

# A bibliometric review of scientific theory in futures and foresight: A commentary on Fergnani and Chermack 2021

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## 1 | INTRODUCTION

We very much welcome the publication of Fergnani and Chermack (2021) as it makes an important contribution to the development of the foresight discipline. The important role of scientific theories in social science and across all disciplines has been reflected for decades (see, e.g., Parsons, 1938). With scientific theories, researchers can link the abstract world (the world of concepts/ideas) and the concrete world (the empirical/observable world) (Chibucos et al., 2005). It is, therefore, more than appropriate to question along with Fergnani and Chermack (2021, p. 1) and colleagues, "why the field of futures and foresight has not been successful at becoming part of the social scientific establishment"? The lack of a theoretical grounding in futures and foresight studies (FFS) has been mentioned and critically discussed by several authors (Hideg, 2007; Marien, 2010; Mermet et al., 2009; Öner, 2010; Piirainen & Gonzalez, 2015). With their recent conceptual analysis, Fergnani and Chermack (2021) build upon their observation and derive argumentative explanations as well as propose recommendations for further evolution in the scientific domain. They underline that "weak theoretical foundations prevent the field from becoming a recognized academic discipline of study in the academic establishment" (Fergnani & Chermack, 2021, p. 1). We have made similar observations in our own studies of the foresight field. However, despite some bibliometric analyses of the futures research domain in general (see, e.g., Fergnani, 2019) and various focused analyses of selected techniques (see, e.g., Flostrand et al., 2020), no such examination of *scientific theory* in FFS exists. Our commentary supports the underlying observations by Fergnani and Chermack (2021) by adopting a brief

bibliometric lens on 50 years of cumulative scholarship (1973–January 2021) in 22 selected journals. These 22 journals include a total of 47,049 articles that were scanned. Based on our search criteria, we found 151 article matches (only 0.32 percent), of which a subset of 28 articles applied *scientific theories* from different disciplines.

## 2 | METHODOLOGICAL APPROACH

We chose the approach of bibliometric analysis, including bibliographic coupling, to measure and illustrate the resistance to scientific theory in futures and foresight. This method can be used to reconstruct the structural landscape of an academic field, which is why this approach is most appropriate for mapping research streams (Zupic & Čater, 2015). Bibliometric analysis includes the investigation of a body of literature regarding quantitative indicators such as citations, thematic associations, authorships, and geographical and institutional patterns (Ellegaard & Wallin, 2015).

A total of 151 publications were identified and subsequently analyzed with the VosViewer software (van Eck et al., 2010). We selected the articles for our review using two categories of keywords: (*futures studies* OR *foresight* OR *judgemental forecasting* OR *judgmental forecasting* OR *futurology* OR *futurism* OR *anticipation* OR *scenario* OR *scenarios* OR *futures field*) AND (*theory* OR *theorizing* OR *theorising* OR *theoretical underpinnings*). For our search, we chose Scopus as the scientific database since it provides a very comprehensive coverage compared to other databases (content coverage: over 77.8 million records, over 25,100 active titles, more than 5,000 publishers)

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and covers minor research areas with more detail (Martin-Martín et al., 2018). Besides, the search was limited to a handful of relevant academic journals devoted in whole or in part to FFS (in alphabetical order; including the number of listed articles in Scopus):

(1) *Academy of Management Journal* (1,877 articles), (2) *British Journal of Management* (1,247 articles), (3) *California Management Review* (1,822 articles), (4) *European Journal of Futures Research* (153 articles), (5) *Foresight* (931 articles), (6) *Futures* (4,020 articles), (7) *Harvard Business Review* (4,390 articles), (8) *IEEE Transactions on Engineering Management* (2,246 articles), (9) *International Journal of Forecasting* (2,287 articles), (10) *International Journal of Foresight and Innovation Policy* (258 articles), (11) *Journal of Forecasting* (1,613 articles), (12) *Journal of Futures Studies* (663 articles), (13) *Journal of Management* (2,230 articles), (14) *Long Range Planning* (3,062 articles), (15) *Omega* (3,284 articles), (16) *R&D Management* (834 articles), (17) *Research Policy* (3,537 articles), (18) *Strategic Management Journal* (2,958 articles), (19) *Strategy and Leadership* (641 articles), (20) *Technological Forecasting and Social Change* (5,404 articles), (21) *Technology Analysis and Strategic Management* (1,442 articles), and (22) *Technovation* (2,150 articles).

The limitation of the journals is based on the approaches and insights of various studies in the field of FFS (see, e.g., Fergnani, 2019, Park et al., 2020, or Tiberius et al., 2020).

### 3 | BIBLIOMETRIC ANALYSIS

#### 3.1 | Descriptive results

Figure 1 depicts the development of the number of publications from 1973 to January 2021 by time. While before 2006 many years produced fewer than five publications, with several intermediate

peaks, an apparent increase can be seen after the year 2007. The previous peak was in 2015 with 21 publications, respectively.

As part of our analysis, we divided the publications into two categories based on their primary contribution: (1) methodological and (2) application. The same categorization already revealed valuable results in the analyses of Flostrand et al. (2020). Publications in the category “Methodological” are mainly dealing with the phenomenon of theorization in the field of FFS, with the development of techniques, as well as general or specific methodological aspects. Publications of the category “Application” are using methods of FFS and include a scientific theory. Table 1 describes exemplary patterns used to classify the publications.

The classification was based on the titles and abstracts, and revealed that 123 articles (81.5 percent) deal with theorizing in the field of FFS (category “Methodological”). This contrasts with 28 publications (18.5%) that use, develop, or elaborate theories through the application of methods (category “Application”). In Figure 1, the development over time of the number of publications per category is also shown. As can be seen, application papers have been published more recently, starting with the first publication in 2007. However, application papers are always in the minority and never numerically exceed the publications of the category “Methodological.” We have to keep in mind that the analysis is limited to a selection of journals mainly from the FFS domain not considering technical journals, for example, from sociology, marketing, psychology, sustainability, or organizational science.

We further analyzed the 28 application papers to determine which scientific theory was used. Although low in absolute numbers, we found a wide variety of theories used, with *social theory* (used four times), *complexity theory*, and *resource-based theory* (both used twice) among the most common theories. Other theories include

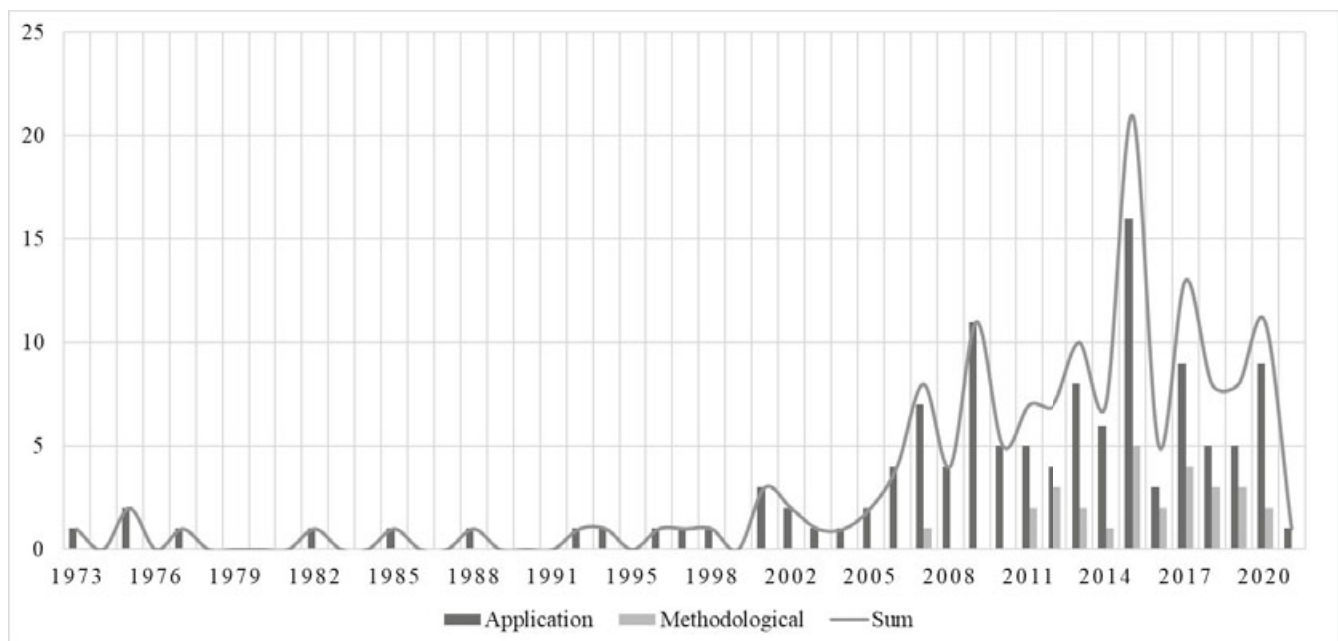


FIGURE 1 Distribution of publications by year and category (1973 to January 2021)

**TABLE 1** Exemplary patterns for the classification of publications

Classification	Exemplary patterns
Methodological	Ramirez et al. (2015): Analyzing the scenario methodology and validating its use as a scientific research methodology; Erik Karlsen et al. (2010): Examining the building of future theories by assessing the inherent ontological and epistemological premises in foresight studies; Piiirainen and Gonzalez (2015): Investigating foresight through the lens of the established literature on theorizing to determine what constitutes a theory and how it applies to foresight; Chermack (2007): Outlining a relationship between scenario construction and theory building, assuming that scenario construction can be a form of theory building
Application	MacKay and Tambeau (2013): Using <i>structuration theory</i> to construct three exploratory scenarios for the future of the public health system in Ontario, Canada; Roßmann et al. (2018): Grounding a multi-method approach in <i>organizational information processing theory</i> ; Burt (2007): Integrating the <i>theory of disruption</i> with scenario methodology using the UK energy industry as an example; Sarpong (2011): Drawing on <i>social theory</i> to show scenario thinking as an everyday practice

**TABLE 2** The top authors (by total publications) with the number of publications  $\geq 3$ 

Rank by total publications	Author	Institution	Country	Total publications	TC	Rank by TC
1	Wright, G.	University of Strathclyde	United Kingdom	7	212	1
2	Sarpong, D.	Brunel University London	United Kingdom	6	84	7
3	Burt, G.	University of Stirling	United Kingdom	5	156	3
3	Pyper, N.	Coventry University	United Kingdom	5	22	13
5	Chermack, T.J.	Colorado State University	United States	4	199	2
5	Fuller, T.	University of Lincoln	United Kingdom	4	139	4
5	Ramirez, R.	University of Oxford	United Kingdom	4	101	6
5	Spaniol, M.J.	Aarhus University	Denmark	4	42	11
5	Tapinos, E.	University of Strathclyde	United Kingdom	4	56	9
10	Aligica, P.D.	George Mason University	United States	3	54	10
10	Bradfield, R.	University of Strathclyde	United Kingdom	3	116	5
10	Cairns, G.	RMIT University	Australia	3	116	5
10	MacKay, R.B.	University of St Andrews	United Kingdom	3	65	8
10	Rowland, N.J.	The Pennsylvania State University	United States	3	34	12

*theory of disruptive innovation, actor-network theory, theory of competitive advantage, information processing theory, institutional theory, or organizational information processing theory.*

Our analysis of the dominant journals shows a strong focus on a few of them. The most productive journal in terms of our search framework is *Futures*, which accounts for 49 articles (32.5%) matching our criteria. It is followed by *Technological Forecasting and Social Change* with 45 articles (29.8%), *Foresight* with 28 articles (18.5%), *Journal of Futures Studies* with 11 articles (7.3%), and *European Journal of Futures Research* with 5 articles (3.3%). These five journals together account for 91.4% of all matching articles. The other 13 publications are heterogeneously distributed among eight different

journals: *International Journal of Foresight and Innovation Policy* (3 articles), *Omega* (3 articles), *Long Range Planning* (2 articles), *Technology Analysis and Strategic Management* (2 articles), *IEEE Transaction on Engineering Management* (1 article), *International Journal of Forecasting* (1 article), and *Journal of Forecasting* (1 article). It is noticeable that ten journals have no publications under the search terms and combinations (*Academy of Management Journal*, *British Journal of Management*, *California Management Review*, *Harvard Business Review*, *Journal of Management*, *Strategic Management Journal*, *R&D Management*, *Research Policy*, *Strategy and Leadership*, and *Technovation*).

The authors with the most published articles (more than three publications in the data sample) are shown in Table 2.

According to our analysis categories, George Wright is the most productive author and has published seven articles in our search domain so far. David Sarpong is the second most productive researcher with six publications, followed by George Burt with five research studies. Obviously, the group of most-productive authors often also appears as co-authors (see, e.g., additional theory-related articles: Cairns et al., 2016; Wright et al., 2013; Wright et al., 2017; Wright et al., 2020). In addition, Table 3 shows the number of total citations (TC) of an author. With 212 TC, this list is headed by George Wright, followed by Thomas J. Chermack with 199 TC, George Burt with 156 TC, and Ted Fuller with 139 TC. In fifth place are Ronald Bradfield (116 TC) and George Cairns (116 TC).

Furthermore, we examined which academic institution is among the most productive. With 17 publications, the University of Strathclyde takes first place, which is not surprising since two of the most productive authors (see Table 3) originate from this university. In second and third place come the University of the West of England (11 publications) and the University of Oxford (10 publications).

We further took a look at the most influential papers, identified by average citations per year (CPY). Citation counts are widely considered to be a key measure of intellectual impact, so analyzing them can reveal the presence of any underlying patterns in the

theoretical structure of a stream of literature. The average yearly citation was used because it ensures that older publications are not favored over younger ones. We performed an analysis of citations by charting the number of citations of the articles in our data sample listed in the Scopus database. Table 3 shows the top ten most-cited publications by CPY. Concluding from the yearly distribution of publications, this list reflects in particular studies after the year 2006. However, one paper published before the upswing is also included. Eight of the ten publications are classified as “Methodological” while two papers fall into the category “Application” of scientific theory to FFS. Table 3 also lists the total citations (TC) of the publications as well as the rank of the publications by TC. We found that seven of the top ten publications ranked by CPY are also among the top ten publications ranked by TC. These publications have been highlighted in bold in the column “Rank (by TC)” in Table 3. The list of the top ten publications by TC additionally includes the paper of Rowe and Wright (1996) (ranked #4 by TC), the article by Burt (2007) (ranked #9 by TC), and the paper of Bowman et al. (2013) (ranked #10 by TC).

Table 4 analyzes the top ten publications identified by TC and CPY in more detail with regard to their connection to Fergani and Chermack (2021). The table first lists the objective of the papers and then indicates to which of the identified nine reasons the article can be assigned.

TABLE 3 The top ten most-cited articles (by CPY)

Rank (by CPY)	CPY	Terminology <sup>a</sup>	Category <sup>b</sup>	Author(s)	Journal	TC	Rank (by TC)
1	18	Scenarios (a); theory (a, k)	Application	Roßmann et al. (2018)	Technological Forecasting and Social Change	54	<b>7</b>
2	12.5	Scenarios (t, a, k); scenario (k); theory (a)	Methodological	Ramirez et al. (2015)	Futures	75	<b>2</b>
3	8.25	Scenario (t, a, k); theory (a)	Methodological	Meissner and Wulf (2013)	Technological Forecasting and Social Change	66	<b>6</b>
4	8	Foresight (t, a, k); theory (a)	Methodological	Gordon et al. (2020)	Technological Forecasting and Social Change	8	85
5	7.13	Scenario (t, a, k); theory (t, a, k)	Methodological	Chermack (2005)	Technological Forecasting and Social Change	114	<b>1</b>
6	6.71	Foresight (t, a, k); theory (a); theoretical underpinnings (a, k)	Methodological	Andersen and Andersen (2014)	Technological Forecasting and Social Change	47	<b>9</b>
7	6.50	Foresight (t, a, k); theory (t)	Methodological	Bootz et al. (2019)	Technological Forecasting and Social Change	13	63
8	6.25	Foresight (t, a); Futures studies (a); theory (a)	Methodological	Fuller and Loogma (2009)	Futures	75	<b>2</b>
9	6.00	Scenarios (t); theory (t)	Methodological	Wilkinson (2009)	Journal of Futures Studies	72	<b>5</b>
9	6.00	Foresight (t, a, k); theory (k)	Application	Piirainen et al. (2017)	Technological Forecasting and Social Change	24	32

Bold indicates top ten publications ranked by CPY.

<sup>a</sup>Indicates which term from the applied search query was used in the title (t), abstract (a), or keywords (k).

<sup>b</sup>Differentiation between Methodological and Application.

**TABLE 4** Linking the most-cited articles (by TC and CPY) to Fergnani and Chermack (2021)

Author(s)	Objective	Link <sup>a</sup>
Chermack (2005)	The paper addresses the gap regarding research and theory development of scenario planning by constructing a theory of scenario planning and making research suggestions.	#8
Ramirez et al. (2015)	The paper concludes that scenarios need to evolve from a research subject of scholars to a research methodology now used by scholars to produce theory-building research.	#7
Fuller and Loogma (2009)	The paper concludes that foresight is both a social construction and a mechanism for social construction.	#6
Rowe and Wright (1996)	The authors contribute to the methodological improvement of structured information exchange in nominal groups by addressing the rationale underlying such techniques and pointing out shortcomings in the research on the validity of the techniques themselves.	#8
Wilkinson (2009)	The author analyzes scenario practices and concludes that they are under-researched and under-theorized.	#1
Meissner and Wulf (2013)	The paper investigates the cognitive benefits of scenario planning by drawing on behavioral decision theory.	#5
Roßmann et al. (2018)	The theory-based publication conducts a Delphi survey based on the organizational information processing theory.	#2
Burt (2007)	The author develops a framework for describing disruption and/or discontinuity using Christensen's theory within the scenario methodology.	#2
Andersen and Andersen (2014)	The publication contributed to theory building in the field of foresight with regard to the development of a systemic approach that focuses on innovation dynamics.	#2
Bowman et al. (2013)	The paper analyzes the theoretical basis for scenario planning processes from the perspective of storytelling theory using an "inductive" method and a "deductive" method to determine why some scenario methods succeed and others fail.	#3
Gordon et al. (2020)	The paper identifies three future research streams for further developing the research field of corporate and organizational foresight through a review.	#8
Bootz et al. (2019)	The authors analyze foresight and knowledge management and find similar results to Fergnani and Chermack (2021), that is, the field is approaching a level of maturity that requires ongoing theoretical investigative efforts to position the field from a methodological perspective.	#1
Piirainen et al. (2017)	The paper follows the call to use theory in foresight by applying the theory to the dynamics of smart specialization in the context of an empirical study.	#2

<sup>a</sup>Indicates to which of the nine reasons, identified by Fergnani and Chermack (2021), the content of the article is concerned: 1 = Different use of the term "theory," 2 = Lack of training in theory building and theory testing, 3 = Misunderstanding of what scientific assessment is, 5 = Disinterest in doing science, 6 = Misplaced conscious/subconscious social constructionist worldviews, 7 = Misplaced conscious/subconscious post normal worldviews, 8 = Enjoyment of being outliers.

### 3.2 | Bibliographic coupling

To illustrate the co-citation relationship of authors, Figure 2 depicts the bibliographic coupling of authors. The authors are represented by filled circles and the co-citation between a pair of researchers is represented by an edge. The dimension of a circle reflects the number of published papers by a researcher, and the width of an edge indicates the intensity of co-citation between the studies of this couple of authors.

Figure 3 illustrates the bibliographic coupling of author keywords of the publications of the category "Methodological." In Figure 4, the bibliographic coupling of author keywords of the publications of the category "Application" is shown. In both figures, the dimension of a filled circle indicates the number of occurrences, and the line's width indicates the level of occurrence of the two connected keywords. The visualization also includes color-coding to indicate the year of publication of the keywords.



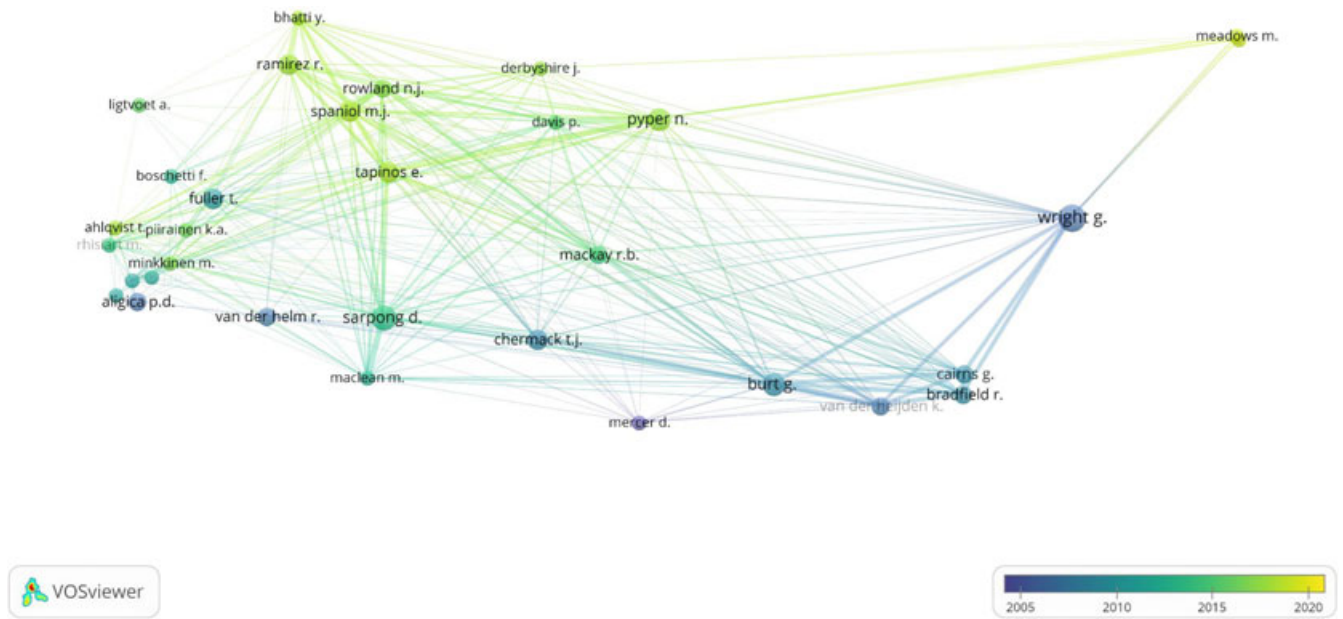


FIGURE 2 Bibliographic coupling of authors

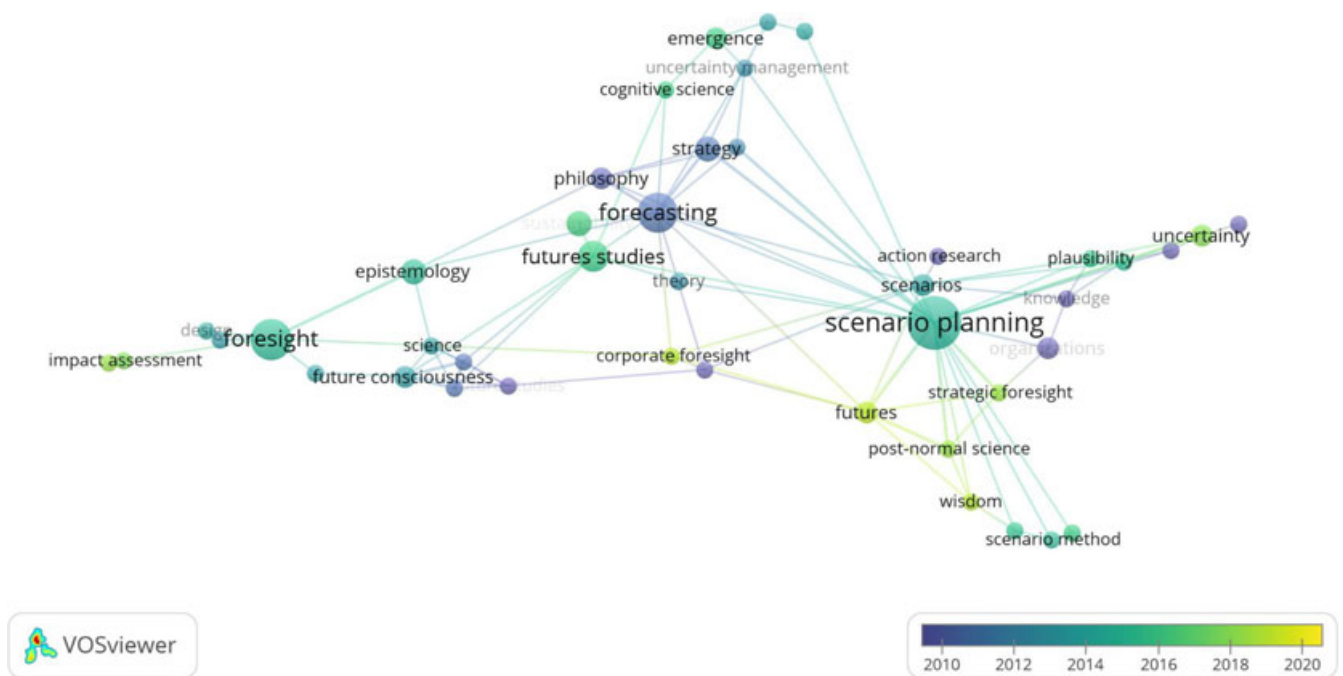


FIGURE 3 Bibliographic coupling of keywords of the publications in category "Methodological"

#### 4 | CONCLUDING REMARK

With our commentary, we enrich the debate on the resistance to scientific theory in futures and foresight. Our bibliometric analysis, including bibliographic illustration, complements earlier observations with distinct measures and illustrations. Furthermore, we can reveal several key findings that contribute to the conceptual analysis of Fergnani and Chermack (2021).

We confirm that compared with theorizing in other scientific disciplines, the frequency and self-conception of its use in FFS is very limited. Even though the first publications date back to 1973, most articles focus on the recent past. As a consequence, we see a concentration of publications in the field of FFS among a few authors or institutions, especially from the United Kingdom.

While there were sporadic application papers in 2007, the continuous publication of application papers in FFS can be observed only since

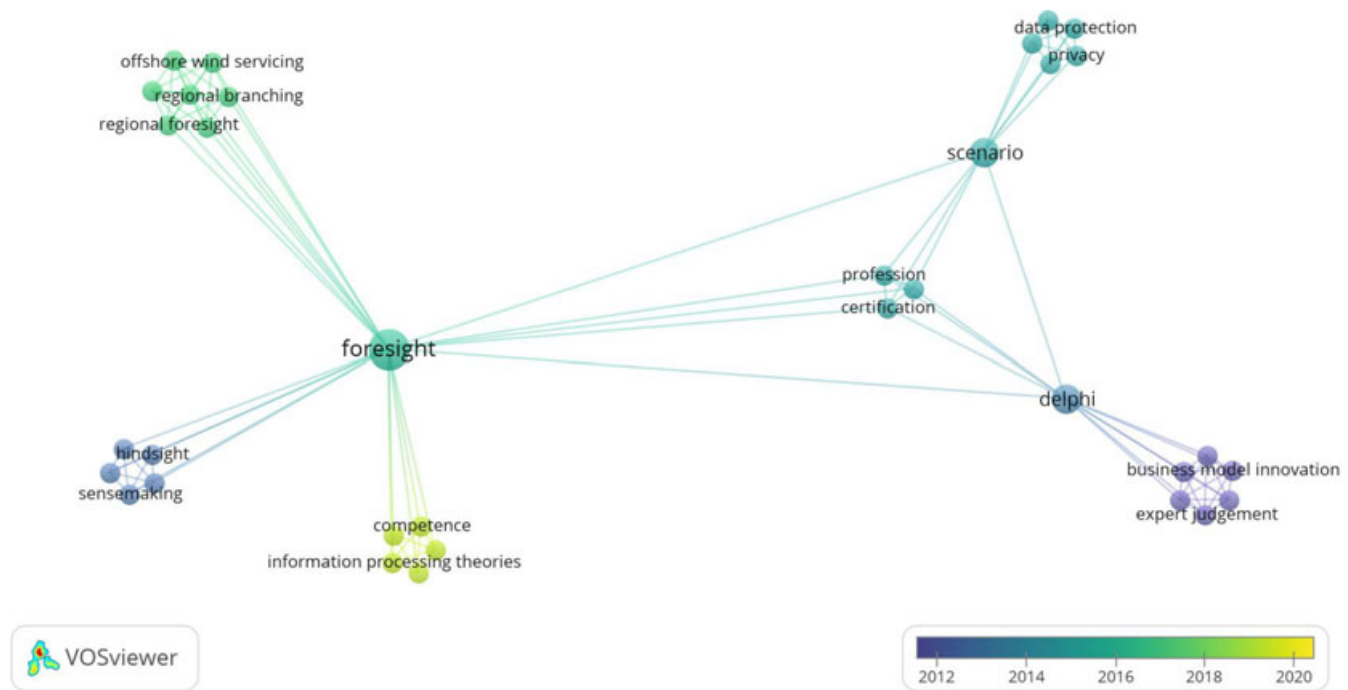


FIGURE 4 Bibliographic coupling of keywords of the publications in category "Application"

2011. Although the proportion of publications that apply and extend theories has increased in recent years (see Roßmann et al., 2018 or Sharma et al., 2019), most of the literature continues to deal with the topic on an analytical level (Wright et al., 2013, Wright et al., 2020 or Bootz et al., 2019 as examples). The analysis of search terms also confirms this observation. Keywords reflecting scientific theories are hardly found in the study. In contrast, keywords of futurology and synonyms are frequently presented and dominate the bibliographic coupling.

Complimentary to the analysis of Fergnani and Chermack (2021), the following thoughts are of particular interest:

- We have to differentiate between a foresight theory and the application of theories to foresight. Momentarily there is not an overall foresight theory or "one-size-fits-all theory" visible on the horizon (see Phillips, 2021, on theory in an Editorial of *Technological Forecasting and Social Change*).
- Fergnani and Chermack (2021) have clear recommendations for journal editors to encourage theory building and testing. While dominant FFS journals like *Technological Forecasting and Social Change* are not claiming for theory in submissions, reviews and publications, the richness of the discipline, its maturity and external awareness (especially in times of interdisciplinary research) would clearly benefit from focused initiatives, (virtual) special issues, calls for papers and the like. In our analysis, we could reveal slow progress in the application of theories from other disciplines. We came, for example, across *organizational information processing theory*, *actor-network theory*, *institutional theory*, *factor-market rivalry theory*, and a few others being applied to FFS. Focus topics and sections could ask for contributions not only on theories in general but very specific and single ones.

- While most FFS journals really welcome rigorous theory-based articles and value their importance, the journals do not include terms like "theory building" and "developing and/or testing theory" on their official journal website, aim, and scope description. A simple inclusion might encourage researchers otherwise submitting to other outlets.
- The analytical publications can provide the basis of rules and guidelines for approved research in the field of FFS. It is necessary to orchestrate these rules and to create clear guidelines for upcoming publications.
- Fergnani and Chermack (2021, p. 9) recommend "authors to familiarize themselves with theory building and theory testing practices." During our analysis, we came across the *Dictionary of Theories*, for which Bothamley (1993) has compiled more than 5,000 theories, laws, hypotheses, principles, rules, theorems, 'ologies, and 'isms from all subject areas. Also, we found the *Handbook of Anticipation* valuable, which its editors and authors consider "the first systematic exploration of the theory and practice of anticipation" (Preface, p. v) (Poli, 2019). Such theory-related compendia also exist for specific domains like psychology, philosophy and social sciences and might be a good initial orientation for setting up research endeavors.

Fergnani and Chermack (2021) elaborate on *critical realism theory* and suggest its application in FFS research. In our analysis, we could neither find an application of this theory so far nor a dominant use of another single theory. Although small in absolute numbers, we found various theories from different scientific domains being used in the field of FFS. This observation supports the general paradigm of FFS as

being a meta-discipline (Bell, 2003; Slaughter, 2002) that applies various methods transdisciplinary and draws on a broad base of literature and knowledge from all the other disciplines (Blass, 2003). It is important to emphasize that for this commentary we analyzed a limited set of 22 selected journals only. Complimentary analyses could include additional journals to capture publications not published in traditional FFS journals, among them, for example, Chermack (2004) in *Human Resource Development Review*, Hirschinger et al. (2015) in *Journal of Supply Chain Management*, Wright et al. (2019) in *European Journal of Operational Research* or Suddendorf and Corballis (2007) in *Behavioral and Brain Sciences*. A search for the exact terms “theory” AND “foresight” in Google Scholar reveals 303.000 hits indicating further valuable contributions across various disciplines and publications outlets. For an expanded analysis across further disciplines and publication formats, the application of a more granular review framework like TCCM (T stands for theory, C for context, C for characteristics, and M for methodology) might be beneficial (see Paul and Rosado-Serrano, 2019).

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## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in Elsevier Scopus at [www.scopus.com](http://www.scopus.com)

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