paralysis in the face of choices and decision-making, and urgency to adapt to new conditions, that is, the search for stability in the face of instability. To overcome this challenge, strengthening professionals' readiness to respond in crisis situations through lessons learned, a broader knowledge base, emotional intelligence management, and adaptive leadership are some of the actions that can be promoted through more robust human capital factors, as they involve issues related to professional competence, social competences, motivation and professional motivation, and leadership abilities.

Accelerated digitization through constant technological innovations also causes discomfort among professionals in organizations due to fears of job loss, the extinction of activities in the work environment, and a lack of training or generational inability to use cutting-edge technology. Although the organizational intention is to absorb market innovations, accelerate processes, and increase productivity, it must also focus on preparing its professionals to adapt to this new reality. Strengthen professional skills with training and readjustments at work; encourage exchanges between professionals and between teams influenced by social skills; observe issues of emotional well-being of workers to reduce fears and resistance, opting for continuous learning and simple language to maintain positive professional motivation; and manage activities in mixed teams of young and senior employees in an optimized manner, taking into account learning limitations and the balance of risk exposure, deciding between speed promoted by proactivity and the primacy of more careful analysis promoted by generational differences in teams that need to be constantly revisited by leadership skills to avoid possible conflicts and other vulnerabilities.

Considering the situation of institutions that deal with future-oriented activities in developing countries, especially public organizations in which the scarcity of investments in science and technology hinders technological advances, the development of strategic projects of great relevance to a country or for global benefit, but which are also large in scale, or the proposal of global solutions to address climate change and other megatrends, operational

sustainability is another emerging challenge. To remain sustainable, an organization needs responsible and efficient management, even with limited financial resources, and for this it needs alternative actions and the creativity of its people, the differentiated value provided by its human capital, to generate efficiency and effectiveness with economy. Valuing and training employees to expand their skills for adaptation and new positions, as well as professional retraining, may be more sustainable practices for retaining talent than large financial expenditures to attract professionals in the market, and they strengthen the professional competence factor of human capital. Social relations can also have a positive influence when used to perpetuate good practices, multiply internal knowledge, and prioritize sustainable development by reducing the social and environmental impacts generated by non-compliant processes, characteristics that the human capital factor related to social skills contributes to increasing resilience. The health and well-being of workers are also part of this equation, as they are linked to employee motivation, generating operational sustainability by reducing absenteeism due to illness and maintaining productivity at an adequate level. A manager who correctly defines the activities for their subordinates, who chooses them in an optimized way to perform in a role of greater competence, avoids rework and stimulates a culture of innovation in their work environment, introduces favorable labor aspects, and reinforces the human capital factor related to leadership skills, thus promoting greater long-term operational sustainability.

3.4 Structural capital factors in foresight publications

Structural capital represents the core business intelligence resources or a cognitive background that differentiate organizations in providing products and services, which is capable to promote better performance and competitive advantage (Palmucci et al., 2025). This organizational knowledge may be expressed through trademarks, patents, technologies, management processes, development of goods and culture (Elena-Pérez et al., 2011; Junior et al., 2019).

The *Intellectual Capital Statement* organizes the structural capital into six factors: corporate culture, internal cooperation and knowledge transfer, information technology and explicit knowledge, management tools, product innovation, and process optimization and innovation (Mertins et al., 2009). The most prevalent themes in the publications referring to the factors in this dimension referred to emerging technologies and innovation, as it is possible to observe in Table 6. In the context of rapid changes and challenging scenarios, analyzing impact

of emergent technologies and decision-making for investment in innovation can minimize potential risks, to protect organizations becoming more resilient to future trends (Junior et al., 2019; Poteralska, 2017).

Under the corporate culture factor, the following subfactors stand out: organizational culture per se, innovation culture and collaborative culture. When investigating the internal cooperation and knowledge transfer factor, the subfactors identified were knowledge transfer/mentoring and multidisciplinarity/heterogeneity of the team. A subfactor of information technology and explicit knowledge perceived was emerging technologies. Regarding management tools, some administrative practices or tools and foresight methods stood out: technological roadmap, scenario analysis, design thinking, environmental scanning or future horizon scanning and ambidexterity practices. When we analyzed the product innovation factor, we classified the themes into the following subfactors: product innovation/competitive intelligence, entrepreneurial characteristics, sustainability-oriented innovations and radical innovation. For the process optimization and innovation factor, the themes transformed into subfactors were process agility and open innovation. Table 6 shows these factors and subfactors with their associated references.

A compelling reflection on the subfactors identified is interesting: innovation goes through several categories of structural capital and managers often do not realize how important it is to articulate resources and work with organizational factors in an integrated way to obtain better results. At least eight subfactors remark this consideration: culture of innovation, transfer of knowledge/mentoring, emerging technologies, product innovation itself/competitive intelligence, entrepreneurial characteristics, sustainability-oriented innovations, radical innovation and open innovation.

In the context of rapid external changes, with emerging of diverse potential technologies and their quick replacement, investment in foresight activities has become relevant for enhancing competitiveness and innovation performance (Poteralska, 2017; Scheiner et al., 2015; Wiener et al., 2018), contributing to reinforcing structural capital maturity by empowering those subfactors related.

The subfactor culture of innovation means turning the environment favorable for innovation. While transfer of knowledge/mentoring refers to an external search for knowledge for innovation and its dissemination or multiplication internally. Emerging technologies benefit organizations with updates, integration of systems, new processes and challenges, including for areas of great social or strategic interest. Product innovation itself/competitive intelligence

purposes adding new inputs, opening space for new market niches or improving existing products to increase competitive advantage. Through entrepreneurial characteristics, especially leaders, organizations take advantage of creativity to foster a more innovative environment. Sustainability-oriented innovations aid in the development of products with less environmental impact, generating a sense of purpose for the organization. Stimulating radical innovation requires a disruptive transformation in the concept of a product or addition of new functionalities not yet perceived by the company or its competitors. Open innovation allows the development of products in a shared, collaborative or networked way between two or more institutions in the innovation ecosystem, whether they belong to the university, government, industry, startups, and companies from another sector, etc.).

Although the recognition of many positive values accumulated by open innovation, its implementation in organizations is harder than predicted in empirical theory, because of less trust among partners and fear of losing know-how, occasioned by lack of binding between parts. To avoid it, some practices may help in the process such as creating an exchange inspiring learning climate between organizations, extracting benefits to individuals and their institutions and selecting intermediaries responsible for integrating and managing activities in the relationship (Gattringer & Wiener, 2020). This deployment requires leadership to shift culture and development of professionals' skills, demonstrating once more how structural capital strengthening depends on human capital investment (Hansen et al., 2021).

The importance of adding ambidexterity, foresight methods or techniques for developing solutions with the participation of customers and beneficiaries during the conception of a product or service (using, for example, design thinking) as management tools in daily routine in organizations, could reduce some uncertainties, due to a forward vision in terms of trend analysis or preparedness for long-term actions. It means amplifying organizations' perspective beyond their own boundaries for perceiving how to modify resources, processes and deliverables, using external investigation and co-creation approach to become sustainable, relevant and promoting better performance (Ali et al., 2021; Gallego Giraldo & Calderon-Hernandez, 2023; Steininger et al., 2022). This could promote an investigation of the most likely scenario with more accuracy, could contribute to market pioneering, and in meeting the needs of customers and users more assertively.

Table 6 - Structural capital factors and subfactors related to corporate foresight

Structural capital			
Factor (Descriptions from Mertins et al., 2009)	**Categories**	**Subfactor**	**References**
Corporate culture	For mission accomplishment	Organizational culture	(Ali Almansoori & Asmai, 2021; Wiener et al., 2018)
	For future purpose	Innovation culture	(Innes, 2024)
	For operational sustainability	Collaborative culture	(Wiener et al., 2018)
Internal cooperation and knowledge transfer	Knowledge transfer	Knowledge transfer/Mentoring	(Hakmaoui et al., 2022; Innes, 2024)
	Collaborative development	Multidisciplinarity/ Team heterogeneity	(Wiener et al., 2018)
Information technology and explicit knowledge	Future technology analysis	Emergent Technologies (AI, IoT, Big data, etc.)	(AlMalki & Durugbo, 2023; Calof et al., 2018; Farrukh & Holgado, 2020; Marcovitch & Wilner, 2024; Muhlroth & Grottke, 2022; Nascimento et al., 2021; Scheiner et al., 2015)
Management instruments (administrative tools and foresight methods)	Foresight methods	Technology roadmap	(Gershman et al., 2016; Yoon et al., 2018)
		Scenarios analysis	(Ali Almansoori & Asmai, 2021; Pinto & Medina, 2020)
		Environmental scanning or horizon scanning	(Ali Almansoori & Asmai, 2021; Zhang et al., 2024)
	Design and requirements capture tools	Design thinking	(Gordon et al., 2019; Tantiyaswasdikul, 2023)
	Management analysis	Ambidexterity practices	(Zhang et al., 2024)
Products innovation	Competitive information searching	Products innovation/ competitive intelligence	(Ruff, 2015)
	Market investigation	Entrepreneurial characteristics	(Malewska et al., 2021)
	Innovation with purpose	Innovations oriented to sustainability	(Tantiyaswasdikul, 2023; Wiener et al., 2020)
	Disruptive innovation	Radical innovation	(Tiberius et al., 2021)
Processes optimization and innovation	Internal processes optimization	Processes agility	(Shafiabady et al., 2023; Vecchiato, 2015)
	Shared development	Open innovation	(Calof et al., 2018; Gattringer & Wiener, 2020; Scheiner et al., 2015)

Source: Elaborated by the authors

Categories presented to structural capital factors demonstrate a relation but not a hierarchy among them, but some of them present a maturity dependence of others for being well-succeed, which is the case of variables related to corporate culture and products innovations categories. For consolidation of corporate culture, first organizations should invest for mission accomplishment category, after that in reinforcement for operational sustainability,

lasting with preparing for future purpose. Referring to products innovation intellectual capital factor, the investment should start in parallel by competitive information searching and market investigation categories, which will enable organizations for innovation with purpose, and it will prepare to evolute to amplify their perspective to a disruptive innovation thinking.

3.5 Relational capital factors in foresight publications

Relational capital represents organizational resources introduced by values obtained through external partnerships, which can be reached by supply-chain business collaborations or agreements (Chatterji & Kiran, 2023), or even through co-creation with innovation ecosystem comprised by clients and beneficiaries, colleges and universities, startup companies, mature companies, government or investors(Aarikka-Stenroos & Ritala, 2017; Bittencourt & Figueiró, 2019). Besides that, a foresight process conducted in innovation networks with active contributions from the partners could promote benefits to the whole network, strengthening inter and intra organizations relational capital (Heger & Boman, 2015; Weber et al., 2015; Wiener, 2018; Yoon et al., 2018).

Five factors represent relational capital, according to the guidelines of the European regulation on intellectual capital, the so-called *Intellectual Capital Statement* - InCaS: relationships with customers, relationships with investors, relationships with suppliers, relationships with the public in general or beneficiaries and relationships with cooperation partners (Mertins et al., 2009).

Compared with these types of relationships, the approaches in foresight publications are predominantly related to relationships with customers, relationships with the public or beneficiaries and relationships with cooperation partners, stakeholders who contribute collaboratively to organizations by defining needs and sharing expertise for the development of a product, process or service (Fritzsche, 2018; Rindova & Martins, 2021).

In most cases, cooperation partners are entities in the innovative ecosystem that make it possible to create value and opportunities for organizations. It occurs during incorporation of expertise and resources from an outside source by dynamic capabilities generated in disruptive changes and other processes of organization learning, generation of information and knowledge sharing, which can even improve human capital factors such as professional competence, social competence and professional motivation. This type of relationship can occur in two ways, either

separately or concurrently, identified by the following subfactors: transdisciplinarity or knowledge translation practices and direct experience with the ecosystem.

The literature identifies the need to change organizational culture to allow new forms of interaction between organizations (Liu & Hansen, 2022), whether through translational practices in open and interdisciplinary laboratories (Fritzsche, 2018) or to stimulate research networks and business networks for market orientation (Halinen et al., 2024). Generally, prospective studies point out the best direction for each organization, according to their actuation sector, and their maturity or availability for taking risks. Depending on their strategy, they will become more resilient and take advantage of opportunities in projects in future-oriented areas.

Training people in the new functions of the jobs of the future and the needs imposed by the market requires alignment between consumer behavior and public policies. That is why collaboration between the university-industry-government entities favors the discovery of new or better possibilities for each of them to act (AlMalki & Durugbo, 2023; Farrukh & Holgado, 2020).

To obtain greater benefits and minimize the risks involved in partnerships, organizations strategically look for availability and compatibility in terms of emerging technologies, organizational proximity either for logistical advantages or for regional similarities, trust in partners and commitment (Gattringer et al., 2017).

Collaborative foresight expects a coalition of values of human capital and relational capital partnerships, taking benefits from social skills of individuals and social connectivity, favoring the sustainability of organizations and innovation processes for the development of their products (Jokinen et al., 2023; Moldavanova & Goerdel, 2018). Blending those concepts is an advantageous way for improving short-term responsiveness and investment in competitive sustainability for long-term growth (Bhattacharyya & Thakre, 2021). Such a characteristic is important when dealing with unforeseen situations of low probability and high impact, perceived as Wild Cards, which relate weak signals to the field of complexity, causing them to emerge abruptly (Bredikhin, 2020; Gudanowska et al., 2020; Nikolova & Todorova, 2023), providing greater readiness for events of this nature, such as crises and disasters or others on a global scale, such as public health emergencies, for example ((Bhattacharyya & Thakre, 2021; Weber et al., 2015).

Some benefits could be detached from these partnerships such as disclosure of relevant information among partners, improvement in networking, transparency (Chatterji & Kiran,

2023), improvement of social intelligence – conquered by social interactions, cooperation practices, productive social relations, trust and sharing of knowledge, privileged information and ideas (Abuzyarova et al., 2019) – enhancing of reputation management and understanding of environment needs (Palmucci et al., 2025). One reason for that is the innovation process which stimulates much of the collective intelligence activities, more often oriented by research and development phases and new product development decisions (Calof et al., 2018).

Table 7 shows the relational capital factors by means of the corresponding subfactors and the respective references found in the literature on corporate foresight.

Table 7 - Relational capital factors and subfactors related to corporate foresight

Relational capital			
Factor (Descriptions from Mertins et al., 2009)	**Categories**	**Subfactor**	**References**
Customer relationships	Value creation with customers	Stakeholders collaboration	(Fritzsche, 2018; Rindova & Martins, 2021)
Investor relationships	External funding purposes		
Supplier relationships	Supplier qualification purposes		
Public relationships	Public hearing		
Relationships to co-operation partners	Vertical partnership	Transdisciplinarity/ Translation practices	(AlMalki & Durugbo, 2023; Fritzsche, 2018; Mabille & Steenkamp, 2021; Schulte et al., 2022)
	Mixed partnership	Experience with the ecosystem	(AlMalki & Durugbo, 2023; Bhattacharyya & Thakre, 2021; Calof et al., 2018; Chulok, 2022; Farrukh & Holgado, 2020; Gattringer et al., 2017; Gattringer & Wiener, 2020; Halinen et al., 2024; Jokinen et al., 2023; Liu & Hansen, 2022; Marcovitch & Wilner, 2024; Moldavanova & Goerdel, 2018; Weber et al., 2015; Wiener et al., 2018)

Source: Elaborated by the authors

For relational capital factors' categories there are no hierarchy or maturity dependence to robust this intellectual capital dimension. The reinforcement is promoted through trust and diversity of partnerships, depending on organizations' interest.

3.6 Adding strength to intellectual capital

Considering the analyses carried out, it is worth highlighting the importance of human capital and relational capital in thinking about performance and increasing resilience in organizations over the long term. Professionals, their experiences and social articulation in the intra- or inter-organizational sphere also promote differentiation between organizations, since human capital carries criteria of value, rarity, inability for imitation or replacement, which underpins organizational resilience, and the values added to products and services (Ju, 2023). As such, this intangible asset can generate value and competitive advantage.

The incorporation of new talent, professional qualification and retraining are also a way of organizational adaptation in favor of resilience, through investment in strengthening its human resources. The analysis of the dynamic capabilities observed for survival and pioneering in the face of social and technological disruption (Gordon et al., 2020; Meyer et al., 2022) prompt the assessment of such needs.

The collective knowledge generated, transformed or created can overcome common sense barriers, providing innovative solutions, by means of the socialization knowledge spiral, externalization, combination and internalization - SECI model (Hakmaoui et al., 2022), and it is favorable when applied to the organizational mission and the results generated still favor institutions to be successful. This shared knowledge, when used to benefit the association between an organization's competitive intelligence and corporate foresight, raises the need for more integrated and dynamic anticipatory systems (Hakmaoui et al., 2022). In this way, it will be possible to absorb the dynamicity of external environment, considering rapid adaptations inherent in the volatility, uncertainty, complexity and ambiguity of the VUCA world (Vélez-Rolón et al., 2023), or aspects related to the fragility, anxiety, non-linearity and incomprehensibility of the BANI vision (Nataliia & Olena, 2023).

These dynamic aspects of the external environment are increasingly in the appropriation of the new digital media that are emerging. For this to happen, it is not enough for organizations to adapt to the digital transformation process by incorporating the new emerging technologies. They need to have the skills to operate them more optimally, taking full advantage of their

potential. Given the rapid pace of change, the job market ends up not having enough professionals with the desired qualifications to meet the demands of all companies, and when it does, it ends up offering exorbitant salaries given the rarity of the skills required. As a long-term strategy, organizations should consider training their employees in emerging technologies, with the aim of enabling them to use digital technologies (Malewska et al., 2021). Another possible alternative is to make use of interpersonal and inter-organizational relationships, drawing on multidisciplinary and transdisciplinary skills added to the sharing of resources, through innovative ecosystems enabling the creation of new solutions, including the use of emerging technologies in areas other than the technological business niche.

The focus on innovation provided by the various fronts of the structural capital subfactors, the adoption of new technologies, more modern and dynamic management practices and tools to streamline processes, if combined, can bring more robustness to intellectual capital in addition to the initiatives proposed for the other human and relational dimensions described above.

It is important to remember that human capital also reflects part of society, and as such can bring its perceptions to micro-reality at the intra-organizational level, being equally capable of proposing suggestions and having valuable insights into understanding the needs of beneficiaries or consumer behavior.

Under these circumstances, we can perceive the influence of corporate foresight and the importance of anticipatory studies for the future, when there are opportunities identified, and threats are mitigated from arising from megatrends or unforeseen events such as wild cards. Prospective practices like shall orientate how managers can strengthen intellectual capital in organizations in a preventive manner, considering increased resilience to be ready to face adverse events. To give greater visibility to the correlation between the various subfactors involved, already mentioned throughout the text, the diagram in Figure 5 shows the influences of the foresight perspective on the PESTEL themes surrounding dynamic capabilities environment and the intellectual capital in organizations.

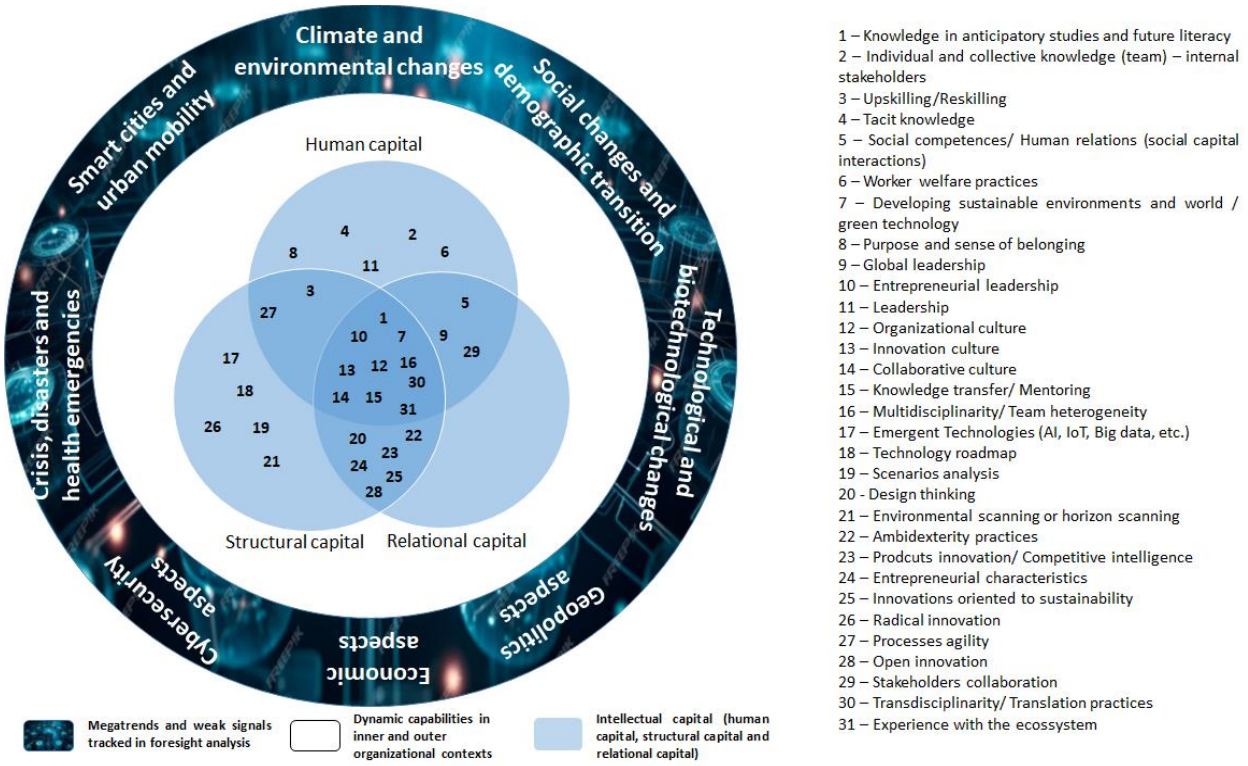

Figure 5: Diagram of external influences on intellectual capital (IC)
Source: Elaborated by the authors

Dynamic capabilities were mentioned in the diagram of Figure 5 as an external contributor to intellectual capital strength, because they can affect each dimension (human capital, structural capital and relational capital), generating modifications in innovation performance and value creation (Ali et al., 2021). Observing organizational resources through a dynamic intellectual capital perspective, it could also predict advantages among competitors (Esmaeili Givi et al., 2022) in a macro scope; and sensing, sizing and reconfiguring competences and capabilities, conducting agile processes and consolidating strategic partnerships and acquisitions improving human, structural and relational capital (Chirumalla, 2021; Esmaeili Givi et al., 2022; Helfat et al., 2007; Teece, 2007) in a micro scope.

As intellectual capital is known as intangible assets or knowledge-based assets (Poteralska, 2017), organizations should invest in its strength through knowledge management process to acquire, create, transfer, share or use knowledge as a differentiated intelligence value to provide strategic advantage (Junior et al., 2019), emphasizing issues as consistency, robustness and sustainability of the business model (Mertins et al., 2003). These issues are specifically beneficial to future-oriented projects, as prospect analysis using foresight is focused

on a knowledge-based view and could aid managers in long-term evaluations (Junior et al., 2019; Rohrbeck et al., 2015), including future-oriented technology analysis, reinforcing not only knowledge management process, but also in information acquisition, innovation stimulation and decision-making (Junior et al., 2019).

There are possibilities for transforming the knowledge generated into organizational resilience by associating intellectual capital factors with future studies, using a multifactorial analysis of resources (Mehralian et al., 2024; Pellegrini et al., 2020). This analysis should be in line with the opportunity to combine strategic intelligence from organizational learning with foresight components that can measure maturity levels in a model that reflects their integrative capacities (Bleoju & Capatina, 2019; Hakmaoui et al., 2022; Shafiabady et al., 2023; Yoon et al., 2018). Furthermore, it would be very beneficial if we added these elements to intellectual capital maturity models for continuous and dynamic verification of organizational resilience and other windows of opportunity in new businesses or for expanding niches in the face of medium- to long-term trends detected.

Figure 6 highlights a virtuous cycle of intellectual capital subfactors, presenting their related categories and the evolutionary sequence of strengthening and its impact in various organizational contexts such as universities, companies, and government.

The horizontal arrows indicate the origin of the demand for improvement of intangible assets, i.e., it first begins with the government, which makes demands on companies through regulations, societal needs, and administrative alignment (in the case of public agencies), which in turn makes demands on universities to meet the training needs of the labor market. The vertical arrows guide the evolutionary sequence of strengthening intangible assets, first passing through the robustness of the base with professional, cognitive, and critical training of human capital, then migrates to the categories of subfactors linked to the individual's relationships with other people, entities, and access to other complementary skills achieved with relational capital, and finally, all this combination of incorporated and strengthened resources achieves the strengthening of the organizational system to consolidate its differentiated value of structural capital.

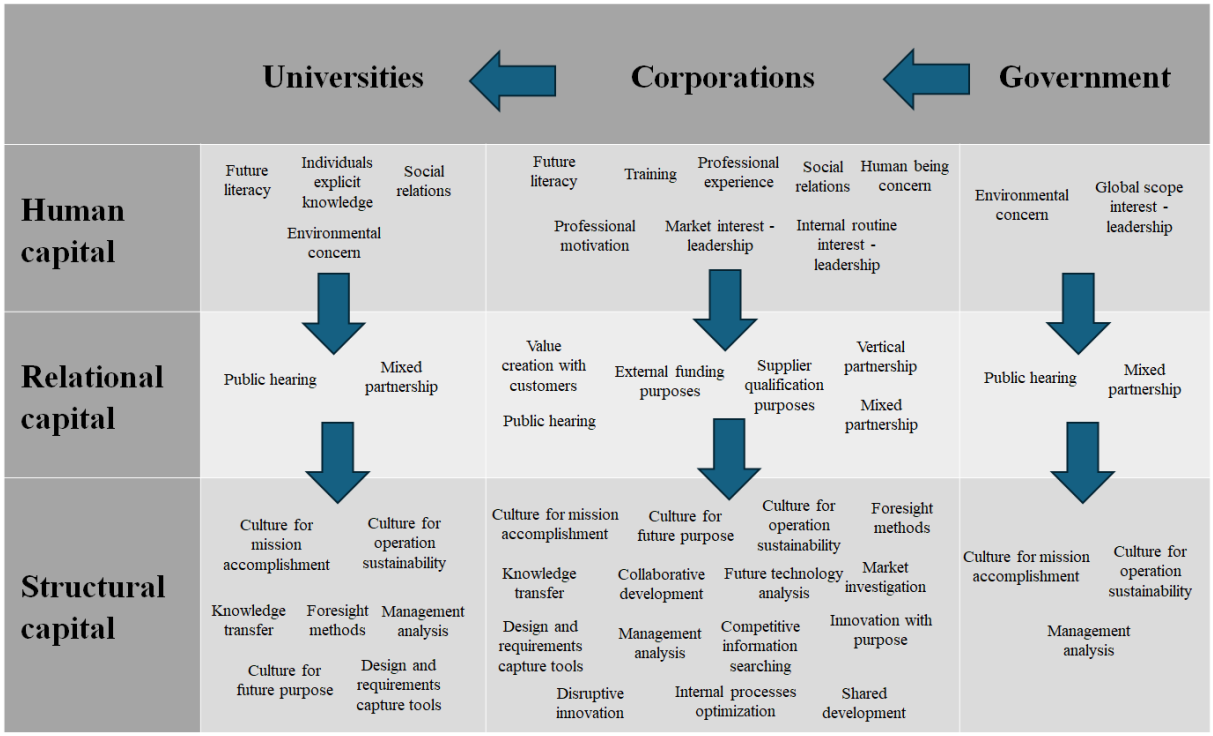

Figure 6: Articulations in IC dimensions categories in Universities, Corporations and Government contexts
Source: Elaborated by the authors

Note that some categories can be seen in more than one organizational context. This is the case for the human capital categories of future literacy and social relations (universities and corporations) and environmental concern (universities and government), particularly located where theoretical and practical discussion begins. In relation to relational capital, the categories mentioned by more than one context are: public hearing and mixed partnership (universities, corporations, and government), which demonstrate the importance of understanding the needs of users and beneficiaries to improve their products and services, improve results, loyalty, and trust. In terms of structural capital, the categories covered by two contexts are: culture for future purpose, knowledge transfer, foresight methods and design and requirements capture tools (universities and corporations), because they are basic topics focused on professional training and thinking for the future where foresight practices can be applied more frequently, which is not the case in government, since this is a more deliberative and negotiating body than an executive one, like the others, and where there is less concern for the long-term future, given that government administrations have a short term of office and therefore focus on more structural and quickly resolvable issues rather than strategic ones, except in special cases when

required to do so in international discussion forums. Among the three contexts, universities, corporations, and government, there are three categories that are repeated: management analysis, culture for mission accomplishment, and culture for operational sustainability, which consist of the effective application of management and operational techniques and tools inherent to any organizational profile.

Throughout this study it was possible to perceive some theoretical implications related to intellectual capital factors which could bring a visible dependence among its three dimensions, proving that those factors cannot be investigated individually and there are a such kind of order in terms of maturity evolution to reach resources robustness, as well as the possibility of its modification according to disruptive changes reinforcing the importance of dynamic capabilities in this transformation process, demonstrating that both should be consider in corporate foresight analysis when investigating megatrends and future-oriented projects strategies.

As evidenced through expert surveys and statistical analyses, some authors have already confirmed the correlation and dependence of human capital on the dimensions of structural and relational capital and the influence of the three dimensions on organizational performance (Bellucci et al., 2021; Ju, 2023; Vaz et al., 2019), which we can intuitively associate with a microanalysis where subfactors of the respective dimensions of intellectual capital and their relationships can benefit a direction on how to increase organizational resilience through a chain improvement of resources and the articulation between them. For example, if the organizational strategy is to implement new technology in a production process, there is a need to prepare professional skills in advance, seek internal expertise from previous experience, and at the same time seek to encourage both internal and external professional knowledge exchanges, improving competitive intelligence, optimizing processes, and stimulating innovative arrangements so that the field is ready for technological adoption. This corresponds to improving human and relational capital subfactors to enable the robustness of structural capital. This type of reasoning can also be applied to the development of solutions that meet global demands (individual skills generating positive links between the innovation ecosystem and transdisciplinary relationships for the development of disruptive innovations that meet global needs – once again fostering a virtuous cycle of human capital combined with relational capital to enhance structural capital).

It can also impact on foresight theory for beyond the superficial perspective of knowledge-based resources view of value, rarity and inimitability to deeply immerse in

knowledge management resources of intellectual capital. As perceived, both may be affected by events dynamicity, so developing a dynamic maturity model with intellectual capital and foresight factors could aid researchers in future analysis. Besides that, some practical implications can emerge as articulated actions that can conducted to benefit more than one intellectual capital factor, economizing in investments and at the same time turning internal resources robust and organizations more resilient, mapping organizations training track, and improving organizational learning by improvement of explicit knowledge, experience and social relationships with internal and external environment, and preparedness for the future, reducing uncertainties and mitigating possible risks of adverse scenarios.

In practical terms, this means that the resilience of institutional resources does not depend solely on the availability of senior management or investment directed at a single action. A systemic and coordinated view of resources is needed to prioritize actions that increase the potential of the sub-factors of each dimension of intellectual capital in an integrated manner. To broaden this vision, raising awareness and training professionals to conduct long-term future studies will enable the adoption of situational analysis tools such as ambidexterity, PESTEL environmental scanning, and scenario development, which, strengthened by the multidisciplinary assessment of internal partners and transdisciplinary assessment of external partners and associated with the influence of each dimension on the categories of analysis (going through an articulated process between strengthening human capital to improve the use of structural capital resources with evaluation by a commission involving relational capital), will allow for a more accurate identification of the needs required for the development of future-oriented projects, changes in the direction of management model strategies, and operational longevity.

This study combining intellectual capital and foresight enables the ideation of new perspectives for advances in future research using both themes. As resilience is a matter of concern for organizations in terms of maintaining their operational sustainability and achieving future competitive advantage (Moura & Amelia Tomei, 2021), these frameworks will be constantly analyzed in an integrated manner with the aim of identifying ways to provide greater robustness to institutional intangible assets to challenge existing or prospective adversities, especially with the aim of reducing uncertainties and mitigating risks. Thus, some fields emerge as strongly requested for a future research agenda using this combination, as presented in Figure 7: future of jobs; sustainable products and processes; transformations in social behavior and impacts; emerging technologies, competences and capabilities; future technologies analysis

(FTAs) and radical innovation; maturity in partnerships for open innovation; preparedness for new crises, emergencies, endemics, and pandemics; among others. As these fields are linked to the main global megatrends of studies conducted for the next five years (Dubai Future Foundation, 2024; Insight & Foresight, 2024), they may be of great interest for future theoretical and practical research.

Figure 7: Future research agenda
Source: Elaborated by the authors

Concerning the future of jobs, research may focus on skills (individual, team, and stakeholder relations) and technical and technological capabilities possessed and acquired, as well as possible changes in internal governance rules and work processes, which will require more in-depth research on knowledge management and the intellectual capital involved.

Sustainable products and processes come from adapting to trends in new forms of consumption by customers and beneficiaries with the constant changes in the BANI world and the adoption of ecologically sustainable production practices in compliance with agreements in global forums that discuss the effects and impacts of climate change and the implementation of Environmental, Social and Governance (ESG) practices by organizations, which may be of particular interest from the metalworking industry to the agribusiness sector. And to make them more sustainable, it is necessary to invest in raising awareness and training human capital to

adhere to greener development practices and more optimized processes by promoting improvements in structural capital factors. Studies such as this can stimulate the development of new socio-environmental protection regulations and limitations on abusive industrial practices, the mapping of external variables that have a chain reaction impact on the stakeholders involved, and the development of environmental public policies in line with international conventions.

Transformations in social behavior also influence the needs and demands of customers and beneficiaries, which can be seen in the strengthening of social control in the pursuit of rights and greater accountability of institutions, requiring process improvement, cost-effective use of financial resources, and, above all, proof of improved results. If they fail to do so, they will be subject to losing market share to competitors and substitutes or being extinguished. To adapt to this state of greater social appropriation and empowerment that the world has been moving towards, especially driven by social media, organizations need to make their intellectual capital more robust and thus generate greater proximity to users and maintain a healthy institutional image to generate trust and loyalty.

The continuous waves of technological change also need to be perceived by organizations as a way of adapting and incorporating them into their work processes and product development to avoid the obsolescence of adopted practices, slow response times, and the extinction of their niche market. However, introducing new systems, tools, and technological equipment is not so simple, as it requires an investigation of the company's profile, how the technology could be absorbed without resistance, and the most economically feasible choice among the emerging technologies available to stimulate and expand innovation processes. To enable this incorporation of new technologies, managers need to improve the skills of their human capital, invest in knowledge transfer through relational capital, and amplify the technical and technological capabilities of structural capital. The same concern with the maturity of intangible organizational resources is valid for the evaluation of future technologies for internal development and the need for organizational restructuring to foster radical innovation and increase competitive advantage.

The advancement in the maturity of partnerships is related to the evolution of the organizational condition from closed innovation to open innovation (Fan & Liu, 2025). This advancement introduces greater dynamic capacity to organizations, which leads to changes in the three dimensions of intellectual capital and innovation performance (Ali et al., 2021).

Future trends also point to the possibility of new environmental and geopolitical crises, emergencies, endemic diseases, and pandemics in public health. To deal with such events, which may arise as wildcards—low probability but high impact—organizations need to improve their state of readiness to act more effectively. To do so, they need to increase their resilience, which can be achieved through the robustness of their intellectual capital resources. This can even favor the introduction of new socio-environmental protection regulations, the formulation of crisis management plans, and the development of more effective long-term environmental and health public policies.

In addition, the identified fields may also raise theoretical questions regarding intellectual capital, dynamic capabilities, and foresight, in terms of existing competencies and capabilities versus those to be incorporated. This is because it is not just a matter of adopting recommendations and findings on what is already available in the literature, or in intra-, inter-, or extra-institutional practice, or through human perception derived from the experience of managers, as these would only meet short- to medium-term demands. There is a need to add to the research process an investigation by specialists in transdisciplinary areas to develop scenarios and thus acquire the real needs for adopting even more disruptive skills and capabilities in the long term.

4 CONCLUSIONS

Studies on the evolution of the field of foresight in the last decade have shown positive results that are somewhat different from those of the previous decades analyzed by Rohrbeck, Batistela and Huizingh. Although there are still ambiguous terminologies denoting the multiplicity of approaches to the concept of foresight (corporate and strategic), and the emergence of new nomenclatures for specific future studies aimed at association between stakeholders, such as the term's foresight network, collaborative foresight, and open foresight, for example, the field has become more organized. A greater number of publications in the main journals on the subject and greater diffusion around the world in the last decade, especially in the Asian region, proved the strengthening of the foresight theme. In addition to this improvement over ancient decades, there was an exponential leap in debates relating foresight to management, especially in discussions related to innovation. Proof of that is the number of articles published in the main journals observed in the current decade and the spread of knowledge to other journals that in previous decades were still non-existent or unknown.

Another relevant observation is the publications focused on the organizational sphere, which in the period represented approximately 96% of the total number of works found in the database.

Concerning the thematic association between foresight and intellectual capital in organizations, the direct link between both approaches reached insufficient publications, but indirectly the mention of one or more intellectual capital factors was noticeable, from which subfactors of importance in foresight studies for organizations could be extracted for each dimension. The subfactors identified for the human capital dimension were knowledge in anticipatory studies and future literacy; individual and collective knowledge; qualification/retraining; tacit knowledge; social skills/human relations; worker well-being practices; and developing sustainable environments and world/green technology; purpose and sense of belonging; global leadership; entrepreneurial leadership; and leadership itself. For the structural capital dimension, the subfactors tracked were: organizational culture per se; innovation culture; collaborative culture; knowledge transfer/mentoring; multidisciplinarity/heterogeneity of the team; emerging technologies; technological roadmap; scenario analysis; design thinking; environmental scanning or future horizon scanning; ambidexterity practices; product innovation per se/competitive intelligence; entrepreneurial characteristics; sustainability-oriented innovations; radical innovation; process agility; and open innovation. Regarding relational capital, the subfactors found were stakeholder collaboration; transdisciplinarity/translation practices; and experience with the ecosystem.

Categories indicated have no hierarchy among them, but some human and structural capital factors that present a maturity dependence of others for being well-succeed. In human capital composition, there is a maturity dependence between *leadership abilities* categories, initiating by *internal routine interest*, to reinforce next the *market interest* and when they assess more robustness, they should evolve to a worldwide actuation, solely or through partnerships, investing in a *global scope interest*. For consolidation of *corporate culture*, the maturity route begins *for mission accomplishment* category, after that *for operational sustainability*, lasting with preparation *for future purpose*. Regarding to *products innovation* intellectual capital factor, the investment should start in parallel by *competitive information searching* and *market investigation* categories, strengthening organizations resources and intelligence for *innovation with purpose*, which will prepare it to a *disruptive innovation* mindset.

Discussions enabled the perception of some contributions to theory and practice in articulation of the main constructs addressed: intellectual capital and foresight. Theoretical contributions can be summarized as follows: empirical studies that validate the relationship

between foresight and each dimension of intellectual capital; research on the impact of megatrends on human, structural and relational capital factors; and development of dynamic maturity models integrating foresight and knowledge management. The roll of practical contributions may include possibility of articulating structuring actions; guidelines focused on the knowledge trail of professionals; improvement in organizations resilience, learning with internal and external partners; consolidation of innovative initiatives and preparedness for long-term future.

As practical application, this study offers a possibility for intellectual capital maturity models development based on a wider scope of factors and subfactors than others found in literature, it can also be helpful in identifying areas for policymaking definitions, or for managers' decision-making.

As the literature shows that the dimensions of structural capital and relational capital are dependent on human capital and that the three interconnected dimensions are responsible for organizational performance, this study demonstrates as a theoretical implication that, from a microanalysis perspective, this reality can also be reproduced at the level of the subfactors related to these dimensions, whose themes promote a chain reaction between them in a virtuous cycle of robustness that positively impacts the subfactors, related factors, dimensions, and intellectual capital itself. As practical implications, these levels can be adopted to prepare the organization for the adoption of foresight techniques, which can contribute to strengthening the culture of innovation and strategy execution. In addition, both factors and subfactors can guide future studies by simultaneously applying techniques such as environmental scanning, associating them with PESTEL and the scenario development process, promoting a more complete analysis and a systemic view of possible impacts for each dimension of intellectual capital, which would mainly assist in the prioritization of institutional actions and policymaking.

Although the research period covered the last decade, which would define a comprehensive and more recent time frame, this study had other limitations that could be highlighted, such as the number of builders selected for the search string, the number of works tracked, the databases investigated, and the inclusion and exclusion criteria selected. To address the limitation of builders in the string, future research could be expanded to include knowledge management or dynamic capabilities that are relevant to the study context. To increase the scope of findings in the works tracked, the number of works could be increased based on the diverse perceptions of research team members with transdisciplinary skill profiles. Although the

selected databases, Web of Science and Scopus, are comprehensive in terms of publication volume and well recognized in academia for identifying subfactors in a generalized manner for various types of organizations, as was the intention of this study, expanding and directing the scope to specific areas of activity could require a search in other databases that would yield more specific results. Even though the research period was the last decade, which would define a Despite the fact that the inclusion and exclusion criteria selected were highlighted in the methodology adopted, which allows for scientific reproduction, they have a limitation given the subjectivity of the authors' choice in defining such criteria. What would add scientific transparency is the publication of the methodological sequence of the systematic review applied (which was highlighted on the OSF website), the availability of raw research data to peers, and open access to publications consulted by interested parties. This would open the way for more targeted recommendations on reproducibility, research reliability, evidence for advances in the field, and even the availability of information for public policy formulation.

Opportunities for further studies include the possibility of increasing the number of publications with approaches directly linking foresight to intellectual capital, or at least to one of its dimensions and the impacts of megatrends. The intensification of studies on the approach to human and relational capital and the future of markets and humanity could be an interesting scope of evaluation. Advancements on dynamic capabilities discussion and the opportunities for improving intellectual capital through Nonaka and Takeuchi's knowledge generation spiral can derive wide debates on the subject. Alternatively, development of dynamic maturity models with intellectual capital factors influenced by other relevant factors from foresight processes to increase organizational resilience becomes promising. Whatever path academics or practitioners choose to tread, there are some unexplored fields to investigate the benefits of foresight to organization routine. Many of them will indicate possible directions to taking advantage of windows of opportunity to invest in future-oriented strategic projects, create value of greater institutional and social relevance and promote competitive advantage, even if they are subject to increasingly complex and uncertain futures. To do so, managers must be willing to take risks to put it into practice.

Some fields were outlined as being in high demand for a future research agenda using the combined constructs of intellectual capital and foresight, such as: the future of jobs; sustainable products and processes; transformations in social behavior and impacts; emerging technologies, competences and capabilities; future technology analysis (FTAs) and radical

innovation; maturity in partnerships for open innovation; preparedness for new crises, emergencies, endemics, and pandemics; among others.

Further methodologies perspectives should be explored. Comparative case studies involving different approaches (private corporations, public agencies, and universities), using the Delphi technique with scenario analysis and system dynamics to demonstrate the relationships among stakeholders, exploring the dialogue between corporate foresight and collaborative foresight. Or even, longitudinal analyses involving technological development and external environmental influences, using tools such as scenario analysis, morphological matrix, technology roadmap, and system dynamics to map technological opportunities, connecting aspects of corporate foresight with technology foresight. This would extend debates including variables inherent to the macroeconomic context, management, and innovation.

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