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Chapter: Strategic Digital Transformation: Enhancing Business through Innovation

INTELLECTUAL STRUCTURE OF THE RESEARCH ON CORPORATE FORESIGHT AND INNOVATION: THINKING INSIDE THE BOX

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Annotation. The aim of this study is to identify the scholarly works that have had the greatest impact on the research on corporate foresight (CF) and innovation and to analyze the intellectual structure of the knowledge base of the research developed in this field. The methodology is based on the bibliometric techniques of citation and co-citation analysis, which are applied to a total of 129 articles published between 2006 and 2023* (database consultation date: January 3, 2024). ***Clarivate Analytics' Web of Science™ (WoS) database is used in this study. We chose bibliometric analysis over other traditional methods like systematic literature review (SLR) as bibliometric techniques are replicable, objective, unbiased, and rigorous, and thus superior to other techniques for conducting literature reviews.***

Keywords: corporate foresight, innovation, bibliometrics, citation and co-citation analyses.

JEL classification: M10, Q32, L10.

Introduction

The ability to anticipate and prepare for future challenges and opportunities is key in an ever-changing business environment. In this context, the concept of corporate foresight (CF) has emerged as a strategic tool that enables organizations to identify emerging trends and anticipate future scenarios to foster innovation and adaptability (Rohrbeck and Schwarz, 2013). This paper seeks to link the scientific literature on CF and innovation by exploring how strategic anticipation of future market dynamics and the competitive environment can drive the development of new ideas, technologies, and business models. Through a comprehensive analysis of existing research, this study examines the impact of CF on innovation processes, as well as its ability to generate sustainable competitive advantages (Rohrbeck, 2012; Vecchiato, 2012; Alouani *et al.,* 2025; Bekzhanova *et al.,* 2024).

In a recent article entitled *'Corporate Foresight: A New Frontier for Strategy and Management,'* published in the journal *The Academy of Management Perspectives,* Alessandro Fergnani (2022) seeks to introduce the construct of CF to an audience of strategy and management scholars. In this article, CF is defined, situated in the broader epistemological underpinnings of futures studies, theoretically inscribed in the dynamic capabilities' framework, distinguished from related constructs, and decomposed into its main components. He also argues that CF is of fundamental relevance to strategy and management

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scholarship due to four reasons: (a) CF can integrate with, enrich, and expand the dynamic capabilities framework by considering an additional, under investigated, future-oriented firm capability; (b) the emergence of CF is an organizational phenomenon, closely aligned with the contingency theory of the firm; (c) CF can favorably affect important organizational outcomes including learning, creativity, innovation, and performance via a mechanism to create competitive advantage that has not been previously explored by strategy and management scholars; and (d) further investigating CF from a strategy and management point of view opens a rich research agenda[1].

In line with the points mentioned above and to cover the existing gap and enable deeper insights, the aim of this paper –which is designed to accelerate the academic debate and stimulate future research on CF and its symbiotic relationship with innovation[2]– is to study more deeply the intellectual underpinnings of research on CF and innovation through the works that have had the greatest impact on scholars. In other words, to unveil the intellectual structure of the knowledge base of CF and innovation research. While it is widely acknowledged among foresight scholars that the link between cause and effect can be elusive (Sarpong and Meissner, 2018, p.625), a recurrent theme of recent theory on CF, at both firm and cluster levels, has increasingly found a positive relationship between CF and innovation (Anderson *et al.,* 2004; Zeng *et al.,* 2010; Ramírez *et al.,* 2011; Ruff, 2015; Gershman *et al.,* 2016; among others).

The methodology of the present study is based on the bibliometric techniques of citation and co-citation analysis, which are applied to a total of 129 articles on CF and innovation published between 2006 and 2023. Clarivate Analytics' Web of Science™ (WoS) database is used in this study. We chose bibliometric analysis over other traditional methods like systematic literature review (SLR) as bibliometric techniques are replicable, transparent, objective, unbiased, and rigorous, and thus superior to other techniques for conducting literature reviews (Tiberius *et al.,* 2020; Gupta *et al.,* 2021; Tandon *et al.,* 2021; White and Borgholthaus, 2022).

Well-conducted bibliometric studies may considerably improve the knowledge of a field of research by allowing and empowering scholars to gain a holistic perspective, identify research gaps and conduct critical assessments of contextualized research issues. Many other authors, in addition to those previously referenced, have acknowledged that bibliometrics is a highly effective approach due to its ability to succinctly, efficiently, and objectively summarize the knowledge available on a particular field or research topic. In fact, bibliometric methods are ideal for mapping the intellectual structure of a given field because they enable scholars to identify the what, where, and by whom of the establishment of the field (Dharmani *et al.,* 2021). Moreover, because bibliometric studies like ours avoid subjectivity, they enhance and extend qualitative reviews by converting the descriptive information about an article (e.g., authors, keywords, references, journals, institutions, etc.) into networked maps, clusters, and nodes that can be leveraged for further systematic analyses (Waltman *et al.,* 2010).

[1] In the literature on CF one finds very few reports on how foresight is actually ***integrated in innovation and strategy processes***. Also, if case studies or practical examples are cited, they are mostly either anecdotal, abstract, or do not represent the full spectrum of the activities of the respective units. Also, external researchers only get limited insights into company practices because of issues of confidentiality.

[2] If a company fosters an environment that encourages innovation, it will be able to adapt to the surrounding changes. Firms that encourage innovation often have open communication channels between departments and units, encourage a creative climate, and promote innovative thinking. **They use futures thinking techniques and scenario analysis to highlight areas where innovation opportunities can be created.** By using effective innovation management, they increase their innovation capabilities and create a more resilient company.

Shown below are some of the research questions that bibliometrics studies help researchers address (Zupic and Čater, 2015; Köseoğlu *et al.,* 2016, 2018; Bhatt *et al.,* 2020; Hota *et al.,* 2020, 2023; among others):

- What is the intellectual structure of a discipline, and how has it evolved over time?
- What are the most prominent research traditions in a field?
- What does the social structure of a discipline entail?
- What are the conceptual structures that define a research field or scientific domain?
- What methods are most effective in evaluating research output within a domain or discipline?

Accordingly, given the rationale and methodological considerations mentioned above, in this research we consider the use of bibliometric methods as pertinent. In the form of a literature review, this article aims to identify the most influential works, i.e., those with the greatest impact on the research related to CF and innovation and to analyze the intellectual structure of the knowledge base of the research developed concerning this particular field.

The two important research questions (RQs) which are explored in the study are as follows:

RQ1: Which scholarly works have had the greatest impact on the research on CF and innovation?

RQ2: What is the intellectual structure of research in the scientific field of CF in relation to innovation?

Overall, our review of the literature depicts a poorly organized academic field, developed more or less in isolation– where explorative research dominates, and puts us on the track of researchers "thinking inside the box" with many articles lacking theoretical foundation.

The remainder of the paper is organized as follows. Section 1 describes the methodology. In Section 2, we present and discuss the results. Finally, we outline the conclusions, the implications of the study, its limitations, and directions for further research.

1. Methodology

1.1 Methods: Citation VS. Co-Citation Analysis

In this study, citation and document co-citation analyses –bibliographic coupling and co-word analyses in a complementary way– are the main bibliometric analysis techniques.

Citation analysis is based on the premise that authors cite documents they consider to be important in the development of their research (Ramos-Rodríguez and Ruíz-Navarro, 2004, p.981). Therefore, frequently cited documents are likely to have exerted a greater influence on how a discipline has evolved –and on its intellectual structure or knowledge base– than those less frequently cited (Culnan, 1987; Tahai and Meyer, 1999; Ma, 2009). To a certain extent, citation analysis could be understood as a previous step to co-citation analysis, which is "advantageous for mapping the intellectual heritage of a particular field on the basis of high-impact publications" (Vogel and Güttel, 2013, p.429).

Co-citation analysis –pioneered by Henry Small (1973) (cf. Irina Marshakova, 1973)– is based on the hypothesis that a certain intellectual connection could exist –at least from the citing author's perspective (McCain, 1990, p.443)– between two documents that are cited together, i.e., co-cited, so that the greater the co-citation frequency, the closer the connection between them (Garfield, 1970; Griffith *et al.*, 1974; Small and Griffith, 1974; Cawkell, 1976). According to Small (1973, p.265), if it may be hypothesized that

highly-cited documents symbolize the key concepts, methods, or experiments in a scientific domain or discipline, such co-citation patterns could then be used to provide details on the evolution of the intellectual structure of a discipline, leading to the identification of the documents that could have served as the pillars of its future advancement by providing a comprehensive assessment of its evolution.

1.2 Database Selection

Clarivate Analytics' Web of Science™ (WoS) database was used to carry out this research. From this database, a total of 129 peer-reviewed journal articles published between 2006 and 2023* (database consultation date: January 3, 2024) were finally retrieved.

Instead of using books, book chapters, conference proceedings, letters or documents containing reviews or notes, we chose to use articles published in a journal, because they are the only ones that can be viewed –in the words of Robert K. Merton (Merton, 1973)– as certified knowledge. Moreover, the use of articles that have already been published in refereed journals –the peer-review process acts as a mechanism of control to validate the knowledge found in these articles– constitutes common practice in these studies, i.e., when bibliometric analysis is used, given that it increases the reliability of the obtained results.

1.3 Search Query

The following search query was run in the topic field (TS) of the WoS Core Collection™.

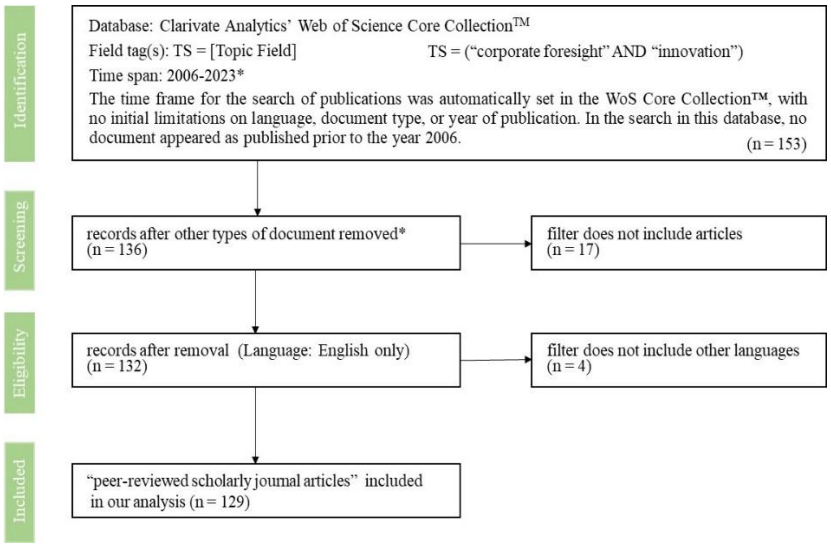
TS = (“corporate foresight” AND “innovation”)

The query was run on 3 January 2024 and the initial sample obtained was then filtered according to the inclusion/exclusion criteria described below.

1.4 Inclusion/Exclusion Criteria

The time frame for the search of publications was automatically set in WoS Core Collection™, with no initial limitations on language, document type, or year of publication. After selecting the search time span of all years, 153 records were first obtained[3]. These records were then filtered by type of publication (Document type: Article) by excluding 17 records consisting of proceeding papers, review articles, book chapters, editorial material, books, etc. When applying the language criteria (Language: English only) 4 records were excluded. A total of 132 records were then assessed for eligibility (*Figure 1*). No other irrelevant records were detected at this stage, except for 3 bibliographic records that appeared in the WoS as articles and were books or book chapters. These records were manually deleted.

[3] Once the initial search was carried out and despite having been developed to be used in systematic literature reviews (Moher *et al.,* 2009; Page *et al.,* 2021), the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement was adopted to refine our search results. In our particular case, the adoption of the PRISMA statement as a guide was due to three principal reasons: (i) the recognition it has based on its comprehensiveness; (ii) the fact that it has recently started to be used in a great number of bibliometric studies (e.g., Pham *et al.,* 2021; Thukral and Jain, 2021; Kim and Fung So, 2022; Fauzi, 2023; García-Lillo *et al.,* 2023); and, (iii) that this statement provides the potential to increase reliability across reviews.



Source: created by the authors.

Figure 1. **PRISMA Statement Diagram and Steps in Bibliographic Data Identification and Search Refinement**

Unlike previous studies, the data used in this study were not drawn from journals chosen by peer researchers (Holsapple *et al.*, 1993; Walstrom and Leonard, 2000) or a particular journal (e.g., Gordon *et al.*, 2020). Instead, the entire database of the WoS Core Collection™ served as the universe for analysis. Our dataset covers the period from 2006 to 2023* (database consultation date: January 3, 2024). In the search in this database, no document appeared as published prior to the year 2006.

1.5 Analysis of Data

The data analysis process involved employing multiple tools and software, including Microsoft software, Bibexcel, Bibliometrix, and VOSviewer to analyze and process the collected data.

The study was conducted in two separate stages. The first stage consisted of a citation analysis to determine the frequency of citation of the bibliographic references used in all the articles analyzed in this research as citing documents. This analysis aimed to identify the works that had the greatest influence on the scholarly community.

In a second stage, document co-citation analysis (DCA) was conducted to analyze the intellectual structure of research on CF and innovation. For this last analysis, we considered a co-citation matrix $\mathbf{C(c_{ij})_{nxn}}$ of dimensions 50x50 made by forming all the pairs possible from the 50 most influential works identified in the previous stage. The outcome of this analysis was complemented by the results of the bibliographic coupling and co-word analyses also developed in this study.

2. Results and Discussion

In this section, we discuss the main results of the citation and co-citation analyses of the bibliographic references made by the 282 authors in the 129 peer-reviewed journal articles on CF and innovation published in 40 different sources from 2006 through 2023* (*Table 1*) that were analyzed in this study, with Rohrbeck R (14 articles), Vishnevskiy K (11 articles), and Meissner D (10 articles) standing out as (co-) authoring the largest number of articles (*Table 2*). The average citations per document was 22.79.

Table 1. List of the top 10 most relevant authors (sorted by number of publications)

Authors	Frequency (Number of articles)	Articles fractionalized
Rohrbeck R	14	6.67
Vishnevskiy K	11	3.95
Meissner D	10	3.28
Wiener M	7	3.50
Calof J	4	1.25
Gattringer R	4	1.50
Karasev O	4	1.20
Vecchiato R	4	2.83
Battistella C	3	1.67
Schwarz JO	3	1.17

Source: created by the authors.

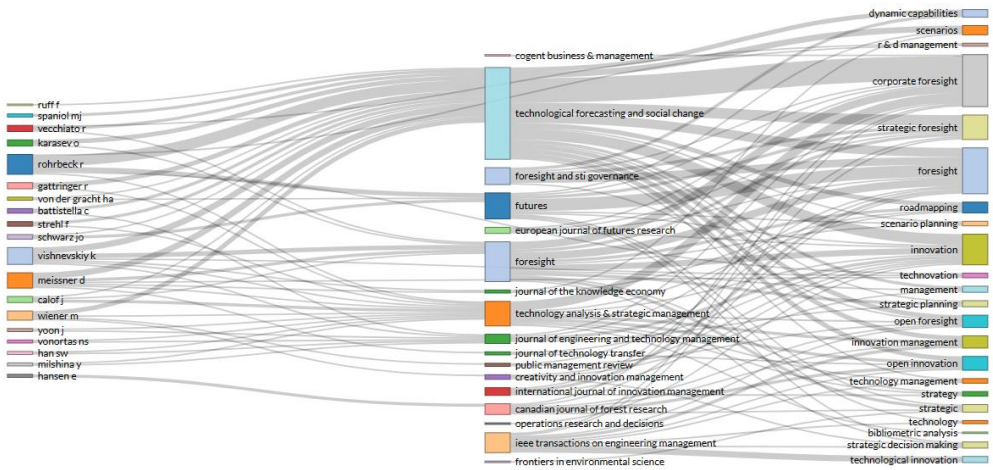
Table 2. Main information about data, document contents, authors, and authors collaboration

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2006:2023
Sources (journals, books, etc.)	40
Documents	129
Annual growth rate %	14.50
Document Average Age	5.53
Average citations per doc.	22.79
References	6,702
DOCUMENT CONTENTS	
Keywords Plus (ID)	319
Author's Keywords (DE)	441
AUTHORS	
Authors	282
Authors of single-authored documents	15
AUTHORS COLLABORATION	
Single-authored docs.	19
Co-authors per doc.	2.81
International co-authorships %	35.66

Source: created by the authors.

In *Figure 2*, a Sankey diagram –also known as three-field plot– for the 129 articles acting as citing documents provides a snapshot of the relationships between the top 20 most relevant authors–, the top 20 most relevant sources, i.e., the scholarly journals, where such documents were published, and the top 20 most frequent author's keywords (DE) reflecting research themes in the field under examination in this study. The thickness of the arrows depicts the strength of the bibliometric linkages.

It can be seen from *Figure 2* that the most frequent author's keywords (DE) were: corporate foresight, foresight, innovation, strategic foresight, and innovation management. The most relevant source was by far *Technological Forecasting and Social Change* (39 articles), followed by the journal for the interdisciplinary study of futures, anticipation and foresight *Futures* (15 articles), *Foresight* (11 articles), *Technology Analysis & Strategic Management* (9 articles), and *Foresight and STI Governance* (5 articles). Published since 2007, in 2014 *Foresight Journal* launched its English title — *Foresight and STI Governance*.



Source: created by the authors.

Figure 2. **Sankey Diagram Shown Interlinkages between Most Relevant Authors, Sources, and Author's Keywords (DE)**

Table 3. List of the top 10 most relevant sources

Source	Frequency	Percentage	Total percentage
Technological Forecasting and Social Change	39	30.23%	30.23%
Futures	15	11.63%	41.86%
Foresight	11	8.53%	50.39%
Technology Analysis & Strategic Management	9	6.98%	57.36%
Foresight and STI Governance	5	3.88%	61.24%
IEEE Transactions on Engineering Management	4	3.10%	64.34%
Journal of Engineering and Technology Management	3	2.33%	66.67%
International Journal of Innovation Management	3	2.33%	68.99%
European Journal of Futures Research	3	2.33%	71.32%
Technovation	2	1.55%	72.87%
Other sources (30)	35	27,13%	100%
TOTAL	**129**	**100%**	

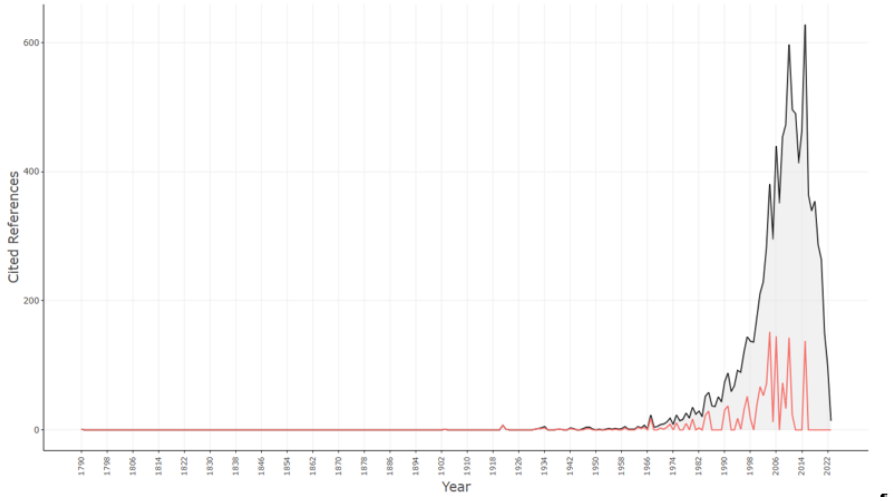
Source: created by the authors.

Table 3 reveals the top 10 most relevant sources, with *Technological Forecasting and Social Change* ranking as the first source. In addition to the above journals, in the period analyzed only ten other journals listed in Journal Citation Reports (JCR) have published at least two articles on CF and innovation.

2.1 Initial and Descriptive Results of the Citation Analysis

As we have explained in the section on methodology, the first stage in this study was a citation analysis to determine the frequency of citation of the bibliographic references used in all the articles analyzed as citing documents. In all, 10,153 bibliographic references to 6,702 different works were analyzed, giving an average of 78.7 references per article. *Figure 3* reveals the frequency distribution (RPY – Reference Publication Year Spectroscopy) of the dates of the citations analyzed. RPY is a bibliometric method to analyze the temporal distribution of citations in academic literature. It provides insights into the age of

references used in scholarly articles and how they relate to the publication year of the citing papers. For instance, by grouping citations by their publication year, RPY allows researchers to see which cohorts (groups of publications from specific years) are most frequently cited over time. In *Figure 3*, the last of these cohorts can be observed in 2015, precisely coinciding with the publication this same year of the Special Issue on Corporate Foresight (Guest editors: René Rohrbeck, Eelko Huizing and Cinzia Battistella) edited by the journal *Technological Forecasting and Social Change*.



Source: created by the authors.

Figure 3. **Reference Publication Year Spectroscopy Shown the Frequency Distribution of the Dates of the Citations Analyzed, 1790-2022**

Table 4. List of the top 10 most local cited sources (from reference lists)

Source	Number of citations	2022 Impact Factor (Clarivate Analytics, 2023)	Publisher
Technological Forecasting and Social Change	1,437	12.0	Elsevier
Futures	466	3.0	Elsevier
Strategic Management Journal	264	8.3	Wiley
Technology Analysis & Strategic Management	247	3.4	Routledge – Taylor & Francis Group
Foresight	215	2.0	Emerald
Harvard Business Review	147	14.7	Harvard Business School Publishing Corporation
Long Range Planning	143	8.5	Emerald
The Academy of Management Review	129	16.4	Academy of Management
Journal of Product Innovation Management	127	10.5	Wiley
Technovation	122	12.5	Elsevier

Source: created by the authors.

A preliminary analysis of all bibliographic references showed that by far the most frequently cited source was the journal *Technological Forecasting and Social Change* (1,437 citations), followed by *Futures* (466 citations) and the journal *Strategic Management Journal* (264 citations) (*Table 4*). *Technology Analysis &*

Strategic Management (247 citations), the journal of future studies, strategic thinking and policy *Foresight* (215 citations), *Harvard Business Review* (147 citations), *Long Range Planning* (143 citations), *The Academy of Management Review* (129 citations), *Journal of Product Innovation Management* (127 citations), and *Technovation* (122 citations) complete the top 10 of most cited sources.

As can be appreciated, the ranking of *Technological Forecasting and Social Change* is higher than many other leading management journals, such as *The Academy of Management Review, Strategic Management Journal, Harvard Business Review,* and *Long Range Planning,* and the citation count from this journal (1,437 citations) far exceeds that of the other journals in the list –its citation count is larger than the sum of the following 5 journals' citations.

This result corroborates *Technological Forecasting and Social Change* as the most influential journal in CF research, not only by considering CF as a separate research stream but also in conjunction with other topics such as innovation. This also indicates that CF has developed into a fully fledged field that can support its own knowledge generation and dissemination, wherein *Technological Forecasting and Social Change,* together with *Futures* and *Foresight,* play a leading role in supporting the process of scientific communication for scholars and practitioners wishing to deal directly with the methodology and practice of technological forecasting and future studies as planning tools as they interrelate social, environmental, and technological factors. However, it is also a signal –and not an especially weak signal (Ansoff, 1975)– that the field continues to develop more or less in isolation from general management debates. This is something that Rohrbeck *et al*. (2015) already warned CF scholars about in their paper entitled: *'Corporate foresight: An emerging field with a rich tradition,'* considering it as an undesirable situation in which more recent CF articles showed a decreasing tendency to utilize the theoretical basis created by scholars in preceding research streams: environmental scanning (Fahey and King, 1977; Thomas, 1980), strategic issues management (Ansoff, 1980; Dutton and Jackson, 1987; Camillus and Datta, 1991), sensemaking and sensegiving (Weick *et al.*, 2005; Daft and Weick, 1984; Maitlis and Christianson, 2014), and (forward-looking) organizational search (Gavetti and Levinthal, 2000; Tripsas and Gavetti, 2000; Knudsen and Levinthal, 2007).

Table 5 reports the top ten most local cited documents –ranging from 71 to 29 citations– by the articles included in our dataset. Local citations measure how many times a document included in a collection, e.g., the dataset from which the bibliographic references were extracted, have been cited by the documents included in the same collection. In terms of total local citations (TLC) and total local citations per year (TLC/t) received, the most influential document, with a total of 71 citations, was the article by Rohrbeck and Gemünden (2011) entitled: *'Corporate foresight: Its three roles in enhancing the innovation capacity of a firm,'* published in *Technological Forecasting and Social Change,* followed by the articles by Rohrbeck *et al*. (2015): *'Corporate foresight: An emerging field with a rich tradition,'* and Heger and Rohrbeck (2012): *'Strategic foresight for collaborative exploration of new business fields foresight: An emerging field with a rich tradition,'* both published in the journal ranked as the most popular publication outlet for research on CF and innovation (see *Table 3*), namely *Technological Forecasting and Social Change*. In 2022, the total number of citations of this journal by all journals listed in JCR was 41,192 (2022 Journal Citation Reports. Clarivate Analytics, 2023).

Table 5. List with the top 10 most local cited articles –ranging from 71 to 29 citations– by the 129 articles included in our dataset

Raning		TLC	TGC
1	Rohrbeck R, Gemünden HG (2011). Corporate foresight: Its three roles in enhancing the innovation capacity of a firm. *Technological Forecasting and Social Change* 78(2), 231–243.	71	188
2	Rohrbeck R, Battistella C, Huizingh E (2015). Corporate foresight: An emerging field with a rich tradition. *Technological Forecasting and Social Change* 101, December 2015, 1–9.	48	139
3	Heger T, Rohrbeck R (2012). Strategic foresight for collaborative exploration of new business fields. *Technological Forecasting and Social Change* 79(5), 819–831.	38	96
4	Rohrbeck R, Schwarz JO (2013). The value contribution of strategic foresight: Insights from an empirical study of large European companies. *Technological Forecasting and Social Change* 80(8), 1593–1606.	37	121
5	von der Gracht HA, Vennemann CR, Darkow IL (2010). Corporate foresight and innovation management: A portfolio-approach in evaluating organizational development. *Futures* 42(4), 380–393.	36	79
6	Rohrbeck R, Kum ME (2018). Corporate foresight and its impact on firm performance: A longitudinal analysis. *Technological Forecasting and Social Change* 129, April 2018, 105–116.	36	93
7	Rohrbeck R (2012). Exploring value creation from corporate-foresight activities. *Futures* 44(5), 440–452.	35	72
8	Ruff F (2006). Corporate foresight: integrating the future business environment into innovation and strategy. *International Journal of Technology Management* 34(3-4), 278–295.	34	56
9	Ruff F (2015). The advanced role of corporate foresight in innovation and strategic management — Reflections on practical experiences from the automotive industry. *Technological Forecasting and Social Change* 101, December 2015, 37–48.	32	53
10	Vecchiato R (2015). Creating value through foresight: First mover advantages and strategic agility. *Technological Forecasting and Social Change* 101, December 2015, 25–36.	29	96

Notes: TLC = Total local citations received. Local citations measure how many times a document (or an author) included in a collection, e.g., the dataset from which our bibliographic data were extracted, have been cited by the documents included in the same collection; TGC = Total global citations received. Global citations measure the total citations that an article, included in a collection, has received from documents indexed on bibliographic databases (WoS, Scopus, etc.) worldwide.

Source: created by the authors.

Table 6. List of the top 10 most local cited authors (sorted by number of local citations)

Authors	Local citations
Rohrbeck R	324
Gemünden HG	71
Ruff F	66
Battistella C	64
Vishnevskiy K	62
Heger T	56
Huizingh E	48
Meissner D	48
Schwarz JO	40
von der Gracht HA	39

Source: created by the authors.

Table 6 reveals the top 10 most local cited authors, with Rohrbeck R at the top with 324 local citations, followed by Gemünden HG and Ruff F, with 71 and 66 citations.

2.3 Identification of the Works that Had the Greatest Influence on the Scholarly Community

Table 7 exhibits the 50 most cited scholarly works and their frequency –total counts– in the articles published during the 18-year period: 2006-2023* covered by the study, arranged in order of the number of citations. This table also shows the percentage of articles from this period that cited each work in terms

of relative citation frequency. References that appear in *italics* refer to works (books, book chapters, articles, etc.) included among the top 20 most cited references.

Table 7. List of the 50 most cited works and their frequency

Rank	Document cited	2006-2023 (n = 129)	
1	*Rohrbeck and Gemünden (2011)*	71	55.04%
2	*Daheim and Uerz (2008)*	51	39.53%
3	*Rohrbeck et al. (2015)*	48	37.21%
4	*Heger and Rohrbeck (2012)*	38	29.46%
5	*Rohrbeck (2011)*	38	29.46%
6	*Rohrbeck and Schwarz (2013)*	37	28.68%
7	*Rohrbeck and Kum (2018)*	36	27.91%
8	*von der Gracht et al. (2010)*	36	27.91%
9	*Rohrbeck (2012)*	35	27.13%
10	*Ruff (2006)*	34	26.36%
11	*Ruff (2015)*	32	24.81%
12	*Vecchiato and Roveda (2010)*	32	24.81%
13	*Vecchiato (2015)*	29	22.48%
14	*Vecchiato (2012)*	26	20.16%
15	*Vishnevskiy et al. (2015)*	25	19.38%
16	*Eisenhardt (1989)*	20	15.50%
17	*Iden et al. (2017)*	20	15.50%
18	*Eisenhardt and Martin (2000)*	19	14.73%
19	*Heger and Boman (2015)*	18	13.95%
20	*Paliokaitė and Pačėsa (2015)*	18	13.95%
21	van der Duin et al. (2014)	18	13.95%
22	van der Duin and den Hartigh (2009)	18	13.95%
23	Battistella and De Toni (2011)	17	13.18%
24	Boe-Lillegraven and Monterde (2015)	17	13.18%
25	Day and Schoemaker (2005)	17	13.18%
26	Højland and Rohrbeck (2018)	17	13.18%
27	Horton (1999)	17	13.18%
28	Phaal et al. (2004)	17	13.18%
29	Cohen and Levinthal (1990)	16	12.40%
30	Daft and Weick (1984)	16	12.40%
31	Teece et al. (1997)	16	12.40%
32	Tsoukas and Shepherd (2004)	16	12.40%
33	Battistella (2014)	15	11.63%
34	Day and Schoemaker (2004)	15	11.63%
35	Rhisiart et al. (2015)	15	11.63%
36	Andersen and Andersen (2014)	14	10.85%
37	Andriopoulos and Gotsi (2006)	14	10.85%
38	Ansoff (1975)	14	10.85%
39	Becker (2002)	14	10.85%
40	Bootz (2010)	14	10.85%
41	Popper (2008)	14	10.85%
42	Rohrbeck (2010)	14	10.85%
43	Voros (2003)	14	10.85%
44	Daheim and Uerz (2006)	13	10.60%
45	Barney (1991)	13	10.60%
46	Coates et al. (2010)	13	10.08%
47	Hines and Gold (2015)	13	10.08%
48	Martin (1995)	13	10.08%
49	Teece (2007)	13	10.08%
50	Porter (2004)	13	10.08%

Source: created by the authors.

A few remarks regarding the data thus obtained are mentioned below:

- Of the 20 most frequently cited works (see *Table 7*) –some authors, such as White and McCain (1998) among others, go so far as to refer to them as the 'canonical literature' or the 'literary canon'– 19 were published as articles in journals and only one in book form. In general, this is due to the tendency among authors to use articles published in journals as their source of data for research work and to rely more heavily on empirical studies with some form of empirical data collection and analysis (Üsdiken and Pasadeos, 1995; Ramos-Rodríguez and Ruíz-Navarro, 2004).

- In addition to the book by Rohrbeck (2011), the top 5 most cited works brings together the articles by Rohrbeck and Gemünden (2011), Daheim and Uerz (2008), Rohrbeck *et al*. (2015), and Heger and Rohrbeck (2012).

- Our analysis revealed –in concurrence with the systematic review of the literature by Iden *et al*. (2017) on the nature of strategic foresight research– that case studies were the most frequently applied research strategy for empirical research. This explains why the article by Kathleen M. Eisenhardt (1989): *'Building Theories from Case Study Research'* is in the top 20 most cited works.

- Of the 50 most influential works listed in *Table 7*, almost half (23 articles) were published as articles in the journal *Technological Forecasting and Social Change,* 8 of these articles in the 2015 special issue devoted to CF (vol. 101). It is interesting and surprising to observe so many articles published in the same journal when an analysis like ours is conducted. It should be expected that more scholarly works appear that offer some sort of theoretical perspective, like the articles by Ansoff (1975), Daft and Weick (1984), Cohen and Levinthal (1990), and Teece *et al*. (1997) in our case. This puts us on the track of researchers "thinking inside the box" (Shafique, 2013) and citing documents lacking theoretical foundation.

- Other notable examples of works with a significant presence in the ranking are those that introduced new approaches or theoretical perspectives to the study of the field of foresight. For instance, the works by Heger and Boman (2015): *'Networked foresight — The case of EIT ICT Labs*,*'* and van der Duin *et al*. (2014): *'Toward networked foresight? Exploring the use of futures research in innovation networks,'* on networked foresight.

Shown below are the results of the co-citation analysis conducted to map the intellectual structure of the knowledge base of CF and innovation research.

As explained in the Methodology section, a co-occurrence matrix to carry out the analysis mentioned above was constructed from the 50 most influential works identified in the first stage of this study.

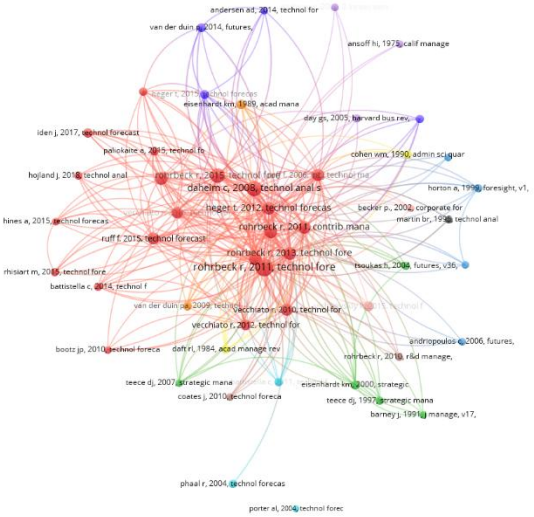
2.4 Intellectual Structure of the Knowledge Base of Corporate Foresight and Innovation Research

As can be observed from *Figure 4*, using the bibliometric maps generated by the VOSviewer computer program for bibliometric mapping, the co-citation patterns that emerge for the analysis of the 50 most influential works listed in *Table 7* are visually mapped in this figure.

Compared with those of other visual knowledge map tools, we found that the maps generated by VOSviewer (Copyright © 2009-2024 Nees Jan van Eck and Ludo Waltman) have richer colors and a more pleasing appearance. For this reason, we chose this software to carry out the analyses.

In *Figure 4*, 11 different clusters are distinguished by colors, while the nodes on the map vary in size depending on the number of citations received. The cluster with red colored nodes has the largest number of documents (21 articles and 1 book) and the most cited and influential works, with the article

by Rohrbeck and Gemünden (2011): *'Corporate foresight: Its three roles in enhancing the innovation capacity of a firm,'* heading this cluster.



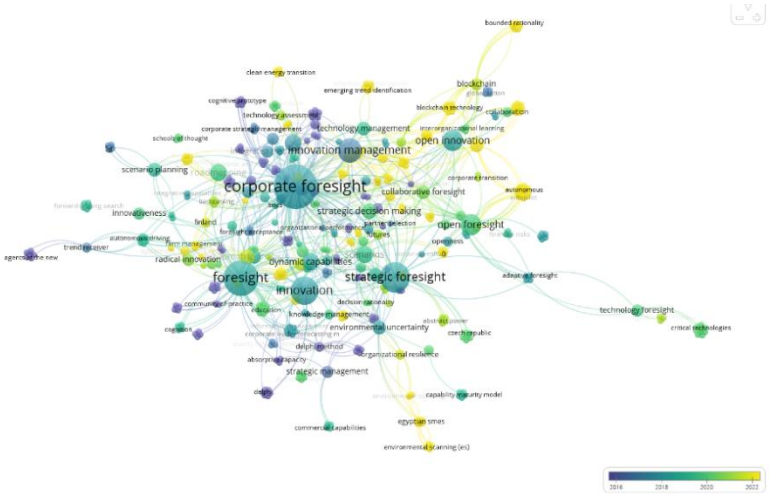
Source: created by the authors.

Figure 4. **Map of the Intellectual Structure of Research on Corporate Foresight and Innovation for the Period 2006-2023**

In an overall look at the co-citation map, other relevant clusters are visible. For instance, the cluster (in green) that includes among others the articles by Barney (1991), Eisenhardt and Martin (2000), Teece *et al.* (1997), and Teece (2007), suggests the relevance of one of the fundamental pillars on which the research on CF is mainly supported: the integration of the resource-based view of the firm (RVB) and the dynamic capabilities theory. It is worth keeping in mind that CF can be defined as "a dynamic, firm-level capability that allows firms to evaluate future scenarios of the business environment, including systematic doomsday collapses" (Fergnani, 2022, p.820). Whereas previous studies often investigated the influence of strategic foresight activities on innovation (van der Duin *et al.,* 2009; von der Gracht *et al.,* 2010), firm performance (Rohrbeck and Kum, 2018) or strategy development and implementation (Fink *et al.,* 2005; Groenveld, 2007), a growing body of literature is more recently examining the impact of strategic foresight on the dynamic capabilities of firms to survive and grow in the face of competitive and uncertain environments (Rhisiart *et al.,* 2015; Haarhaus and Liening, 2020) and corporate foresight as a microfoundation of dynamic capabilities (Schwarz *et al.,* 2020) or a dynamic, firm-level capability (Fergnani, 2022).

As would be expected, another of the clusters identified in this study (in yellow) brings together the works by Cohen and Levinthal (1990): *'Absorptive Capacity: A New Perspective on Learning and Innovation,'* and Daft and Weick (1984): *'Toward a Model of Organizations as Interpretation Systems.'* According to these last authors, organizations perceive their environment (step 1: scanning — data collection), translate what they find into organizational implications (step 2: interpretation — data giving meaning), and develop responses based on their insights into their environment (step 3: learning — action taken). In their paper, Cohen and Levinthal (1990) argue that the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. They label this capability a firm's absorptive capacity and suggest that it is largely a function of the firm's level of prior related knowledge.

From *Figure 4* other clusters can be visualized. For example, the cluster (in purple) bringing together the works by Igor H. Ansoff (1975) –the first to observe how the inherent ignorance of firms about changes in the environment often resulted in missed opportunities and a failure to respond to threats–and Day and Schoemaker (2005) or the cluster (in matte black) consisting solely of the article by Martin (1995): *'Foresight in science and technology.'* This last paper analyzes the experiences of Japan, the US, the Netherlands, Germany, Australia, New Zealand and the UK in using foresight to help in selecting and exploiting research that is likely to yield longer-term economic and social benefits and concludes by drawing an analogy between models of innovation and foresight. In *'Foresight in science and technology,'* Martin (1995) emphasizes the importance of strategic foresight in guiding scientific and technological development. Overall, Martin argues that effective foresight in science and technology is vital for guiding decision-making and ensuring that advancements benefit society as a whole.



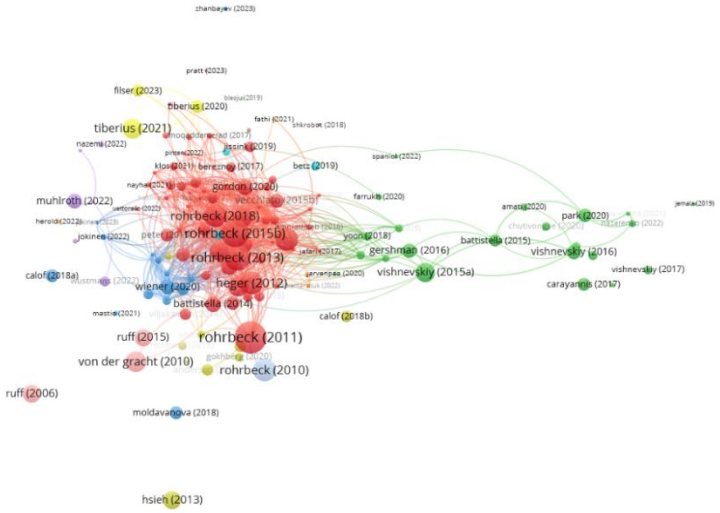
Source: created by the authors.

Figure 5. **Results of the Co-Occurrence Analysis of Author Keywords (Overlay Visualization) Used on All the Articles Analyzed**

As a way to complement the analysis, *Figure 5* shows the results of the co-occurrence analysis of author keywords (overlay visualization) used in all the articles analyzed as source documents in this study.

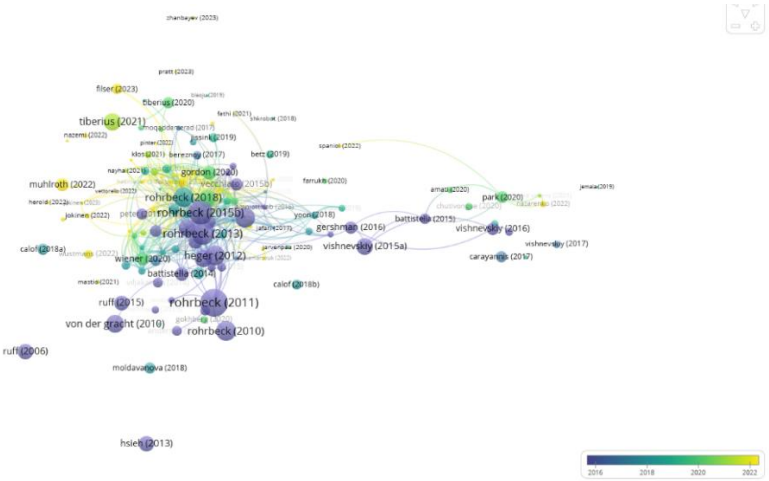
Figure 6 (network visualization) and *Figure 7* (overlay visualization) depict the main results of the bibliographic coupling analysis (BCA) carried out to identify active research fronts in the field. Among the research fronts that bring together the most recently published scholarly works, we found the research front (in purple) integrating the works by Gilmore *et al. (2023),* Nazemi *et al.* (2022), Wustmans et al. (2022), Mühlroth and Grottke (2022), Mühlroth *et al.* (2023), and Laurell and Sandström (2022). In this last paper, entitled 'Social Media Analytics as an Enabler for External Search and Open Foresight—The Case of Tesla's Autopilot and Regulatory Scrutiny of Autonomous Driving' published in IEEE Transactions on Engineering Management, the authors underscore the potential of this platform (Social Media Analytics) for external search for knowledge and open foresight that enable firms to tune in to weak signals and scan the periphery. The rest of the papers in this cluster refer to the use of technologies such as machine learning, artificial intelligence and blockchain to spot emerging trends and technologies. Corporate foresight involves anticipating future trends and changes to inform strategic planning. Utilizing technologies like machine learning (ML), artificial intelligence (AI), and blockchain can significantly enhance this process. Combining ML, AI, and blockchain enables organizations to spot trends earlier by analyzing diverse data sources –e.g., AI tools can gauge public sentiment through social media and

online reviews, providing insights into consumer behavior and emerging market needs (Wankhade *et al., 2022;* Sharma *et al., 2024)* and predict future trends based on historical data, allowing companies to make informed decisions about product development, market-entry, and resource allocation– and ensuring data integrity. By integrating these technologies into their strategic frameworks, organizations can better navigate uncertainties and capitalize on emerging opportunities. And this can be particularly interesting for small businesses: through the integration of AI into their corporate foresight strategies, small firms can enhance their agility, adapt to changing market conditions, and drive innovation. With the right tools and approaches, these firms can turn potential challenges into opportunities for growth and success.



Source: created by the authors.

Figure 6. **Bibliographic Coupling Analysis (BCA) Results (I) – Fronts of Research Identified in This Study (Network Visualization)**



Source: created by the authors.

Figure 7. **Bibliographic Coupling Analysis (BCA) Results (II) – Fronts of Research Identified in This Study (Overlay Visualization)**

As can be observed, another of the research fronts that could be considered as emerging is the research front represented by the cluster (in yellow) that integrates the works by Filser *et al.* (2023), Tiberius *et al.* (2020), and Tiberius *et al.* (2021). All these scholarly works use bibliometric analysis.

By way of example, in their recent article entitled: *'Radical innovations: Between established knowledge and future research opportunities,'* Tiberius *et al.* (2021) identify as a future research opportunity the extension of radical innovation research's epistemological basis by adding strategic foresight.

Conclusions, Limitations, Implications, and Future Research

In a celebrated lecture given at the Harvard Business School in 1931, and paraphrasing his words, Alfred North Whitehead identified foresight as a crucial attribute of the mind of the strategist. As stated by Tsoukas and Shepherd (2004), "anticipating contemporary notions of sensemaking, double-loop learning, and scenario planning, Whitehead perspicuously saw that business organizations need to cultivate foresight in order to cope with the relentless change that modernity generates."

It is precisely this need for business organizations to cultivate foresight, as perspicuously identified by Whitehead, that motivates this study. In line with the above and on the basis that CF can favorably affect important organizational outcomes including learning, creativity, innovation, and performance via a mechanism to create competitive advantage –Rohrbeck *et al.* (2015) use the term CF as a practice that permits an organization to lay the foundation for a future competitive advantage through value creation–, CF and its symbiotic relationship to innovation figures as the focal point of this article. Our literature review allowed us to identify the works with the greatest impact on the scholarly community and the research traditions –the term research tradition here refers to "a fairly broad but distinguishable part of scientific literature in a field of research" (Shafique, 2013, p.62) in which these works are embedded, characterizing their respective knowledge bases, as well as unveiling the intellectual structure of the knowledge base of CF and innovation research. We also provide an overview of the most cited journals, authors, and most local cited publications and conduct a bibliographic coupling analysis to identify active research fronts in the field.

As previously mentioned in the Introduction section, the main conclusion that can be drawn from our work is that we are in the presence of a poorly organized academic field dominated by explorative research. We make a plea to scholars to ensure that the field does not continue to develop in isolation from general management debates. We believe that this is particularly needed in light of a rapid growth of both practitioner and academic interest in the field under examination.

Limitations

As is the case with any research, this study comes with several limitations, some of which stem from its design[4] –e.g., the focus on journal articles only and the use of a single database: the WoS, might draw criticism–, whereas others are a direct result of using bibliometric methods due to the intrinsic drawbacks of these methods. Citation analysis is a good example of this. While bibliometric analysis is based on the assumption that citations can indicate scientific work's present and past activities (Schildt *et al.*, 2006, p.400), multiple studies have revealed diverse reasons for citing older literature (Moravcsik and Murugesan, 1975; Brooks 1985, 1986; White and Wang, 1997; Case and Higgins 2000; Bornmann and Daniel, 2008; among others). Factors such as interpersonal relationships (Pasadeos *et al.*, 1998) and

[4] It is important to explicitly state that the research was conducted exclusively in English and utilizing only the Web of Science (WoS) database.

institutional prestige (Crane, 1967; Pfeffer *et al.*, 1977; Rodgers and Maranto, 1989) have been found to positively influence citation patterns. Furthermore, it is essential to recognize that citation counts represent just one proxy measure of research impact or influence (Schrock *et al.*, 2016; Abramo *et al.*, 2019). In any case, it is also worth noting that this study addresses the limitations commonly found in previous research works. For instance, unlike some of these prior studies, our research does not concentrate on a specific journal, regardless of its relevance.

Practical and theoretical implications

As would be expected, the findings discussed in the previous sections of our manuscript are relevant to both academics and practitioners.

To begin with, our study provides researchers with a comprehensive overview of the existing scholarship on CF and innovation by delimiting the current scope and boundaries of research. As a result, scholars with an interest in the field can utilize our study's findings to gain a deeper insight into the historical, present, and future dimensions of the field. In an increasingly knowledge-based economy, understanding the factors that determine an organization's ability to produce new ideas and continually innovate is a fundamental issue for strategic management scholars.

Logically, our study also contributes to practice, and managers would benefit from our review. The summaries of the various issues analyzed may serve as guidelines for managers who are planning to adopt or are already adopting CF in their firms for enhancing innovation.

Foresight, like other business disciplines, is both an art and a science. Foresight can unlock more flexible decision-making, promote entrepreneurial behaviors, increase sense of agency and drive firm performance. But without a standard methodology and set of tools it is rendered ambiguous or even unexplainable to non-practitioners. Even among practitioners, there is little consensus on exactly what a trend is and how it is different from a strong signal or a macro trend or a force.

To date, we have had the advantage of a rear-view mirror. However, looking into the future of the research on CF and innovation can be somewhat more complex.

By way of example, we advocate the value of more regionally-focused studies. Thus, future research could broaden the investigation to include countries or regions –the anticipation of the future could take a significantly different approach– in which the distribution of businesses across industries, innovativeness, and institutional environments may differ. Novel technologies are introduced to society in ways that bring varying levels of political accountability. In many cases (e.g., automobiles in the early 20th century, social media in the early 21st century), market forces principally govern novel technologies, where innovators who promise social benefit are welcomed by eager consumers while regulatory regimes arrive late and perform weakly. At the other end are highly complex and risky technologies (e.g., nuclear weapons, nuclear power, hydro-electric interventions), which are introduced largely insulated from market forces (Mukherjee *et al.,* 2023, p.437).

New perspectives and avenues for further investigation combining citation and co-citation analyses with content analysis (e.g., using textual data) –content analysis is a qualitative method that aims to identify cognitive schemas and extract in-depth insights from the literature (Prashar and Sunder, 2020)– is also encouraged. This integrated approach (or sometimes called hybrid review), which is a result of combining bibliometric and structured reviews or content analysis could be particularly successful to summarize and synthesize current research trends, direction, and patterns of research (Pizzi *et al.*, 2020; Prashar

and Sunder, 2020; Ranjbari *et al.*, 2021; Ramadan *et al.*, 2022; among others).In doing so, we address the call of contemporary researchers (Hota *et al.*, 2020; Zhu and Cunningham, 2022; Kaushik *et al.*, 2023; Wahyuningrum *et al.*, 2023; among others), who in other fields have urged future researchers to use advanced approaches such as combined bibliometric analysis and topic modeling[5] to better portray the extant literature and set the grounds for influential research in the future. To the best of our knowledge, based on thorough literature searching, no such comprehensive analysis and review has been found in the field under examination.

Further research may also usefully consider measuring the impact and influence of articles or any other type of document through different means (e.g., expert opinion methodology) instead of by means of citation counts.

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INTELEKTINĖ ĮMONIŲ PROGNOZAVIMO IR INOVACIJŲ TYRIMŲ STRUKTŪRA: STANDARTINIS MĄSTYMAS

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Santrauka. Neseniai paskelbtame straipsnyje „Corporate Foresight: A New Frontier for Strategy and Management", paskelbtame žurnale *The Academy of Management Perspectives*, Alessandro Fergnani (2022) siekia pristatyti korporatyvinio prognozavimo (CF) konstrukciją strategijos ir vadybos mokslininkų auditorijai. Minėtame straipsnyje apibrėžiamas CF, įtrauktas į platesnius ateities studijų epistemologinius pagrindus. Jis teoriškai įrašytas į dinaminių galimybių sistemą, atskirtas nuo susijusių konstruktų ir suskaidytas į pagrindinius komponentus. Teigiama, kad CF yra labai svarbus strategijai ir valdymui, nes, be kitų priežasčių, gali palankiai paveikti svarbius organizacinius rezultatus, įtraukiant mokymąsi, kūrybiškumą, inovacijas ir našumą. Šiuo atveju naudojamas mechanizmas, leidžiantis sukurti konkurencinį pranašumą, kurio anksčiau neištyrė strategijos ir vadybos mokslininkai. Šiame darbe, siekiant ištirti simbiotinį ryšį tarp įmonių prognozavimo ir inovacijų, taikomi bibliometriniai metodai. Analizuojamos citatos susieja šios srities intelektinę tyrimų struktūrą. Taip pat nustatyti svarbiausi šios srities autoriai, straipsniai ir žurnalai, pateikiamos patikimos gairės tolesniems tyrimams. Apskritai ši literatūros apžvalga atspindi prastai organizuotą akademinį lauką, kuriame vyrauja taikomieji tyrimai, tyrėjus suskliaudžiantys į standartinio mąstymo modelį.

Reikšminiai žodžiai: įmonių prognozavimas; inovacijos; bibliometrija; citavimo ir bendro citavimo analizė.