Research Landscape and Trends in Corporate Foresight

Eurico Chichorro
PhD Student, eurico_chichorro@iscte-iul.pt

Leandro Pereira
Assistant Professor, Business Research Unit – BRU-IUL, leandro.pereira@iscte-iul.pt

Álvaro Dias
Assistant Professor, alvaro.dias1@gmail.com

Renato Lopes da Costa
Assistant Professor, Business Research Unit – BRU-IUL, renato.lopes.costa@iscte-iul.pt

ISCTE – Instituto Universitário de Lisboa, Avenida das Forças Armadas, 1649-026 Lisboa, Portugal

Rui Gonçalves
Professor, ruiahgoncalves@gmail.com

Instituto PIAGET Almada, Avenida Jorge Peixinho, n.30, Quinta da Arreinela, 2805-059 Almada, Portugal

Abstract

Corporate Foresight (CF) gains increasing research interest as an efficient decision-making tool in the face of growing market uncertainty. We carried out a bibliometric analysis of the CF literature published between 2001 and 2021. The results of bibliometric analysis propose in which journals researchers should publish their papers to obtain more citations, which to cite, which keywords to use, and which references to explore. This allows managers, researchers, and practitioners to gain in-depth knowledge of CF literature.

Keywords: corporate foresight; strategic foresight; open foresight; bibliometric analysis; journals; citation.

Paper type: Research Article

Citation: Chichorro E., Pereira L., Dias A., Lopes da Costa R., Gonçalves R. (2022) Research Landscape and Trends in Corporate Foresight. *Foresight and STI Governance*, 16(3), 49–66. DOI: 10.17323/2500-2597.2022.3.49.66

Introduction

Technological innovation spurs economic growth while amplifying market uncertainty and causing other "big challenges". Companies face challenges in comprehending the factors that lead to environmental change, assessing their impact on businesses, choosing options for response, and assessing the consequences of those choices (Latzer, 2009; Vecchiato, Roveda, 2010). When dealing with continuous turbulence of the external environment, the "traditional" concepts of strategic management, such as the resource-based view and capabilities theory, do not work (Vecchiato, Roveda, 2010; Rotjanakorn et al., 2020). Therefore, there is a need for strategic fit — companies need processes to keep track of the consistency and positioning of their strategy with regard to weak signals and trends, as well as the skills to create alternative scenarios for the future. Such an approach will make it possible to adjust corporate agendas for "future proofing" in a timely manner, thus gaining long-term competitive advantages (Battistella, De Toni, 2011).

The basis for the designing such strategies is offered by the Corporate Foresight (CF) toolkit (Rohrbeck, Gemünden, 2009; Vecchiato, 2015; Bereznoy, 2017). Their success depends on the ability to think holistically, create partnership networks for innovations, involve a wide range of stakeholders in the Foresight process (Ratcliffe, 2006; Wiener, Boer, 2019), and have a comprehensive understanding of the CF knowledge base, including research areas, cases.

The purpose of the paper is to understand current trends in CF research by quantitatively, computationally, and systematically reviewing the literature corpus. Previous efforts to review this field of study have been qualitative, such as (Daheim, Uerz, 2006; Rohrbeck et al., 2015; Adegbile et al., 2017; Iden et al., 2017; Gordon et al., 2020). Thus, there is a gap to be fulfilled where quantitative and computational analyses are used to identify future research patterns. This study aims to provide the first bibliometric analysis exploring corporate foresight literature. Though, it must be noted that, to our knowledge, there are already two publications that performed bibliometric analyses: on technology foresight (Gibson et al., 2018) and on regional foresight (Amini et al., 2021). However, our research will have a broader perspective. Based on this research problem three research questions were formulated:

- How has corporate foresight research changed over the last two decades?
- What is the intellectual structure of corporate foresight?
- What are the current research trends in corporate foresight literature?

Methodology

Research design and tools

To analyze and cohesively organize the knowledge base of a particular domain, a systematic literature review is often used. It implements a content analysis of a limited number of reviewed studies (most often no more than a hundred sources) (Donthu et al., 2021; Han et al., 2020). It is manually intensive, qualitative (i.e., it relies exclusively on expert judgement), and hence the results are subjective, thereby prone to bias (Zhai et al., 2021).

Another common approach, bibliometric network analysis, combines qualitative and quantitative computational methods, that is, it combines both quantitative analysis (evaluation and interpretation) and qualitative analysis (interpretation only). With its help, much larger arrays of scientific publications (about several hundred or even thousands) are processed, common research topics and directions of future research are identified (Han et al., 2020). The use of quantitative computational methods creates a more objective picture of a certain research field and makes it possible to identify links between its various branches (Han et al., 2020, Zhai et al., 2021).

Bibliometrics are used to analyze research elements such as citation, authors, and semantics using graphic elements to present the data in the form of a network map (nodes) (Gibson et al., 2018). It provides an in-depth understanding of the state-of-art and trends of the studied field. A comparison of the characteristics of each of the two approaches justifies our choice in favor of bibliometric analysis since it fully meets the objectives of our study.

There are several types of networks represented in Table 1. The metrics used to evaluate each network's node are presented in Table 2.

Each network can be divided into clusters. The division of the network into groups of individual nodes is called clustering, and those groups are called clusters. There are two types of clustering approaches: a hard clustering approach (non-overlapping clusters) and a soft clustering approach (overlapping clusters) (Chen, 2016). Using non-overlapping clusters allows for differentiating between the clusters' natures, being more efficient than using overlapping ones.

Cluster labeling is an algorithm-based approach that employs index words or terms from the article

Table 1. **Network Types Analyzed within The Study**

Network type	Code
Co-authorship network	node = author
Co-authors' institutions network	node = institution
Co-authors' countries network	node = country
Co-occuring phrases network	node = term
Co-occuring author keywords network	node = keyword
Co-ocurring subject categories	node = category
Document co-citation network	node = reference
Author co-citation network	node = cited author
Journal co-citation network	node = cited journal

Source: authors.

Table 2. **Metrics Used to Evaluate Network Nodes**

Metrics	Description
Degree of Centrality	This is the number of the relational ties of a node within a network (Donthu et al., 2021). For example, if the node is an author, the degree of centrality is the number of authors with whom one author worked.
Betweenness Centrality	According to Chen et al. (2010), each node in a network has its betweenness centrality metric. It varies from 0 to 1*. It determines how close the node is to be in the center of a path that links other nodes in the network as it measures the probability that a node is on the shortest path in the network (Chen, 2005). High betweenness centrality ratings suggest potentially revolutionary scientific articles as well as gatekeepers, responsible articles, or authors for innovation, in networks (Chen, 2006).
Burstness	Concerning the burstness of an item (reference, author, keyword, journal…), the burst value evaluates whether a particular frequency function exhibits statistically significant changes over a brief time interval within a larger timeframe. Citation analysis can use burstness to determine whether and when the citation count of a certain reference has increased (Chen et al., 2010).
Sigma	The sigma value (∑), represents a measure of scientific innovation, novelty. It selects scientific publications that are likely to contain innovative ideas based on two transformative discovery criteria, centrality, and burstiness - $(centrality+1)^{burstness}$ - (Chen et al., 2010). According to Gaggero et al. (2020), it measures the combined strength of structural and temporal properties of a node, namely, its betweenness centrality and citation burst. Higher sigma values often signify greater creativity, innovativeness, and influence (Zhang et al., 2020). In the current research, we set sigma>1.5 to represent the possible originality, innovation, and influence of a topic.

Source: authors.

titles and abstracts of each cluster (Chen et al., 2010). Clusters are automatically labeled by the selection of phrases and index terms from the cited publications in each cluster (Chen et al., 2010). These terms are ranked by three different algorithms: Log-Likelihood Ratio (LLR), Latent Semantic Indexing (LSI), and Mutual Information (MI). LLR and MI tend to represent a distinctive feature of a cluster (Chen et al., 2010). The overall structure of networks and the criteria for selecting nodes are determined using the "Q modularity" and "silhouette" metrics (Gaggero et al., 2020) (Tables 3 and 4).

There are several softwares or applications to map knowledge domains, such as CiteSpace, VOSviewer, BibExcel, etc. We decided to use CiteSpace, not only because of the power analysis but also because it is configured according to each researcher's needs, and, thus this makes it the best tool for working with bibliographic information, including Web of Science and Scopus databases (Zhang et al., 2020; Zhai et al., 2021; Amini et al., 2021). CiteSpace processes data into network patterns and helps identify thriving topical areas and novel research patterns[1] by decomposing the network into clusters supported by temporal analyses. It succors collaboration networks, author co-citation networks, and document co-citation networks investigations. The networks developed in CiteSpace consist of nodes that represent the types of entities (e.g., authors, journals, and references) and links that represent the relationship between the nodes (Zhai et al., 2021).

Data Collection

Data was collected from the Web of Science Core Collection, which is the premier resource on the Web of Science and the world's most trusted citation index for scientific and scholarly research. This collection is comprised of 21,000 peer-revied journals published worldwide in over 250 disciplines.[2] Based on the research framework and review studies, such as (Daheim, Uerz, 2008; Rohrbeck et al., 2015; Gordon et al., 2020), the following query was built and searched on WoS: *Query* = ("Corporate foresight" OR "Strategic foresight" OR "Organizational foresight"). The period was set to 2000 to 2021. From this query, the initial result was 435 publications. Since there

Table 3. **Cluster Metrics for Detecting the Overall Structure of the Networks**

Metrics	Description
Modularity Q	Regarding the modularity Q of a network, it is the degree to which it can be split into inde-pendent blocks. The modularity score ranges between 0 and 1 (Chen et al. (2010). A net-work with low modularity, closest to 0, cannot be reduced to clusters with defined bounda-ries, whereas a network with high modularity may be well structured, meaning that it can be divided into clear clusters. However, the closer to 1, the more a cluster will be isolated, dis-persing the network (Chen et al., 2010).
Silhouette	The silhouette metric can be used to estimate the uncertainty in determining the nature of a cluster (Rousseeuw, 1987). The silhouette value, which ranges from -1 to 1, shows the de-gree of uncertainty that must be considered when understanding the nature of the cluster. A value of 1 denotes the complete isolation from other clusters, which represents an easier way to label the clusters (Chen et al., 2010).

Source: authors.

[1] http://cluster.cis.drexel.edu/%7Ecchen/CiteSpace/, accessed 10.08.2021.

[2] https://clarivate.libguides.com/webofscienceplatform/woscc, accessed 02.08.2021.

Table 4. **Node Selection Criteria**

Metrics	Description
G-Index	The g-index is the (unique) greatest number (in which articles are ordered in decreasing order of the number of citations they received) such that the top g articles got (collectively) at least g2 citations (Egghe, 2006). The number of citations in an author's most important articles is factored into the g-index. The highest number that equals the average number of citations of the most highly referenced g publications is the g-index. CiteSpace employs a modified g-index with a scaling factor k to make it even more versatile. The k parameter can be any positive value, allowing the user to tailor the total size of the resulting network to their requirements.*
Top N	This criterion selects the N articles that were most cited and utilizes data from them to build the network for each time slice (Gaggero et al., 2020).
Top N%	This criterion selects the N% articles that were most cited and utilizes data from them to build the network for each time slice (Gaggero et al., 2020).

* https://sites.google.com/site/CiteSpace101/6-configure-a-CiteSpace-run/6-4-node-selection, accessed 10.09.2021.

Source: authors.

are zero papers from 2000, the final timespan was set, 2001-2021. This timeframe was selected because it allows for a deep interpretation of the past two decades of the research stream.

In order to improve the effectiveness of data processing, analyzing, and interpreting, the data was preliminarily filtered using the principal criteria that all papers must have a title and abstract in English. No language barrier was implemented. It was decided that all publications, English, Russian, German, French, Spanish, and Portuguese publications should not be excluded from the analysis, because CiteSpace has the computational power to analyze different languages. However, poetry and letters were filtered out leaving only 433 results (346 articles, 65 proceeding papers, 19 review articles, 13 editorial materials, eight early access papers, and six book reviews).

Data Processing

A descriptive analysis of publication frequency over time and a descriptive analysis of citation frequency over time allowed for understanding how CF evolved over the past few decades. We conducted a descriptive analysis, based on WoS data of the top 10 journals according to publications and citations, followed by the top 10 authors per publications and citations, the top 40 most used keywords (author keywords and keywords plus[3]), and finally the top 10 most cited publications to have an overview of the sample's data. These descriptive analyses allowed us to understand how the CF domain is structured.

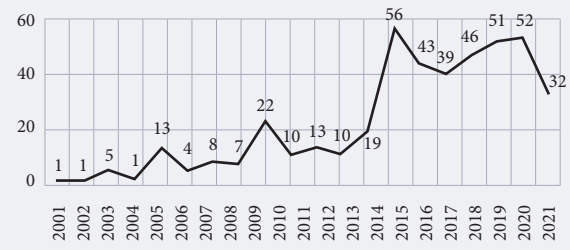
Networks of publications, authors, keywords, and publications were visualized and evaluated using the metrics: frequency, degree of centrality, betweenness, burst value, and sigma value. To continue to understand what the current trends on CF are, we did a clustering analysis on the publications, using the labeling method LLR (Log-Likelihood Ratio). Considering that we wanted to focus our attention on the current trends, we selected the clusters that had recent activity, meaning the ones that had publications in 2020 or 2021. After selecting the clusters, we then focused our attention on the publications that had burst periods covering 2021. It should be noted that for the descriptives and bibliometrics no difference was made between journals, conference proceedings, or scientific books.

Results

Descriptive Analysis

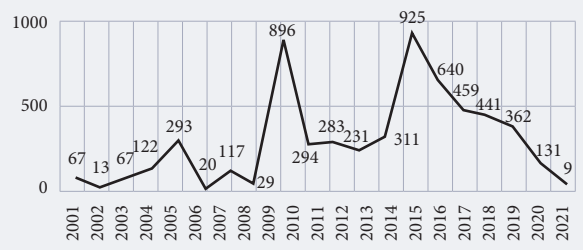
This section presents some descriptive analyses: the publication frequency and citation frequency of CF

Figure 1. **Query Publication Frequency**



Source: authors.

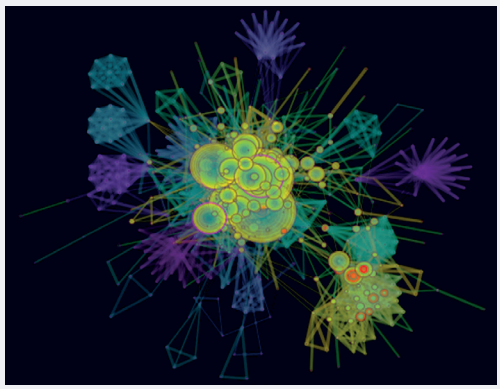
Figure 2. **Query Citation Frequency**



Source: authors.

[3] Keywords plus are words or phrases that frequently appear in the titles of an article's references, but do not appear in the title of the article itself. Based upon a special algorithm that is unique to Clarivate databases, KeyWords Plus enhances the power of cited reference searching by searching across disciplines for all the articles that have cited references in common. https://support.clarivate.com/ScientificandAcademicResearch/s/article/KeyWords-Plus-generation-creation-and-changes?language=en_US, accessed 02.08.2021

Figure 3. **Journal Co-citation Network**



Source: authors.

literature, followed by a journal, authors, keywords, and document analysis.

In relation to *publication frequency*, Figure 1 shows that, since 2001, the number of publications, regarding corporate foresight has gradually increased and 85.68% of the publications were published after 2010. Furthermore, it is possible to see that, in 2001, there was only one publication and, in 2015, the number of publications reached a peak of 56.

Figure 2 presents the number of citations per year (*citation frequency*) for all the 433 articles that composed the data between 2001 and 2021. In total 5,670 citations occurred during the studied period. It is possible to identify two citation peaks: one in 2010, with 896 citations, and another in 2015, with 925 citations. Moreover, 71.26% of the citations occurred after 2010. In contrast, it is possible to observe that the overall citation frequency has been decreasing since 2015.

As to *journal co-citation,* the 433 papers were published in 191 different journals and 154 of those journals only published one paper. In contrast, the 10 journals with more publications accounted for 50.5% of the total publications, see Table 5.

Table 6 shows the top 10 journals based on their citation count. As we see, these 10 journals accumulated 5,670 total citations. The top 10 journals with more citations accounted for 72.61% of the total.

The 433 studies used on the dataset were published by 1,043 distinct authors. In the following table, Table 7, in the column Acc % of 433, we can see that 41.8% (181 publications) of the 433 published papers were produced by 32 authors.

In Table 8, it is possible to see the most cited authors from a total of 38,350 co-citations. René Rohrbeck is in first place with 674 citations from the 17 papers that he participated in, followed by Senthold Asseng with 441 citations, Gerrit Hoogenboom, and Joost Wolf with 389 citations each, and so on. In total, the top 10 most cited authors represent 10.65% of the total number of co-citations.

The following table, Table 9, describing *Co-occurring Author Keywords* shows the top 20 most used keywords (author keywords and keywords plus) from a total of 1,813 distinct keywords. It is possible to see that the 10 most used keywords account almost for 20% of the total keywords used in all papers from our dataset and the top 20 most used keywords account for 26.31% of the total keyword utilization.

Finally, regarding *Document Co-citation,* Table 10 presents the most cited papers from a total of 5,670 ci-

Table 5. **Publications per Journal (2001–2021)**

Journal Name	Number of Publications	Share of 433 (%)	Acc. % of 433*
Technology Forecasting and Social Change	78	18.01	18.01
Futures	50	11.55	29.56
Foresight	28	6.47	36.03
Technology Analysis & Strategic Management	15	3.46	39.49
European Journal of Futures Research	13	3.00	42.49
Journal of Futures Studies	8	1.85	44.34
Global food Security	7	1.62	45.96
Foresight and STI Governance	7	1.62	47.58
Technology Innovation Management Review	7	1.62	49.19
Futurist	6	1.39	50.58
TOTAL	433		

Editorial note: * * In this and subsequent tables, the value of Acc. % means the sum of the individual shares of the current and higher ranking positions in the total sample.

Source: authors.

Table 6. **Citations per Journal (2001–2021)**

Journal Name	Citation Count	Share of 5670 (%)	Acc. % of 5670
Technological Forecasting and Social Change	2216	39.08	39.08
Futures	766	13.51	52.59
Nature Climate Change	296	5.22	57.81
Technology Analysis & Strategic Management	201	3.54	61.36
Global Change Biology	144	2.54	63.90
Foresight	123	2.17	66.07
Marketing Science	122	2.15	68.22
Global Food Security	89	1.57	69.79
Conservation Letters	82	1.45	71.23
R&D Management	78	1.38	72.61
TOTAL	5670		

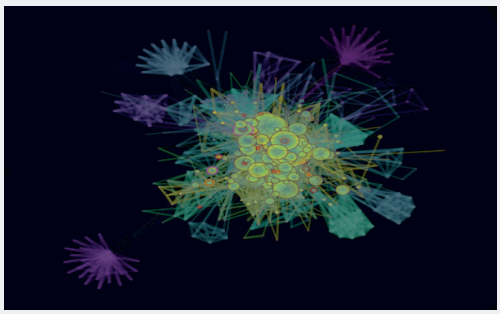
Source: authors.

Table 7. **Publications per Author (2001–2021)**

Rank	Author Name	Number of Publications	Share of 433 (%)	Acc. % of 433
1	René Rohrbeck	17	3.93	3.93
2	David Sarpong	12	2.77	6.70
3	Daniel Mason-d'croz	10	2.31	9.01
4	Dirk Meissner	10	2.31	11.32
5	Konstantin Vishnevskiy	9	2.08	13.39
6	Melanie Wiener	8	1.85	15.24
7	Riccardo Vecchiato	7	1.62	16.86
8	Senthold Asseng	6	1.39	18.24
9	Sika Gbegbelegbe, Jari Kaivo-Oja, Anna Kononiuk, Pierre Martre, Richard D. Robertson, Heiko A.von der Gracht	5	1.15 each (6.93 total)	25.17
10	Cinzia Battistella, Frank Ewert, Regina Gattringer, Guy Hareau, Gerritt Hoogenboom, Oleg Karasev, Kurt-Christian Kersebaum, Mairi Maclean, Matthew P. Reynolds, Sherman Robinson, Alex Ruane, Jan Oliver Schwarz, Mikhail Semenov, William J. Sutherland, Victor Tiberius, Julia Rose West, Keith Wiebe, Joost Wolf	4	0.92 each (16.63 total)	41.80

Source: authors.

Figure 4. **Author Co-Citation Network**



Source: authors.

Table 8. **Citations per Author for the Top 10 Authors (2001–2021)**

Rank	Author Name	Number of Citations	Share of 38360 (%)	Acc. % of 38360
1	René Rohrbeck	674	1.76	1.76
2	Senthold Asseng	441	1.15	2.91
3	Gerritt Hoogenboom	389	1.01	3.92
4	Joost Wolf	389	1.01	4.93
5	Davide Cammarano	372	0.97	5.90
6	Frank Ewert	364	0.95	6.85
7	Kurt-Christian Kersebaum	364	0.95	7.80
8	Pierre Martre	364	0.95	8.75
9	Ehsan Eyshi Rezaei	364	0.95	9.70
10	Mikhail Semenov	364	0.95	10.65

Source: authors.

tations in the 433 papers. The top 10 most cited publications account for 20.48% of the total citations.

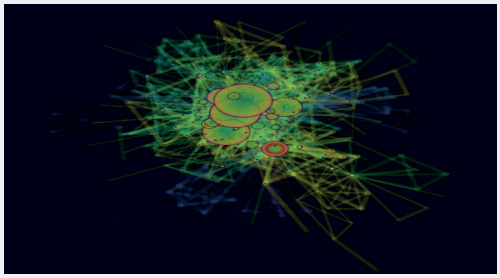
Bibliometric Analysis

In this section, we will present the results of our bibliometric analysis for the document, author, journal, and keyword co-citation network. In Figures 3–6 it is possible to see that items with more citations as they are represented by a larger circle. The circle with a purple ring represents the journals with a betweenness centrality higher than 0.1, and the thicker the ring, the higher the centrality (Chen, 2010). Additionally, the circles with a red ring indicate a burst item (Chen, 2010). For example, the journal network (Figure 3) contains 589 nodes and 3,432 links. In Table 11, is possible to see the top 20 cited journals with the strongest citation burst from a total of 39 automatically generated bursts using CiteSpace.

Table 12 represents the top 10 journals by metric (frequency, burst, degree, centrality, and sigma). We can see that the journal of *Technology Forecasting and Social Change* was cited 237 times. Moreover, the *Journal of Cleaner Production* has the highest burst value, 5.68. The journal *Administrative Science Quarterly* has the biggest degree of centrality (102) and the higher betweenness centrality value (0.2). *Global Environment Change* has the highest sigma, 1.32.

Figure 4 represents a visualization of the author's co-citation network. This network contains 594 nodes and 3,558 links. In Figure 4 it is possible to see the authors with more citations as they are represented with a larger circle, the authors with higher betweenness centrality, and the ones that are considered burst items. Table 13 shows the top 20 cited authors with the strongest citation bursts and time of burst.

Figure 5. **Co-Occurring Author Keywords Network**



Source: authors.

Table 14 shows the top 10 authors from the author co-citation network per metric. From Table 14 we can see that René Rorhbeck was the most cited author, 146 times, Harry Igor Ansoff has the highest degree of centrality, 79, and Michael Porter has the highest betweenness centrality value, 0.15. Harry Igor Ansoff has the highest burst value, 7.26, and he also had the highest sigma value, 2.12.

Figure 5 represents a visualization of the co-occurring author keywords network. This network contains 312 nodes and 1,656 links. In Figure 5 it is possible to see the most used keywords as they are represented with a larger circle, the keywords with higher betweenness, centrality and, although more difficult, the ones that are considered burst items. Table 15 shows the top five keywords with the strongest citation burst and time of occurrence.

In Table 16 it is possible to see the top 10 keywords by metric. The keyword "Future" was the most used keyword, 88 times, "Management" had the highest degree of centrality and betweenness centrality, 81 and 0.19, respectively, and "Perception" had the highest burst value, 2.95, and "Impact" held the highest sigma value, 1.50.

Figure 6 represents a visualization of the document co-citation network. This network contains 663 nodes and 2,315 links. In Figure 6 it is possible to see the most cited references as they are represented with a larger circle and the ones that are considered burst items. Zero references had a betweenness centrality higher than 0.1 and therefore in the network, no purple ring can be identified. Table 17 shows the top 20 references with the strongest citation burst.

Table 18 shows the top 10 references per metric. From Table 18 we can see that the reference (Rohrbeck et al., 2015) was the most cited, 47 times, (Heger, Boman, 2015) had the highest degree of centrality, 37, and (Rohrbeck, Kum, 2018) had the greatest betweenness centrality, 0.07. Furthermore, (Rohrbeck et al., 2015) had the highest burst value, 13.82, and (Rohrbeck, Kum, 2018) had the highest sigma value, 1.90.

Table 9. **Number of Used Keywords (2001–2021)**

Rank	Keywords	Frequency [2001-2021]	Share of 3861 (%)	Acc. % of 3861
1	Strategic Foresight	165	4.27	4.27
2	Corporate Foresight	145	3.76	8.03
3	Innovation	95	2.46	10.49
4	Foresight	67	1.74	12.22
5	Future	67	1.74	13.96
6	Management	49	1.27	15.23
7	Technology	49	1.27	16.50
8	Scenarios	40	1.04	17.53
9	Performance	38	0.98	18.52
10	Futures	37	0.96	19.48
11	Decision Making	34	0.88	20.36
12	Impact	33	0.85	21.21
13	Uncertainty	30	0.78	21.99
14	Knowledge	27	0.70	22.69
15	Dynamic Capabilities	26	0.67	23.36
16	Strategy	25	0.65	24.01
17	Technology Foresight	23	0.60	24.61
18	Climate Change	22	0.57	25.17
19	Framework	22	0.57	25.74
20	Organizations	22	0.57	26.31

Source: authors.

Table 10. **Citations per Reference (2001–2021)**

Rank	Publications	Number of citations	Number of 5670	Acc. of 5670
1	(Liu et al., 2016)	198	3.49	3.49
2	(Rohrbeck, Gemünden, 2011)	155	2.73	6.23
3	(Durance, Godet, 2010)	124	2.19	8.41
4	(Naik et al., 2005)	122	2.15	10.56
5	(Asseng et al., 2019)	105	1.85	12.42
6	(Springmann et al., 2017)	98	1.73	14.14
7	(Rohrbeck, Schwarz, 2013)	91	1.60	15.75
8	(Rohrbeck et al., 2015)	90	1.59	17.34
9	(Vecchiato, Roveda, 2010)	90	1.59	18.92
10	(Habegger, 2010)	88	1.55	20.48

Source: authors.

Table 11. **Top 20 Cited Journals and Books with the Strongest Citation Bursts (2001–2021)**

Cited Journals (Books)	Strength	Begin	End	2001–2021
Social Psychology Network*	3.61	2004	2010	
Competing for the Future (Hamel, Prahalad, 1994)	3.18	2004	2011	
American Journal of Sociology	3.31	2006	2015	
The Art of the Long View (Schwartz, 1996)	4.45	2008	2012	
Competitive Advantage (Porter, 2008)	3.63	2010	2012	
Futures Research Methodology (Glenn, Gordon, 2009)	3.79	2012	2014	
Peripheral Vision (Day, Schoemaker, 2006)	3.39	2012	2015	
Handbook of Research Methodology (Mishra, Alok, 2017)	3.35	2013	2015	
Strategic Change	3.34	2015	2016	
PNAS	3.72	2016	2017	
Nature Journal	4.05	2016	2018	
Psychological Review	3.17	2016	2018	
Global Environmental Change	3.86	2016	2019	
Environment Research Letters	4.42	2016	2019	
European Journal of Agronomy	3.59	2016	2019	
Nature Climate Change	3.59	2016	2019	
Global Change Biology	3.31	2016	2019	
International Journal of Management Reviews	3.78	2018	2021	
Journal of Cleaner Production	5.68	2019	2021	
Journal of Applied Psychology	3.52	2019	2021	

* https://www.socialpsychology.org/, accessed 12.02.2022.
Source: authors.

As to the document co-citation clustering analysis, CiteSpace grouped the references into 82 clusters, which resulted in a mean modularity Q of 0.8214 and a mean silhouette value of 0.9157. CiteSpace only displays the largest connected component of the network by default, as a result, clusters that are not part of the biggest linked component will be invisible.[4] Therefore, from the 82 clusters, CiteSpace only displays nine clusters. In the following table, Table 19, it is possible to see the nine clusters' information and in Figure 7, the timeline view of the clusters and the respective interconnections between the references of each cluster.

Figure 6. **Document Co-Citation Network**

Source: authors.

To answer our research problem, using all the references with a burst value greater than zero, arranged by cluster, we focused our attention on the references that have a burst period covering 2021, as those that might indicate the current trends and hot topics surrounding corporate foresight (see Table 20) and, to have a better understanding of the references' characteristics, we also obtained the results of centrality and newness associated with the selected references.

As shown in Table 20, the references with a burst period covering 2021 belong to one of two clusters: cluster 0 (named "Open Foresight") and cluster 2 (named "Research Opportunities"). The name of the cluster is given by the LLR (log-likelihood ratio) algorithm.

Discussion

The descriptive analyses concerning publication frequency and citation frequency over the period 2001–2021 sought to acknowledge the evolution of CF research over the last two decades. Our results showed that there is visual parallelism between the two evolutionary lines (see Figures 1 and 2) from 2001 to 2017. We noticed that more than 85% of the total publications and more than 70% of the citations occurred after 2010, both reaching a peak in 2015, which means that interest in CF was higher after 2010. This might be related to the fact that in 2010 the world was still facing the effects of 2008 economic crisis and resulting periods of uncertainty. Furthermore, CF is a key instrument for battling uncertainty that has emerged as an important contributor in the face of accelerating change, high business environment unpredict-

[4] https://CiteSpace.podia.com/faq, accessed 09.09.2021.

Table 12. **Top 10 Journals per Bibliometrics (2001–2021)**

Rank	Journal (Book)	Value
	Frequency	
1	*Technological Forecasting & Social Change*	237
2	*Futures*	215
3	*Foresight*	155
4	*Technology Analysis and Strategic Management*	127
5	*Strategic Management Journal*	126
6	*Long Range Planning*	116
7	*Harvard Business Review*	114
8	*Academy of Management Review*	111
9	*Organization Science*	88
10	*Administrative Science Quarterly*	83
	Burst	
1	*Journal of Cleaner Production*	5.68
2	The Art of the Long View	4.45
3	*Environmental Research Letters*	4.42
4	*Nature*	4.05
5	*Global Environmental Change*	3.86
6	*Futures Research Methodology*	3.79
7	*International Journal of Management Reviews*	3.78
8	*PNAS*	3.72
9	Competitive Advantage	3.63
10	Social Psychology Network	3.61
	Degree	
1	*Administrative Science Quarterly*	102
2	*Academy of Management journal*	101
3	*Long Range Planning*	74
4	*Academy of Management Review*	74
5	*Strategic Management Journal*	65
6	*California Management Review*	65
7	*Journal of Management*	63
8	*Organization Science*	58
9	*Journal of Management Studies*	58
10	*Harvard Business Review*	55
	Centrality	
1	*Administrative Science Quarterly*	0.20
2	*Academy of Management journal*	0.17
3	*Harvard Business Review*	0.11
4	*Futures*	0.09
5	*Science*	0.09
6	The Art of Conjecture (De Jouvenel, 2012)	0.09
7	*Journal of Future Studies*	0.08
8	*California Management Review*	0.07
9	The Art of the Long View	0.07
10	*American Economic Review*	0.07
	Sigma	
1	The Art of the Long View	1.33
2	*Global Environment Change*	1.32
3	Handbook of Research Methodology	1.28
4	*PNAS*	1.11
5	Competing for the Future	1.07
6	*Strategic Change*	1.05
7	Futures Research Methodology	1.04
8	*Journal of Cleaner Production*	1.03
9	*Environmental Research Letters*	1.03
10	*International Journal of Management Reviews*	1.03

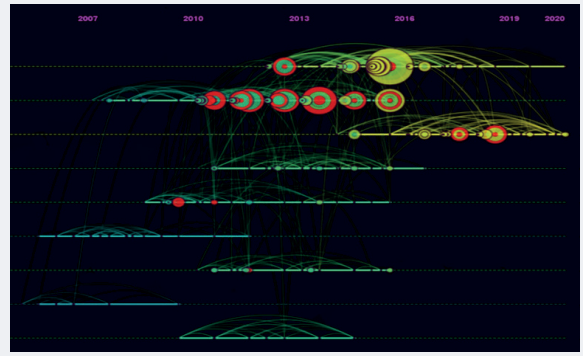
Source: authors.

Table 13. **Top 20 Cited Authors with the Strongest Citation Bursts (2001–2021)**

Cited Authors	Strength	Begin	End	2001–2021
Harry Igor Ansoff	7.26	2006	2012	
Peter Schwartz	4.27	2006	2012	
Liam Fahey	3.91	2006	2015	
Alan Porter	4.30	2010	2012	
Darrell Rigby	3.66	2012	2015	
Tobias Gnatz	3.55	2013	2015	
Effie Amanatidou	5.21	2014	2016	
Heiko von der Gracht	3.95	2014	2015	
Theodore Gordon	3.82	2014	2015	
Averil Horton	4.44	2016	2018	
Konstantin Vishnevskiy	3.91	2016	2019	
Frank Ruff	4.95	2017	2018	
Patrick van der Duin	4.59	2017	2021	
Angela Wilkinson	3.62	2017	2021	
Martin Rhisiart	3.94	2018	2021	
Siri Boe-Lillegraven	3.87	2018	2021	
Jakob Højland	3.61	2018	2021	
Regina Gattringer	3.61	2018	2021	
Jon Iden	6.25	2019	2021	
Tugrul Daim	3.70	2019	2021	

Source: authors.

Figure 7. **Clusters Timeline View**



Cluster 0 — Open Foresight
Cluster 1 — Rich Tradition
Cluster 2 — Research Opportunities
Cluster 3 — Accelerating Technological Change
Cluster 4 — Way Finding
Cluster 7 — Proposal
Cluster 8 — Assessing Delphi Panel Composition
Cluster 12 — Portfolio Approach
Cluster 13 — Conservation Opportunity

Source: authors.

Table 14. **Top 10 Authors by Bibliometrics (2001–2021)**

Rank	Author	Value
	Frequency	
1	René Rohrbeck	146
2	Ricciardo Vecchiato	96
3	Cornelia Daheim	63
4	Kathleen Eisenhardt	59
5	Frank Ruff	51
6	Tobias Heger	50
7	Michel Godet	49
8	Peter Schwartz	48
9	Kees van der Heijden	48
10	Andy Hines	48
	Burst	
1	Harry Igor Ansoff	7.26
2	Jon Iden	6.25
3	Effie Amanatidou	5.21
4	Frank Ruff	4.95
5	Patrick van der Duin	4.59
6	Averil Horton	4.44
7	Alan Porter	4.30
8	Peter Schwartz	4.27
9	Heiko von der Gracht	3.95
10	Martin Rhisiart	3.94
	Degree	
1	Harry Igor Ansoff	79
2	George Burt	63
3	Cornelia Daheim	62
4	Kathleen Eisenhardt	57
5	René Rohrbeck	55
6	Thomas Chermack	55
7	Gary Hamel	53
8	Joseph Coates	53
9	Paul Schoemaker	50
10	Tobias Heger	48
	Centrality	
1	Michael Porter	0.15
2	Harry Igor Ansoff	0.11
3	George Day	0.10
4	Gary Hamel	0.08
5	Richard Daft	0.07
6	Sohail Inayatullah	0.07
7	David Teece	0.07
8	George Burt	0.06
9	Kathleen Eisenhardt	0.06
10	Michel Godet	0.06
	Sigma	
1	Harry Igor Ansoff	2.12
2	Effie Amanatidou	1.22
3	Michel Godet	1.19
4	Heiko von der Gracht	1.11
5	Rafael Ramirez	1.09
6	Frank Ruff	1.08
7	Liam Fahey	1.08
8	Alper Alsan	1.08
9	Alan Porter	1.08
10	Averil Horton	1.07

Source: authors.

Table 15. **Top 5 Keywords with the Strongest Citation Bursts (2001–2021)**

Keywords	Strength	Begin	End	2001–2021
Perception	2.95	2006	2012	
Real Time	2.68	2013	2015	
Industry	2.27	2017	2018	
Open Innovation	2.57	2018	2019	
Impact	2.32	2019	2019	

Source: authors.

ability, and an unprecedented volume of information. Furthermore, we saw that, after 2017, both evolutionary lines (publication frequency and citation frequency) diverged until 2021: the publication frequency increased, suggesting that there was a rising interest in CF in that period, and the citation frequency declined, suggesting that the most cited articles are not the most recent publications. Overall, the increased number of publications and citations, over the past few decades, suggests that CF is evolving from a new knowledge frontier into a well-established one and that this is in line with findings by (Amini et al., 2021).

The results of descriptive analyses on the journals, authors, keywords, and documents showed that the 433 studies were published in 191 journals, which demonstrates some diversity and interest, and that, 50.5% of those studies were published only in 10 journals, which suggests that those 10 journals are more interested in corporate foresight literature (see Table 5). Moreover, the first two journals that published more articles related to CF, the *Technological Forecasting and Social Change* and *Futures* journals are also the two journals that received more citations probably because the names of the journals are associated with the relationship between CF and uncertainty motivated by the social and economic development due to the rapid technological changes and the rapid diffusion of innovations (Latzer, 2009) and also because CF is seen as a future-oriented strategy (Vecchiato, 2015). Furthermore, four of the top 10 most cited journals are natural sciences journals: *Nature Climate Change*, *Global Change Biology*, *Conservation Letters,* and *Global Food Security-Agriculture Policy Economics and Environment* (see Table 6). This might suggest an increasing interest in foresight studies by natural sciences practitioners. Additionally, finding general management journals in these top 10 most cited journals, such as *Technology Analysis & Strategic Management* and *Technology Innovation Management Review* and *Marketing Science* and *R&D Management*, might also suggest an increasing interest from the general strategic management school in CF.

Looking into the authors' descriptive analysis, we can see that more than 41% of the 433 publications (181 publications) were developed by 32 authors,

Table 16. **Top 10 Keywords by Metric (2001–2021)**

Rank	Keyword	Value
	Frequency	
1	Future	88
2	Corporate Foresight	86
3	Innovation	67
4	Strategic Foresight	56
5	Technology	47
6	Management	43
7	Impact	38
8	Performance	38
9	Knowledge	26
10	Uncertainty	24
	Burst	
1	Perception	2.95
2	Real Time	2.68
3	Open Innovation	2.57
4	Impact	2.32
5	Industry	2.27
6	Future	–
7	Corporate Foresight	–
8	Innovation	–
9	Strategic Foresight	–
10	Technology	–
	Degree	
1	Management	81
2	Innovation	72
3	Corporate Foresight	71
4	Performance	68
5	Future	65
6	Impact	62
7	Decision Making	62
8	Knowledge	58
9	Strategic Foresight	54
10	Framework	53
	Centrality	
1	Management	0.19
2	Impact	0.19
3	Performance	0.15
4	Innovation	0.13
5	Corporate Foresight	0.13
6	Future	0.13
7	Decision Making	0.10
8	Strategic Foresight	0.10
9	Framework	0.10
10	Uncertainty	0.10
	Sigma	
1	Impact	1.50
2	Industry	1.14
3	Perception	1.11
4	Real Time	1.02
5	Management	1.00
6	Performance	1.00
7	Innovation	1.00
8	Corporate Foresight	1.00
9	Future	1.00
10	Decision Making	1.00

Source: authors.

Table 17. **Top 20 References with the Strongest Citation Bursts (2001–2021)**

References	Strength	Begin	End	2001–2021
(Vecchiato, Roveda, 2010)	7.36	2012	2015	
(Rohrbeck, Gemunden, 2011)	10.57	2013	2016	
(Von der Gracht et al., 2010)	6.12	2013	2015	
(Bootz, 2010)	4.06	2013	2015	
(Rohrbeck, 2012)	7.42	2014	2017	
(Heger, Rohrbeck, 2012)	6.79	2014	2017	
(Vecchiato, 2012)	6.54	2014	2016	
(Rohrbeck, 2011)	5.92	2014	2016	
(Rohrbeck, Schwarz, 2013)	8.73	2015	2018	
(Battistella, 2014)	4.30	2015	2018	
(Vishnevskiy et al., 2015)	3.71	2016	2019	
(Ruff, 2015)	6.40	2017	2019	
(Van der Duin et al., 2014)	4.83	2017	2019	
(Rohrbeck et al., 2015)	13.82	2017	2021	
(Heger, Boman, 2015)	4.87	2017	2021	
(Boe-Lillegraven, Monterde, 2015)	4.29	2017	2021	
(Vecchiato, 2015)	3.76	2017	2021	
(Paliokaitė, Pačėsa, 2015)	3.71	2017	2021	
(Rohrbeck, Kum, 2018)	8.97	2019	2021	
(Iden et al., 2017)	6.20	2019	2021	

Source: authors.

which indicates that those authors are strongly interested in the proliferation of the CF approach. Authors such as René Rohrbeck, Dirk Meissner, Konstantin Vishnevskiy, Ricciardo Vecchiato, David Sarpong, and Melanie Wiener, among others, focus their efforts on research related to corporate foresight, strategic foresight, futures, scenarios, and open foresight and its impacts on management, innovation, and technology. Moreover, authors such as David Mason-d'Croz, Senthold Asseng, and others focus their efforts on future perspectives and scenarios research linked to agricultural and climate issues. Therefore, it might suggest, once again, the increased interest in foresight studies in the natural science area. The same applies to the most cited authors, who, besides René Rohrbeck, all have publications concerning climate change because most of them worked together on those publications.

Regarding the keywords' descriptive analysis, we can see that from the 1,813 distinct references used in all 433 documents, the top 40 keywords were used 33% of the time. As expected, the two most used keywords are "strategic foresight" and "corporate foresight". Moreover, when looking into the remaining keywords, we can see the connection between CF and innovation, technology, scenarios, performance,

Table 18. **Top 10 Reference by Bibliometrics (2001–2021)**

Rank	Publication	Value
	Frequency	
1	(Rohrbeck et al., 2015)	88
2	(Rohrbeck, Schwarz, 2013)	86
3	(Rohrbeck, Gemünden, 2011)	67
4	(Rohrbeck, 2012)	56
5	(Heger, Rohrbeck, 2012)	47
6	(Ruff, 2015)	43
7	(Vishnevskiy et al., 2015)	38
8	(Rohrbeck, Kum, 2018)	38
9	(Vecchiato, Roveda, 2010)	26
10	(Rohrbeck, 2011)	24
	Burst	
1	(Rohrbeck et al., 2015)	13.82
2	(Rohrbeck, Gemünden, 2011)	10.57
3	(Rohrbeck, Kum, 2018)	8.97
4	(Rohrbeck, 2012)	8.73
5	(Vecchiato, Roveda, 2010)	7.42
6	(Rohrbeck, 2011)	7.36
7	(Heger, Rohrbeck, 2012)	6.79
8	(Vecchiato, 2010)	6.54
9	(Ruff, 2015)	6.4
10	(Iden et al., 2017)	6.2
	Degree	
1	(Heger, Boman, 2015)	37
2	(Vecchiato, Roveda, 2010)	35
3	(Vecchiato, 2015)	31
4	(Andersen, Andersen, 2014)	31
5	(Rohrbeck, Kum, 2018)	30
6	(Battistella, De Toni, 2011)	30
7	(Rohrbeck, 2011)	27
8	(Van der Duin et al., 2014)	27
9	(Paliokaite, Pačesa, 2015)	26
10	(Heger, Rohrbeck, 2012)	25
	Centrality	
1	(Rohrbeck, Kum, 2018)	0.07
2	(Vecchiato, 2015)	0.06
3	(Georghiou et al., 2009)	0.06
4	(Habegger, 2010)	0.06
5	(Vecchiato, Roveda, 2010)	0.05
6	(Andersen, Andersen, 2014)	0.05
7	(Battistella, De Toni, 2011)	0.05
8	(Daheim, Uerz, 2008)	0.05
9	(Heger, Boman, 2015)	0.04
10	(Amanatidou et al., 2012)	0.04
	Sigma	
1	(Rohrbeck, Kum, 2018)	1.90
2	(Vecchiato, Roveda, 2010)	1.48
3	(Rohrbeck et al., 2015)	1.29
4	(Rohrbeck, Gemünden, 2011)	1.28
5	(Heger, Rohrbeck, 2012)	1.25
6	(Vecchiato, 2015)	1.24
7	(Vecchiato, 2010)	1.24
8	(Heger, Boman, 2015)	1.22
9	(Vecchiato, Roveda, 2010)	1.21
10	(Battistella, De Toni, 2011)	1.18

Source: authors.

Table 19. **Document Co-Citation Clustering Information**

Cluster ID	Cluster name LLR	Size	Silhouette	From – To
0	Open Foresight	72	0.905	2012–2020
1	Rich Tradition	64	0.861	2007–2015
2	Research Opportunities	61	0.934	2014–2020
3	Accelerating Technological Change	36	0.852	2010–2016
4	Way Finding	31	0.938	2008–2015
7	Proposal	28	0.957	2010–2015
8	Assessing Delphi Panel Composition	28	0.968	2005–2011
12	Portfolio Approach	15	0.988	2005–2009
13	Conservation Opportunity	13	0.999	2009–2014

Source: authors.

impact, decision making, uncertainty, and climate change.[5]

Lastly, concerning the documents' descriptive analysis we saw that five of the most cited papers were published in the journal with the highest number of publications and citations, *Technological Forecasting and Social Change*, which, once again, suggests the importance of this journal in the proliferation of CF knowledge. Correspondingly it is possible to draw parallels with innovation, scenarios, uncertainty, and technology that are most frequently met within the same journal.

Further, most of the researchers of the top 10 most cited documents are among the top 10 most productive and most cited authors, such as René Rohrbeck, Riccardo Vecchiato, Senthold Asseng, and Frank Ewert. Moreover, similarities to the previous descriptive analyses can be drawn, because three of the ten most cited articles are related to climate change issues (Liu et al., 2016; Springmann et al., 2017; Asseng et al., 2019).

To acknowledge the current research trends in CF literature, we conducted four bibliometric analyses on journals, authors, keywords, and documents, and one clustering analysis on the documents.

By conducting the journals' bibliometric analysis, we revealed the most relevant journals in CF literature. The bibliometric results show that the journals with the highest number of relationships, measured by the degree of centrality, and the ones that are closest to a center path between other nodes, measured by betweenness centrality, are those journals related to administrative and management science, namely *Admin-*

[5] Which, once again, might suggest the increasing interest by the natural sciences.

Table 20. **Cluster Recent Burst Composition**

ARTICLE			MEASURES						
Number of citations	Publication	Keywords	Burst			2001–2021	Degree of Centrality	Betweenness Centrality	Sigma of Newness
			Value	Start	End				
Cluster 0 — Open Foresight (number of publications = 72, silhouette = 0.905)									
47	(Rohrbeck et al., 2015)	Corporate Foresight, Strategic Foresight, Review, Historical Development	13.82	2017	2021		18.0	0.02	1.29
17	(Heger, Boman, 2015)	Strategic Foresight, Business Field Exploration, Innovation Management, Open Innovation	4.87	2017	2021		37.0	0.04	1.22
15	(Boe-Lillegraven, Monterde, 2015)	Corporate Foresight, Future Research, Strategic Planning, Innovation Management, Business Environment, Automotive Business	4.29	2017	2021		20.0	0.01	1.03
18	(Vecchiato, 2015)	Corporate Foresight, Networked Foresight, Innovation Networks, Collaboration for Innovation, Open Innovation, Dynamic Capabilities	3.76	2017	2021		31.0	0.06	1.24
13	(Paliokaite, Pačesa, 2015)	Organisational Foresight, Capabilities, Exploration, Exploitation, Organisational Ambidexterity	3.71	2017	2021		19.0	0.02	1.07
10	(Rhisiart et al., 2015)	Scenarios, Strategic Foresight, Learning	3.62	2018	2021		5.0	0.00	1.00
Cluster 2 — Research Opportunities (number of publications = 61, silhouette = 0.934)									
20	(Rohrbeck, Kum, 2018)	Corporate Foresight, Future Preparedness, Firm Performance, Behavioural Theory of the Firm	8.97	2019	2021		30.0	0.07	1.90
17	(Iden et al., 2017)	Strategic Foresight, Systematic Literature Review, Corporate Foresight, Technology Foresight	6.20	2019	2021		19.0	0.01	1.06
10	(Højland, Rohrbeck, 2018)	Corporate Foresight, Business Development, Cognitive Search, Experimental Search	3.62	2018	2021		12.0	0.01	1.05
9	(Gershman et al., 2016)	State-Owned Enterprises, Corporate Foresight, Technology Roadmaps, Innovation Strategies, Innovation Management	3.26	2018	2021		14.0	0.01	1.04

Source: authors.

istrative Science Quarterly, *Academy of Management Journal*, *Academy of Management Review,* and the *Harvard Business Review*. This might suggest the need for CF practitioners to justify the value of CF in comparison to the "planning school" (Battistella, De Toni, 2011). Also, by studying the burstness, we saw that the two highest burst values belong to journals related to environmental issues, the *Journal of Cleaner Production* and the *Environment Research Letters*.

Looking at Table 11, we saw that the *Journal of Cleaner Production* is a burst item, with a value of 5.68, that covers 2021, which might suggest the interest in applying foresight to production best practices to reduce environmental impacts and thus the parallelism with the descriptive analyses results. We also noticed that the *International Journal of Management Reviews* and the *Journal of Applied Psychology* are recent burst items, which might suggest the increasing interest of the general management and psychology fields in foresight. This can be explained by the relationship of CF to higher levels of innovations and performance (Rohrbeck, Kum, 2018) and its link to the role, behavior, and mental models of stakeholders (internal and external) in the path for value creation (Rohrbeck, 2012). This goes along with what was stated in the research (Rohrbeck et al., 2015), that there is some isolation of CF from general management journals and these two journals might be good solutions to break path dependency from the journals *Technological Forecasting and Social Change and Futures* that publish the most CF articles and are the most frequently cited journals. The higher burst value and recent burst period might suggest that the *Journal of Cleaner Production*, *International Journal of Management Reviews*, and *Journal of Applied Psychology* might be good journals to publish CF papers currently because they can bring more citations for a paper.

Building and analyzing the authors' bibliometric network exposed predominant authors in CF literature. Similarly to the journal centrality metrics, in both degree and betweenness, we saw that the top author is an author related to the "planning school", Harry Igor Ansoff, and, again, it might suggest the use of his work to justify the need for CF in the managerial world (Battistella, De Toni, 2011). The same applies to the burst value and sigma metrics, where the top author is Harry Igor Ansoff. This follows what is specified in the managerial world, that Ansoff is the prominent reference in strategic management (Martinet, 2010). The burst occurred between 2006-2012, which might

Table 21. **Key Findings from Cluster #0 and Cluster #2 Articles**

Article	Main findings
	Cluster 0 (Open Foresight)
(Rohrbeck et al., 2015)	• CF in networked organizations is an emerging issue. • A link exists between this article and the cluster since there is a connection between network organizations, collaborative exploration, and openness.
(Heger, Boman, 2015)	• Networked foresight creates value for companies and value is even higher for SMEs because MNEs focus more on their established foresight procedures. • Network partners predominantly see value creation from sensing activities. • The link between this article and the cluster is the aim to provide an understanding of value creation of foresight in networks.
(Boe-Lillegraven, Monterde 2015)	• A fundamental mechanism of a system like the radar is its probing of analytical thinking, as well as its means of connecting and exchanging perspectives across functions and departments. • Implications for future studies into the processes through which foresight delivers value, as well as for the practice of planning, executing, and encouraging involvement in technological foresight.
(Vecchiato, 2015)	• Acknowledgement is needed for a framework that is aware of the true value of CF and thereby the financial advantage that can be gained by incorporating CF in firms' operations. • Highlights the need to study first-mover advantages and strategies made by decision-makers as well as the conditions under which such views may be successful.
(Paliokaite, Pačesa, 2015)	• Environmental scanning, integrative and strategic selection capabilities foster radical innovations, and integrating capabilities foster incremental innovations. • Regular environmental scanning, visioning (road mapping and scorecard), R&D capacity and continuous organizational learning, strong leadership capabilities, and building future scenarios to acquire new information are key subjects for firms to invest in to increase their explorative innovation outcomes.
(Rhisiart et al., 2015)	• The learning value for individuals is domain-based (exploration and understanding of a given subject) and capacity building (know-how to use in the future). This enables collective mental models changes within the organization and enhances the sensing dynamic capabilities throughout the organization enhancing the reflection on the differences between predictive and probabilistic assumptions routinely inherent to strategists.
	Cluster 2 (Research Opportunities)
(Rohrbeck, Kum, 2018)	• Suggestion of a model for evaluating a firm's future preparedness by comparing the maturity of a firm´s CF practices and assessing the need for CF and thus validating that CF helps firms, the vigilant ones, to break path dependencies and attain higher perfor-mance and profitability. • Future prepared companies had 33% higher profitability and 200% higher market capitalization than average for the sample of studied firms.
(Iden et al., 2017)	• Increasing academic interest, but the strategic foresight field is disorganized and there is a lack of theoretical progress. • Exploratory research dominates the field. • Further explanatory research should be developed because it can also contribute to firms' success.
(Højland, Rohrbeck, 2018)	• Systematic CF methodologies are sporadically being used in the early stages, increasing the chance for opportunities to be undetected and therefore unexplored and unexploited. • Successful cases are inherent to numerous cycles of perceiving, prospecting, and prob-ing activities, implying that effective business growth, based on CF, is a non-linear process that relies on feedback loops and takes time.
(Gershman et al., 2016)	• In state-owned enterprises, there is a lack of long-term technology planning due to higher concerns with modernization, a focus on internal markets, commitment to public procurement, and the management structure.

Source: authors.

relate to the spike of CF literature in 2010. Harry Igor Ansoff is the only author with a sigma value (2.12) higher than 1.5 which is directly correlated to the influence of the author in the managerial world. CF is a new managerial subject that disrupted what the "planning school" believe regarding strategic management (see., e.g.: (Ansoff, 1988; Porter, 2008)) and the necessity to specify the limitations of their theories might suggest the appearance of Ansoff in all the metrics. Furthermore, the bibliometrics shows that Jon Iden has a burst value of 6.25 and it is a burst value that covers 2021 (see Table 13), which might suggest that some interest has been given to Jon Iden's work, for example, the systematic literature review on the nature of strategic foresight (Iden et al., 2017), because the number of citations has been increasing since 2019.

Building the keyword bibliometric network allowed us to understand research interest. From our results, we see that the keyword "management" has the highest centrality values. This might suggest that CF is a management approach that disrupts the general strategic management ("planning school") and it is a tool to fight the increasing difficulties in technology planning and innovation management as it induces companies to pursue novel innovation management mechanisms (Milshina, Vishnevskiy, 2018) as well as reassess the nature and processes of strategic decision making (Schweitzer et al., 2019).

From the results, we also noted the relationship of CF with "innovation", "impact", and "performance". This might be explained because CF is an approach that can increase future innovations and that positively impacts R&D procedures and that increases the firm performance, by anticipating environmental changes and, thus, increases value creation (Yoon et al., 2018; Hines, Gold, 2015; Rohrbeck, 2012; Rohrbeck, Gemünden, 2011; Von der Gracht et al., 2010; Adegbile et al., 2017). When looking into the burst values, we see that the most recent burst keywords

are "impact" and "open innovation". The relationship between "open innovation" and CF is based on the discussion of future strategies by involving and collaborating with internal and external stakeholders (Daheim, Uerz, 2008).

Conducting a document co-citation bibliometric analysis revealed the most important papers. Regarding the degree of centrality, the paper with more relationships with other nodes is (Heger, Boman, 2015), which studies the value of networked foresight (NF) and differentiates the benefits of NF for SMEs and multinational enterprises (MNEs). When looking into betweenness centrality, we saw that the paper with the highest betweenness centrality is (Rohrbeck, Kum, 2018), which talks about future preparedness and presents a model that analyzes future preparedness by measuring the need for CF. Regarding sigma, we saw that, once again, (Rohrbeck, Kum, 2018) has the highest value and this might suggest a higher level of novelty compared to the remaining articles. Concerning burstness, we saw that the top document that had the higher burst value (13.82) is (Rohrbeck et al., 2015), which has received more citations in the period between 2001–2021.

After that, to see connections between references, and thus highlight common topics among them, we performed a clustering analysis to the document co-citation network. From the cluster analysis, two clusters were identified as current topics, Cluster 0 and Cluster 2.

Cluster 0, labeled "Open Foresight", is the largest cluster with 72 references and has drawn interest from 2012 to 2020. "Open Foresight" refers to the most recent phase of corporate foresight as it answers to the previous challenges of CF, to the increasing complexity and dynamics of businesses, and it is based on companies shaping the future markets and contexts via a process of discussion and analysis, as mentioned by (Daheim, Uertz, 2008; Kononiuk et al., 2017; Wiener, 2018; Wiener, Boer, 2019) and others. We focused our attention on the references that are considered burst items that cover 2021. From the nine burst references, in the cluster, six of them cover 2021. The six references are summarized in Table 21.

Regarding Cluster 2, labeled "Research Opportunities", it is composed of 61 references, we focused our attention on the references that are considered a burst item that covers 2021. All four references that are considered burst items are also summarized in Table 21.

By looking into the current burst articles in Cluster 0, it is harder to draw a link to open foresight (OF) compared to CF. Nevertheless, these references might suggest that the topic of "Open Foresight" is active, since these articles can be used to justify open foresight studies. For example, it is possible to draw a parallel between network foresight, strategic agility, strong relationships with stakeholders and their involvement in the innovation process, and dynamic capabilities to open foresight. All these factors are inherent to the openness to and collaboration with other companies as studied by (Daheim, Uerz, 2008; Von der Gracht et al., 2010; Ehls et al., 2017; Kononiuk et al., 2017; Wiener, 2018; Wiener, Boer, 2019).

By looking into the current burst articles, in Cluster 2, it is possible to draw a link between the articles and the cluster labeled "Research Opportunities" since three of the four current burst articles — (Rohrbeck, Kum, 2018; Højland, Rohrbeck, 2018; Gershman et al., 2016) — are case studies and comprise exploratory research. Furthermore, the remaining article affiliation with the cluster, Iden et al. (2017) suggests that corporate foresight needs explanatory research to find answers to problems that were not studied in-depth.

To sum up, the descriptive analysis suggests that there is a tendency for the increase of future research on corporate foresight and that bibliometric analysis proposes in which journals researchers should publish their papers to obtain more citations, which authors to cite, which keywords to use, and which references to explore. This allows managers, researchers, and practitioners to gain in-depth knowledge of CF literature.

Conclusion

To our knowledge, this study was the first to study CF research, journals, authors, keywords, and documents with bibliometric analysis. The present research is based on the analysis of 433 studies published between 2001–2021 to computationally find the current trends and better understand the evolution of the field.

Our results suggest that CF research has attracted some attention in the past two decades since the publication and citation frequencies have increased. This fact is also confirmed when investigating the journals, authors, keywords, and references. Journals, such as the *Journal of Cleaner Production*, *Environmental Letters*, and *Global Environment Change* among others, from the general strategic management and natural sciences fields have started publishing foresight literature and this can be seen in both journal descriptive analysis and bibliometric analysis. The obtained results also show the influence of René Rohrbeck, Senthold Asseng, Riccardo Vecchiato, and others, with their pivotal articles in CF literature and proliferation. The results also validate the proximity relationship between CF and open innovation, industry, impacts, performance, decision-making, and uncertainty. Since those are keywords that stand out in the research by being highly used or by having high burst and sigma values. Based on centrality values, the results also suggest that CF is predominantly a management approach that disrupts the general strategic management ("planning school") and it is a tool to fight the rising difficulties in technology planning and innovation management.

The clustering analysis allowed us to understand that currently, we are in the stage, open foresight, as predicted by some authors. The combination of all the results also suggests that efforts should be given to study climate change issues while applying open foresight as a mitigation approach.

When combining both keyword bibliometric analysis (burst and sigma values) and clustering analysis, we can extrapolate the need for a continuous study of open foresight and its impact upon firm performance, as well the application of open foresight in one specific industry and the consideration of all stakeholders, internal and external, and the perceptions of this managerial approach.

Moreover, this study allowed us to acknowledge the potential of CF in both educational and practical matters. We understand the relevance of this approach for companies as a disruptive approach to the general strategic management methodology. However, we consider that efforts should be implemented to structure CF and all the subgenre topics, such as strategic foresight, organizational foresight, technological foresight, networked foresight, collaborative foresight, and open foresight. Furthermore, the results suggest that future studies should follow for an explanatory approach. This will allow one a better understanding of the field and its proliferation outside the academia.

References

Adegbile A., Sarpong D., Meissner D. (2017) Strategic foresight for innovation management: A review and research agenda. *International Journal of Innovation and Technology Management*, 14(4), 1750019. (2017). https://doi.org/10.1142/S0219877017500195

Amanatidou E., Butter M., Carabias V., Könnölä T., Leis M., Saritas O., Schaper-Rinkel P., van Rij V. (2012) On concepts and methods in horizon scanning: Lessons from initiating policy dialogues on emerging issues. *Science and Public Policy*, 39(2), 208–221. https://doi.org/10.1093/scipol/scs017

Amini H., Jabalameli M.S., Ramesht M.H. (2021) Development of regional foresight studies between 2000 and 2019: An overview and co-citation analysis. *European Journal of Futures Research*, 9(1), 1. https://doi.org/10.1186/s40309-021-00170-7

Andersen A.D., Andersen P.D. (2014) Innovation system foresight. *Technological Forecasting and Social Change*, 88, 276–286. https://doi.org/10.1016/j.techfore.2014.06.016

Ansoff H.I. (1988) *The New Corporate Strategy*, New York: Wiley.

Asseng S., Martre P., Maiorano A., Rötter R.P., O'Leary G.J., Fitzgerald G.J., Ewert, F. (2019) Climate change impact and adaptation for wheat protein. *Global Change Biology*, 25(1), 155–173. https://doi.org/10.1111/gcb.14481

Battistella C. (2014) The organisation of Corporate Foresight: A multiple case study in the telecommunication industry. *Technological Forecasting and Social Change*, 87, 60–79. https://doi.org/10.1016/j.techfore.2013.10.022

Battistella C., De Toni A.F. (2011) A methodology of technological foresight: A proposal and field study. *Technological Forecasting and Social Change*, 78(6), 1029–1048. https://doi.org/10.1016/j.techfore.2011.01.006

Bereznoy A. (2017) Corporate foresight in multinational business strategies. *Foresight and STI Governance*, 11(1), 9–22. https://doi.org/10.17323/2500-2597.2017.1.9.22

Boe-Lillegraven S., Monterde S. (2015) Exploring the cognitive value of technology foresight: The case of the Cisco Technology Radar. *Technological Forecasting and Social Change*, 101, 62–82. https://doi.org/10.1016/j.techfore.2014.07.014

Bootz J.P. (2010) Strategic foresight and organizational learning: A survey and critical analysis. *Technological Forecasting and Social Change*, 77(9), 1588–1594. https://doi.org/10.1016/j.techfore.2010.06.015

Chen C. (2005) *The centrality of pivotal points in the evolution of scientific networks*. Paper presented at the 10th International Conference on Intelligent User Interfaces - IUI '05, San Diego, CA, USA. DOI:10.1145/1040830.1040859

Chen C. (2006) CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *Journal of the American Society for Information Science and Technology*, 57(3), 359–377. https://doi.org/10.1002/asi.20317

Chen C. (2016) *CiteSpace: A Practical Guide for Mapping Scientific Literature*, Hauppauge, NY: Nova Science Publishers, Inc. ISBN: 978-1-53610-280-2

Chen C., Ibekwe-SanJuan F., Hou J. (2010) The structure and dynamics of cocitation clusters: A multiple-perspective cocitation analysis. *Journal of the American Society for Information Science and Technology*, 61(7), 1386–1409. https://doi.org/10.1002/asi.21309

Daheim C., Uerz G. (2008) Corporate foresight in Europe: From trend based logics to open foresight. *Technology Analysis and Strategic Management*, 20, 321–336. https://doi.org/10.1080/09537320802000047

Darkow I.L. (2015) The involvement of middle management in strategy development – Development and implementation of a foresight-based approach. *Technological Forecasting and Social Change*, 101, 10–24. https://doi.org/10.1016/j.techfore.2013.12.002

Day G.S., Schoemaker P.H.J. (2006) *Peripheral Vision: Detecting the Weak Signals That Will Make or Break Your Company*, Boston, MA: Harvard Business School Press. ISBN 9781422101544.

De Jouvenel B. (2012) *The Art of Conjecture*, New York: Routledge.

Donthu N., Kumar S., Mukherjee D., Pandey N., Lim W.M. (2021) How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research,* 133, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Durance P., Godet M. (2010) Scenario building: Uses and abuses. *Technological Forecasting and Social Change*, 77(9), 1488–1492. https://doi.org/10.1016/j.techfore.2010.06.007

Egghe L. (2006) Theory and practise of the g-index. *Scientometrics*, 69(1), 131–152. https://doi.org/10.1007/s11192-006-0144-7

Ehls D., Korreck S., Jahn R., Zeng M.A., Heuschneider S., Herstatt C., Koller H., Spaeth S. (2017) Open Foresight: Exploiting Information from External Sources. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2764208

Gaggero G., Bonassi A., Dellantonio S., Pastore L., Aryadoust V., Esposito G. (2020) A Scientometric Review of Alexithymia: Mapping Thematic and Disciplinary Shifts in Half a Century of Research. *Frontiers in Psychiatry*. https://doi.org/10.3389/fpsyt.2020.611489

Georghiou L., Harper J.C., Keenan M., Miles I., Popper R. (eds.) (2009) *The Handbook of Technology Foresight: Concepts and Practice*, Cheltenham: Edward Elgar Publishing Ltd. ISBN: 978 1 84844 810 0

Gershman M., Bredikhin S., Vishnevskiy K. (2016) The role of corporate foresight and technology roadmapping in companies' innovation development: The case of Russian state-owned enterprises. *Technological Forecasting and Social Change*, 110, 187–195. https://doi.org/10.1016/j.techfore.2015.11.018

Gibson E., Daim T., Garces E., Dabic M. (2018) Technology foresight: A bibliometric analysis to identify leading and emerging methods. *Foresight and STI Governance*, 12(1), 6–24. https://doi.org/10.17323/2500-2597.2018.1.6.24

Glenn J.C., Gordon T.J. (eds.) (2009) *Futures Research Methodology — Version 3.0* (CD-ROM and online edition), Tokyo: United Nations University. https://www.millennium-project.org/publications-2/futures-research-methodology-version-3-0/, accessed 15.11.2021.

Gordon A.V., Ramic M., Rohrbeck R., Spaniol M.J. (2020) 50 Years of corporate and organizational foresight: Looking back and going forward. *Technological Forecasting and Social Change*, 154, 119966. https://doi.org/10.1016/j.techfore.2020.119966

Habegger B. (2010) Strategic foresight in public policy: Reviewing the experiences of the UK, Singapore, and the Netherlands. *Futures*, 42(1), 49–58. https://doi.org/10.1016/j.futures.2009.08.002

Hamel G., Prahalad C.K. (1994) *Competing for the Future*, Cambridge, MA: Harvard Business School Press. ISBN 9780875847160.

Han J., Kang H.J., Kim M., Kwon G.H. (2020) Mapping the intellectual structure of research on surgery with mixed reality: Bibliometric network analysis (2000–2019). *Journal of Biomedical Informatics*, 109, 103516. https://doi.org/10.1016/j.jbi.2020.103516

Heger T., Boman M. (2015) Networked foresight – The case of EIT ICT Labs. *Technological Forecasting and Social Change*, 101, 147–164. https://doi.org/10.1016/j.techfore.2014.02.002

Heger T., Rohrbeck R. (2012) Strategic foresight for collaborative exploration of new business fields. *Technological Forecasting and Social Change,* 79(5), 819–831. https://doi.org/10.1016/j.techfore.2011.11.003

Hines A., Gold J. (2015) An organizational futurist role for integrating foresight into corporations. *Technological Forecasting and Social Change*, 101, 99–111. https://doi.org/10.1016/j.techfore.2014.04.003

Højland J., Rohrbeck R. (2018) The role of corporate foresight in exploring new markets – Evidence from 3 case studies in the BOP markets. *Technology Analysis and Strategic Management*, 30(6), 734–746. https://doi.org/10.1080/09537325.2017.1337887

Iden J., Methlie L.B., Christensen G.E. (2017) The nature of strategic foresight research: A systematic literature review. *Technological Forecasting and Social Change*, 116, 87–97. https://doi.org/10.1016/j.techfore.2016.11.002

Kononiuk A., Sacio-Szymańska A. (2015) Assessing the maturity level of foresight in Polish companies — A regional perspective. *European Journal of Futures Research*, 3(1), 23. https://doi.org/10.1007/s40309-015-0082-9

Kononiuk A., Sacio-Szymańska A., Gáspár J. (2017) How do companies envisage the future? Functional foresight approaches. *Engineering Management in Production and Services*, 9(4), 21–33. https://doi.org/10.1515/emj-2017-0028

Latzer M. (2009) Information and communication technology innovations: Radical and disruptive?, *New Media and Society*, 11(4), 599–619. https://doi.org/10.1177/1461444809102964

Liu B., Asseng S., Müller C., Ewert F., Elliott J., Lobell D. B., … Zhu Y. (2016). Similar estimates of temperature impacts on global wheat yield by three independent methods. *Nature Climate Change*, 6(12), 1130–1136. https://doi.org/10.1038/nclimate3115

Martinet A.C. (2010) Strategic planning, strategic management, strategic foresight: The seminal work of H. Igor Ansoff. *Technological Forecasting and Social Change*, 77(9), 1485–1487. https://doi.org/10.1016/j.techfore.2010.06.024

Milshina Y., Vishnevskiy K. (2018) Potentials of collaborative foresight for SMEs. *Technology Analysis and Strategic Management*, 30(6), 701–717. https://doi.org/10.1080/09537325.2017.1406906

Mishra S.B., Alok S. (2017) *Handbook of Research Methodology: A Compendium for Scholars & Researchers*, Schaumburg, IL: eBooks2go Incorporated. ISBN 9781545703403

Muhlroth C., Grottke M. (2020) Artificial Intelligence in Innovation: How to Spot Emerging Trends and Technologies. *IEEE Transactions on Engineering Management,* 69(2), 493–510. https://doi.org/10.1109/TEM.2020.2989214

Naik P.A., Raman K., Winer R.S. (2005) Planning marketing-mix strategies in the presence of interaction effects. *Marketing Science*, 24(1), 25–34. https://doi.org/10.1287/mksc.1040.0083

Paliokaite A., Pačesa N. (2015) The relationship between organisational foresight and organisational ambidexterity. *Technological Forecasting and Social Change*, 101, 165–181. https://doi.org/10.1016/j.techfore.2014.03.004

Porter M.E. (2008) *Competitive Advantage. Creating and Sustaining Superior Performance*, New York: Free Press. ISBN: 9780684841465.

Ratcliffe J.S. (2006) Challenges for corporate foresight: Towards strategic prospective through scenario thinking. *Foresight*, 8(1), 39–54. https://doi.org/10.1108/14636680610647138

Rhisiart M., Miller R., Brooks S. (2015) Learning to use the future: Developing foresight capabilities through scenario processes. *Technological Forecasting and Social Change*, 101, 124–133. https://doi.org/10.1016/j.techfore.2014.10.015

Rohrbeck R. (2011) Corporate Foresight: Towards a Maturity Model for the Future Orientation of a Firm (1st ed.), Heidelberg: Physica-Verlarg. https://doi.org/10.1007/978-3-7908-2626-5

Rohrbeck R. (2012) Exploring value creation from corporate-foresight activities. *Futures*, 44(5), 440–452. https://doi.org/10.1016/j.futures.2012.03.006

Rohrbeck R., Battistella C., Huizingh E. (2015) Corporate foresight: An emerging field with a rich tradition. *Technological Forecasting and Social Change*, 101, 1–9. https://doi.org/10.1016/j.techfore.2015.11.002

Rohrbeck R., Gemünden H.G. (2009) *Making your R&D future proof: The roles of corporate foresight in innovation management*. Paper presented at the PICMET'09 Conference, 2-6 August 2009, Portland, OR, USA. https://doi.org/10.1109/PICMET.2009.5262043

Rohrbeck R., Gemünden H.G. (2011) Corporate foresight: Its three roles in enhancing the innovation capacity of a firm. *Technological Forecasting and Social Change*, 78(2), 231–243. https://doi.org/10.1016/j.techfore.2010.06.019

Rohrbeck R., Kum M.E. (2018) Corporate foresight and its impact on firm performance: A longitudinal analysis. *Technological Forecasting and Social Change*, 129, 105–116. https://doi.org/10.1016/j.techfore.2017.12.013
Rohrbeck R., Schwarz J.O. (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. https://doi.org/10.1016/j.techfore.2013.01.004
Rotjanakorn A., Sadangharn P., Na-Nan K. (2020) Development of dynamic capabilities for automotive industry performance under disruptive innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 6(4), 1–19. https://doi.org/10.3390/joitmc6040097
Rousseeuw P.J. (1987). Silhouettes: A graphical aid to the interpretation and validation of cluster analysis. *Journal of Computational and Applied Mathematics*, 20(C), 53–65. https://doi.org/10.1016/0377-0427(87)90125-7
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, 37–48. https://doi.org/10.1016/j.techfore.2014.07.013
Scheiner C.W., Baccarella C.V., Bessant J., Voigt K.I. (2015) Thinking patterns and gut feeling in technology identification and evaluation. *Technological Forecasting and Social Change*, 101, 112–123. https://doi.org/10.1016/j.techfore.2013.12.003
Schwartz P. (1996) *The art of the long view*: *planning for the future in an uncertain world*, New York: Doubleday. ISBN 0-385-26732-0.
Schweitzer N., Hofmann R., Meinheit A. (2019) Strategic customer foresight: From research to strategic decision-making using the example of highly automated vehicles. *Technological Forecasting and Social Change*, 144, 49–65. https://doi.org/10.1016/j.techfore.2019.04.004
Springmann M., Mason-D'Croz D., Robinson S., Wiebe K., Godfray H.C.J., Rayner M., Scarborough P. (2017) Mitigation potential and global health impacts from emissions pricing of food commodities. *Nature Climate Change*, 7(1), 69–74. https://doi.org/10.1038/nclimate3155
Teece D.J. (2007) Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. https://doi.org/10.1002/smj.640
Van der Duin P., Heger T., Schlesinger M.D. (2014) Toward networked foresight? Exploring the use of futures research in innovation networks. *Futures,* 59, 62–78. https://doi.org/10.1016/j.futures.2014.01.008
Vecchiato R. (2012) Environmental uncertainty, foresight and strategic decision making: An integrated study. *Technological Forecasting and Social Change*, 79(3), 436–447. https://doi.org/10.1016/j.techfore.2011.07.010
Vecchiato R. (2015) Creating value through foresight: First mover advantages and strategic agility. *Technological Forecasting and Social Change*, 101, 25–36. https://doi.org/10.1016/j.techfore.2014.08.016
Vecchiato R., Favato G., Maddaloni F., Do H. (2020) Foresight, cognition, and long-term performance: Insights from the automotive industry and opportunities for future research. *Futures & Foresight Science*, 2(1), e25. https://doi.org/10.1002/ffo2.25
Vecchiato R., Roveda C. (2010) Strategic foresight in corporate organizations: Handling the effect and response uncertainty of technology and social drivers of change. *Technological Forecasting and Social Change*, 77(9), 1527–1539. https://doi.org/10.1016/j.techfore.2009.12.003
Vishnevskiy K., Karasev O., Meissner D. (2015) Integrated roadmaps and corporate foresight as tools of innovation management: The case of Russian companies. *Technological Forecasting and Social Change*, 90(PB), 433–443. https://doi.org/10.1016/j.techfore.2014.04.011
Von der Gracht H.A., Vennemann C.R., Darkow I.L. (2010) Corporate foresight and innovation management: A portfolio-approach in evaluating organizational development. *Futures*, 42(4), 380–393. https://doi.org/10.1016/j.futures.2009.11.023
Wiener M. (2018) Open foresight: The influence of organizational context. *Creativity and Innovation Management*, 27(1), 56–68. https://doi.org/10.1111/caim.12238
Wiener M., Boer H. (2019) Cultural prerequisites for participating in open foresight. *R&D Management,* 49(5), 703–715. https://doi.org/10.1111/radm.12363
Wiener M., Gattringer R., Strehl F. (2020) Collaborative open foresight – A new approach for inspiring discontinuous and sustainability-oriented innovations. *Technological Forecasting and Social Change*, 155, 119370. https://doi.org/10.1016/j.techfore.2018.07.008
Yoon J., Kim Y., Vonortas N.S., Han S.W. (2018) Corporate foresight and innovation: The effects of integrative capabilities and organisational learning. *Technology Analysis and Strategic Management*, 30(6), 633–645. https://doi.org/10.1080/09537325.2017.1395407
Zhai Z., Shan M., Darko A., Chan A.P.C. (2021) Corruption in construction projects: Bibliometric analysis of global research. *Sustainability*, 13(8), 4400. https://doi.org/10.3390/su13084400
Zhang Q., Rong G., Meng Q., Yu M., Xie Q., Fang J. (2020) Outlining the keyword co-occurrence trends in Shuanghuanglian injection research: A bibliometric study using CiteSpace III. *Journal of Traditional Chinese Medical Sciences*, 7(2), 189–198. https://doi.org/10.1016/j.jtcms.2020.05.006