Vol. 03, No. 2 (2021) 187-198, doi: 10.24874/PES03.02.006

Proceedings on Engineering Sciences

www.pesjournal.net

PUBLICATION TRENDS AND THEMATIC EVOLUTION OF SAFETY MOTIVATION RESEARCH: A BIBLIOMETRIC REVIEW

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Keywords:

Publication Trends; Thematic Evolution; Occupational Hazards; Total Quality Management; Research Performance.

A B S T R A C T

Safety motivation is essential for a well-functioning Total Quality Management (TQM) program. Several studies on safety motivation have been published; however, the bibliometric review remains deficient. This review aims to discuss the bibliometric and thematic development of safety motivation research using the Scopus database. The graphical visualisation of the bibliometric indicators using VOSviewer is presented to describe publication trends. SciMAT was used to inspect the thematic evolution of safety motivation research. Safety motivation research has fluctuated with less than 30 publications annually. This review is interested in several themes and dimensions in changes and evolution of safety motivation. Essential themes in the first period (2001-2010) were "questionnaire", "aged" and "occupational hazards". The "human" theme became the most significant number of publications and citations during the second period (2011-2020). These themes may be useful as a reference point for occupational safety and health researchers and professionals interested in safety motivation research.

1. INTRODUCTION

Safety management theorists have applied Total Quality Management (TQM) principles to develop a more comprehensive safety management approach (Kwan, 2016). The necessity for this is that safety management has become a constant expenditure rather than set aside for future needs. Thus, research on quality management theory had discovered quality and safety were connected and play significant roles in managing workplace safety (Ladewski& Al-Bayati, 2019).

Adekitan (2020) argues that stakeholders should play critical roles and commit to the Integrated Safety and Quality Management System (ISQM) to accomplish their best triumph. The ISQM encompasses TQM and Total Safety Management (TSM) (Hamidi et al., 2012; Papova et al., 2018). TQM and TSM are two philosophies that support the idea of safety and quality management; both approaches will provide active participation of all stakeholders and performance evaluation and improvement (Aneziris et al., 2017; Kontogiannis, 2017).

TQM emphasises workers' focus in line with the organisation's need for commerce with the best fruition. The reason is that improving the services and facilities' quality can be carried out quickly and effectively (Razali et al., 2011). Hence, building quality into an organisation helps the workers feel

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motivated to act as a high-quality worker (Talaq & Ahmed, 2003).

In general, motivation is best described as thoughts, actions, emotions, and desires; that cause wants and needs fulfilling. Motivation remains one of the most enduring yet compelling subjects in industrial psychology (Kanfer et al., 2017). Therefore, it appears that motivation at work aligns goal-oriented behaviour with perceived needs for more significant personal effort. Dennis et al. (2016) and Kwan (2016) stated that motivation is more desirable to have non-performance-based safety competition in TSM and encourage positive safety behaviour rather than negatively penalise safety control mechanisms. Also, continuous improvement, employee satisfaction and motivation are vital features of safety management systems (Álvarez-Santos et al., 2018).

TSM provides a clear organisation for safety and responsibilities, communicates with workers, and ensures hazards and risks were understood (Tamimi et al., 2017). The rationale is that the root causes of many industrial catastrophes in the past were the lack of a proper safety management system. Safety management principles should consist of individuals' motivation, knowledge, abilities, and safe work cultures (Purwanto et al., 2019). Consequently, it is indicated that safety motivation is of paramount importance in producing safe work and quality tasks in any organisation. Abdullah and Aziz (2020a) and Neal and Griffin (2006) contemplated that safety motivation refers to an individual's constructive willingness to make safety efforts and the importance of such behaviours. In short, safety motivation can be construed as attitudes and perceptions that influence workers to work safely and practice safe behaviour during work.

Moreover, safety motivation is a vital predictive factor for good safety behaviour and performance (Abdullah & Aziz, 2020a). Nonetheless, previous research focuses on how motivated employees work safely and ignores why they are motivated to work safely. As a new study in this area is published continuously, several reviews have been posted to synthesise the existing information. The publications focus mainly on some specific aspects of safety motivation; assessment of changes from six safety motivation interventions (Hedlund et al. 2016), the impact of safety climate on safety motivation (Wen Lim et al., 2018), and perceived quality of safety motivation on protection equipment (Paolucci et al., 2020). However, the relative pace of research on the topic exceeds a single review paper's ability to cover all safety motivation research aspects. One solution to evaluating the publications' outputs would be to take a bibliometric review to analyse the publications (Abdullah et al., 2020; Cobo et al., 2011).

Bibliometrics is a quantitative measure of large datasets and reveals the evolution of scholarly literature, notable authors, and justifies the circulation of research funds (Abdullah & Abd Aziz, 2020b; Cobo et al., 2011). A bibliometric analysis shows a complete overview of the literature and dominant themes in a given subject (Martínez et al., 2014). There are two main bibliometrics procedures; performance analysis and science mapping. Performance analysis focuses on the number of citations and impact (Campbell et al., 2010). Simultaneously, science mapping is a bibliometric analysis that uses a graphical representation of scientific research structure and its evolution in the intellectual, philosophical or social sphere (Cobo et al., 2011).

This study provides a broad overview of the safety motivation research through bibliometrics approach. It aims to pinpointing influential authors, sources and countries, and understanding the thematic development of safety motivation research. Accordingly, occupational safety and health researchers and professionals could benefit from learning more about safety motivation, workplace safety, and quality. This review could also concretely ensure a better understanding of safety motivation and various critical areas for future research development.

2. MATERIALS AND METHODS

A bibliometric review was conducted on the basis of three key steps as described below:

(i) Ascertain the database of safety motivation research.
(ii) Refine publication trends of safety motivation research.
(iii) Explore the thematic evolution of safety motivation research. Leave one clear line before and after a main or secondary heading and after each paragraph.

2.1 Ascertain the database of safety motivation research

The search query is set at the beginning of the study, and a list of scientific references is compiled. This study used the Scopus database to create a specific safety motivation research list. The Scopus database is chosen for two reasons; (i) the Scopus database contains reliable, and high-quality research

sources; which seeking individual researchers and their publications (Montoya et al., 2018) and (ii) the database had a broader index than the Pubmed and Web of Science (Sweileh et al., 2017).

The list of safety motivationpublications was gathered from the Scopus database on January 1, 2021, with search string "safety motivation" through TITLE-ABS-KEY. The total number of publications returned from the given query was 127. Out of the 127 publications, 112 were articles from various journal sources, 11 were conference papers and less than ten other publications, including trade journals and book series.

A total of 121 publications were written in English, two publications in German and Russian, and one publication in French and Persian. Data in the format of Comma Separated Values (CSV) and Research Information Systems (RIS) including years, authors, the field of study, article sources, countries, and languages were exported to Microsoft Excel, Publish or Perish, VOSviewer, and SCiMAT for further analysis.

2.2 Refine publication trends of safety motivation research

Numerous programming or software tools have been recently established within the past two decades to analyse bibliographies and cataloguing scientific articles (Cobo et al., 2011). These tools represent the associations between study fields, publications, scholars, sources, territories, and other related information. In this study, publication trends were analysed using VOSviewer. According to Van Eck and Waltman (2010; 2019), VOSviewer applied visual elements based on mapping techniques, which converts data related to Comma Separated Values (CSV) format into diagrams or clusters.

Mapping techniques helped researchers analyse authors, locations, institutions, citations, co-citations, and other refining facets (Abdullah et al., 2020). Co-occurrence analysis is used to identify the key thematic areas of safety motivation research. The co-citation analysis was used to classify the prominent outlets and show the authors' information prominence in their clusters.

Nodes and links were two main outputs from the refining publication trends of safety motivation research. According to Cobo et al. (2011), the node represents the publication frequency, whereas, the connection width refers to measuring the relationship strength. During this stage, reference lists from scholarly publications also reviewed by using Publish or Perish software.

2.3 Explore the thematic evolution of safety motivation research

In this stage, SciMAT discovered thematic and conceptual development of safety motivation research. This technique allows researchers to map several research periods based on a longitudinal dimension (Cobo et al., 2011). This study was interested in studying the thematic evolution of safety motivation research starting in 2001. This is primarily reflected in the post-2000 publications that show increasing trends. The timeframes were divided into two periods. The first period (2001–2010) was when the field was still emerging with less than five publications each year. The second period (2011-2020) is characterised by a more excellent in publications, with at least five publications per year.

This study is based on the study design developed by Cobo et al. (2011) to reflect thematic evolution with four theme outputs; as simplified in Table 1.Thematic networks in Figure 1 display the evolution of research topics; while in Figure 2, the thematic development connects various themes through subperiods (Cobo et al., 2011). Figure 1 shows that the strategic diagram uses a horizontal axis to measure centrality and the vertical axis to display network density.

According to Cobo et al. (2011), centrality refers to the metric that measures the relationship between networks, which means that higher centrality correlates with other network themes and plays a critical role in developing study fields. In contrast, the measurement of intra-network relationships with an evident and robust internal relationship to a subject is called a density (Cobo et al., 2011). A thematic network complemented the strategic diagram by showing the relationships between themes. The nodes are sized by frequency or the number of documents, and thickness of the link is commensurate to the equivalence index of documents (Cobo et al., 2011).

As shown in Figure 2, the evolution map shows how thematic field evolution is linked over the study period. The nodes' size is reflected in the number of documents within a given theme, and links between nodes are proportional to the similarity in a topic. It will be at least one out of all the theme keywords that the theme will contain (Cobo et al., 2011). Themes which are shared identical labels are linked by solid lines and themes which share similar keywords but have different

labels are attached by a dotted connection (Cobo et al., 2011).

The overlapping map allows the researcher to determine how stable the first and second period's data was. The horizontal line is the number of words that are shared. The forward-directed arrow shows how many keywords would be missing during the first period. The inward arrow indicates the number of new keywords, on the other hand.

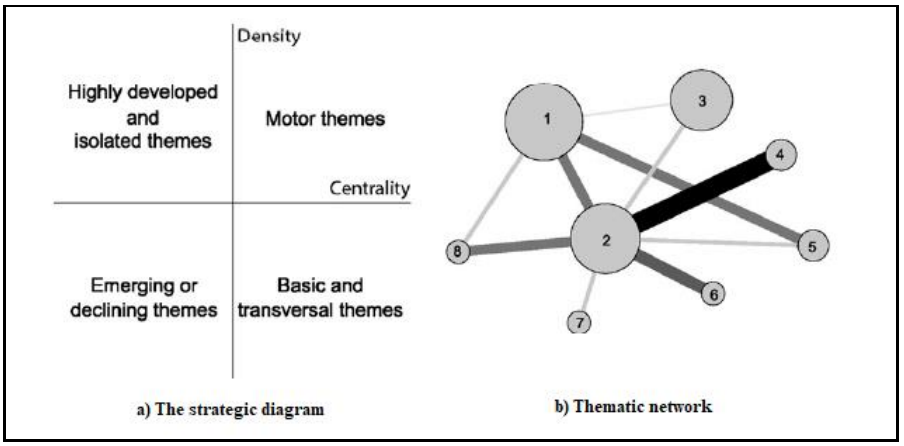

Figure 1. The strategic diagram and thematic network (Cobo et al., 2011)

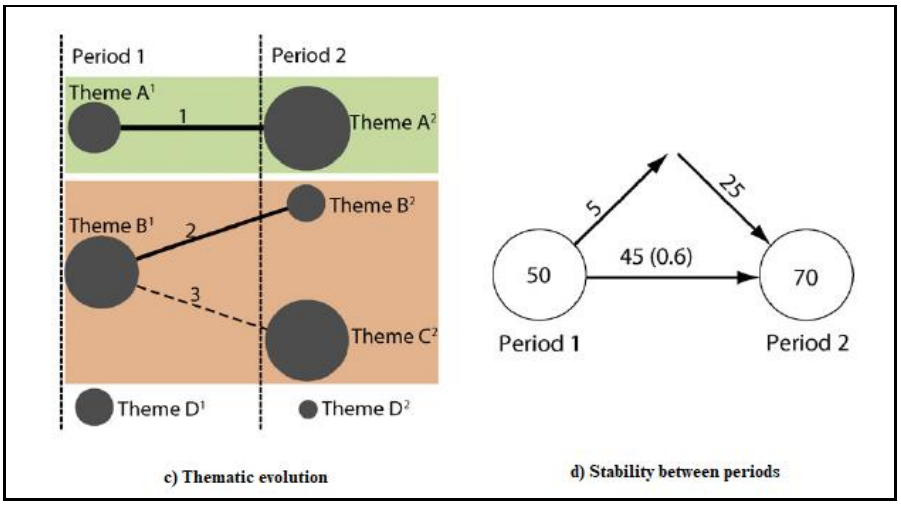

Figure 2. The evolution map and stability between periods (Cobo et al., 2011)

Table 1. The simplified of four themes in the strategic diagram (Cobo et al., 2011)

Themes	Position	Explanation
Motor themes	Upper-right quadrant (first quadrant)	• Well established and essential for the organisation of a field of research • Centrality and density is very high • These themes are related to each other in a similarly broad scope
Highly developed and isolated themes	Upper-left quadrant (second quadrant)	• Well developed internal ties but inconsequential external ties • Only marginal importance for the field • These themes emphasise the necessary specialist and peripheral role.
Emerging or declining themes	Lower-left quadrant (third quadrant)	• Weakly developed and marginal • Being low density and low centrality • These themes representing either emerging or disappearing
Basic and transversal themes	Lower-right (fourth quadrant)	• Essential for a research field but are not developed • These themes depict transversal, general and basic

3. RESULTS AND DISCUSSION

3.1 Publication trends of safety motivation research

The progress of publications on safety motivation research is shown in Figure 3. A total of 127 publications from the Scopus database were recorded over 44 years (1976-2020). From 1976 until 2006, the number of publications was less than five, indicating a low growth rate in safety motivation research. The number of annual publications is increasing at a fantastic rate between 2008 and 2020, with more than five publications. Still, the number of publications has fluctuated with a minimum number of publications, three in 2009, two in 2012 and four in 2014. In 2020, the number of publications was larger than the cumulative total of 27 documents. This could be explained by the fact that, after four decades, occupational safety and health research scholars focuses its attention on safety motivation. An accident could be described as an unexpected event that suddenly happens without warning (Niza et al. 2008). The workers' strong motivation to reduce accidents at work is needed, and research on safety motivation increases. It is since safety motivation links the psychological safety contract as demonstrated by the employer's safety obligations and employees' safety obligations to breaches of safety and safety creative performance (Vatankhah, 2021). It indicates that safety and quality at work are linked and have been concentrated in recent decades and attract future research to scrutinise these factors.

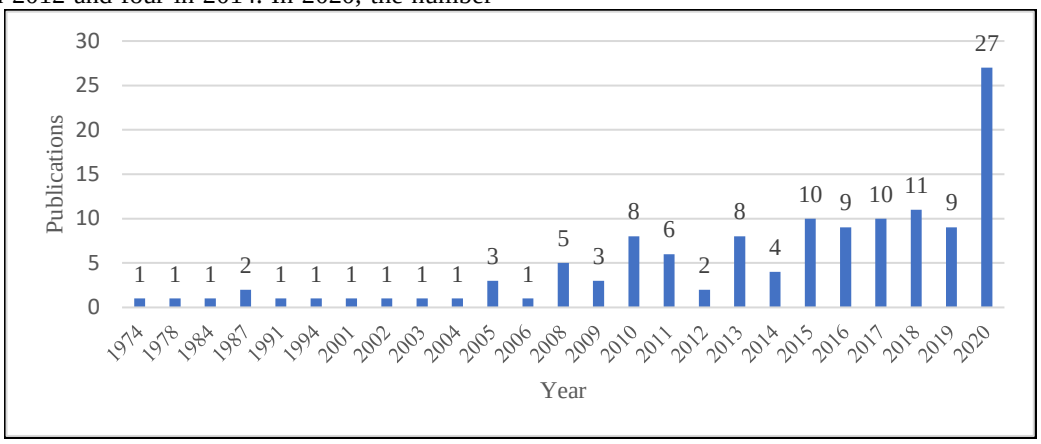

Figure 3. Publication trends of safety motivation research

3.2 Term co-occurrence analysis of safety motivation research

Co-occurrence analysis of frequently co-occurring terms identifies major thematic clusters. The output analysis for 11 keywords is shown in Figure 4. Figure 4 indicates that node size and thickness directly relate to the current network's interaction and the strength of connections.

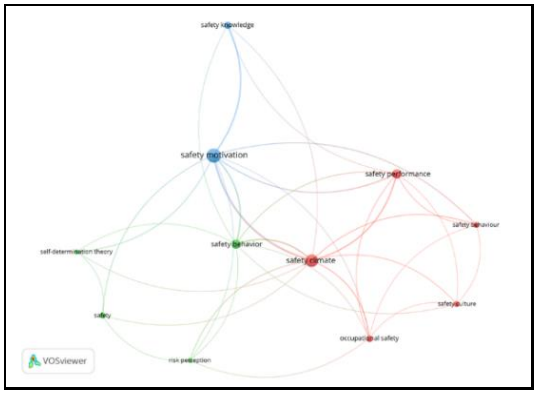

Figure 4. The term co-occurrence analysis

The terms such as "safety climate", "safety motivation", "safety behavior", "occupational safety", and "safety knowledge", have higher occurrence rates and are associated with other terms in greater association strength. In this study, the occurrence values and the link's strength for "safety motivation" were higher and expected.

The term has been included in the search string to examine publication trends and thematic evolution. It can be seen that the terms "safety motivation", "safety behavior", "safety climate", "safety performance", and "safety knowledge" are clustered around the edges of the clusters, indicating that they are strongly related.

The results show that safety motivation is an essential factor in attracting and promoting exemplary safety behaviour and enhancing the quality and safe work environment. Safety motivation is vital for making a safe work environment where employees feel valued and commended rather than undervalued and ignored.

Management must ensure the employees are safe and well-taken care to properly deal and handle safety (Panuwatwanich et al., 2016). Moreover, according to Payne et al. (2009), the safety climate can become a leading and lagging indicator of the safety upshot.

So, there is a need for a comprehensive and informative approach to evaluating the quality of safety management that combines leading and lagging indicators enabled managers to assess the attainment of managing safety at work (Mohammadfam et al., 2017).

3.3 Prominent sources of safety motivation research

Co-citation analysis is used to classify publication outlets or sources that have had a more significant effect on safety motivation research. The co-citation analysis for sources and the times other articles cited them is shown in Figure 5.

The nodes' size reflects the number of citations with three clusters (red, green and blue). Results show that the Journal of Applied Psychology, Safety Science, Journal of Safety Research, Journal of Occupational Health, and Accident Analysis and Prevention significantly influenced the dissemination of safety motivation research over four decades.

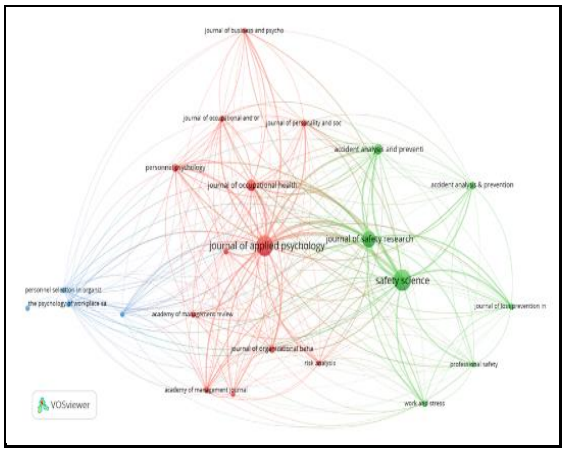

Figure 5. The prominent sources of safety motivation research

3.4 Prominent authors of safety motivation research

This review found that 390 authors have conducted a total of 127 safety motivation research since 1974. Table 2 recorded the author's information with more than three publications. Griffin, M.A, Nordfjærn, T. and Rundmo, T. were three successful authors in writing four publications along 46 years.

Table 2. Most active authors on Safety motivation Research

Author	Publication	Affiliation
Griffin, M.A.	4	Curtin Business School, Perth, Australia
Nordfjærn, T.	4	Norgesteknisk-naturvitenskapeligeuniversitet, Trondheim, Norway
Rundmo, T.	4	Norgesteknisk-naturvitenskapeligeuniversitet, Trondheim, Norway
Korunka, C.	3	Universitat Wien, Vienna, Austria
Lu, C.S.	3	Hong Kong Polytechnic University,
Mariani, M.G.	3	Università di Bologna, Italy
Nykänen, M.	3	Työterveyslaitos, Helsinki, Finland
Sinclair, R.R.	3	Clemson University, United States
Törner, M.	3	GöteborgsUniversitet, Gothenburg, Sweden
Yang, C.S.	3	Chang Jung Christian University, Tainan, Taiwan

The study further investigated the co-authorship of the authors by conducting a co-authorship analysis using VOSviewer. In this study, a co-citation analysis is used to map the intellectual link of the research field.The VOSviewer-generated a co-citation map, as indicated in Figure 6 showed the degree of the author's co-citation.

The co-citation analysis is generated with at least a minimum number of citations is 20, and a number of selected authors is 52. The co-citation map allows for two fundamental revisions. First, the lines refer to the works' conceptual ties, thereby reflecting co-citation connections; thicker lines represent related works. Second, the position of nodes in the network illustrates the notion of the centrality of each work; nodes in the central position were more important, prominent, and influential.

Based on Figure 6, Neal, A. (211 citations) became the most active author, followed by Griffin, M. A. (209 citations). Those two documents were the most

co-cited and important in safety motivation research.

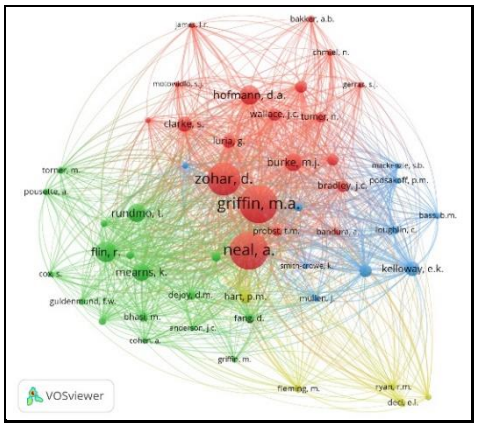

Figure 6. Network visualisation map of the co-citation by author

3.4 Reference analysis

Reference analysis is one of the primary bibliometric analysis identification processes. Table 3 summarised the citation metrics for the retrieved document by using Publish or Perish software. As noted, there were 4158 citations published in the 47 years of safety motivation research. Citation metric was obtained using Publish or Perish (PoP) software through importing files in RIS format from the Scopus database.

Table 4 lists the top five most-cited publications (based on the number of citations) as per the Scopus database. The article wrote by M.S. Christian, J.C. Bradley, J.C. Wallace, and M.J. Burke entitled "Workplace Safety: A Meta-Analysis of the Roles of Person and Situation Factors" issued by the Journal of Applied Psychology got the highest number of citations of a total of 740 citations, equivalent to 61.67 citations per year. The second rank goes to the article written by A. Neal, M.A. Griffin entitled "A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels" with a total of 733 citations and cites per year approximately 48.87. Article written by A. Zacharatos, J. Barling, R.D. Iverson entitled "High-performance work systems and occupational safety" was ranked at third place with a total of 491 citations and 30.69 cites per year. The insights from these three publications helped identify the most prominent safety motivation researchers to be considered in future studies.

Table 3. Metrics citation

Metrics	Data
Publication years	1974 - 2020
Citation years	47 (1974 - 2019)
Papers	127
Citations	4158
Cites/ year	88.47
Cites/ paper	32.74
Authors/ paper	3.06
h-index	26
g-index	64
hI, norm	18
hI, annual	0.38

Table 4. Top five most cited publications

Rank	Citation	Annual Citation	Authors	Title	Year	Source
1	740	61.67	M.S. Christian, J.C. Bradley, J.C. Wallace, M.J. Burke	Workplace Safety: A Meta-Analysis of the Roles of Person and Situation Factors	2009	Journal of Applied Psychology
2	733	48.87	A. Neal, M.A. Griffin	A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels	2006	Journal of Applied Psychology
3	491	30.69	A. Zacharatos, J. Barling, R.D. Iverson	High-performance work systems and occupational safety	2005	Journal of Applied Psychology
4	235	11.75	T.M. Probst, T.L. Brubaker	The effects of job insecurity on employee safety outcomes: cross-sectional and longitudinal explorations.	2001	Journal of Occupational Health Psychology
5	182	16.55	M.N. Vinodkumar, M. Bhasi	Safety management practices and safety behaviour: Assessing the mediating role of safety knowledge and motivation	2010	Accident Analysis and Prevention

3.5 Thematic evolution of safety motivation research

The thematic evolution of safety motivation research is examined using SciMAT. Key outputs of the SciMAT are graphical depictions of the thematic structure across the selected periods chosen by the researchers.

A strategic diagram has grouped themes into four groups, as discussed in Table 1. The strategic diagrams are presented in Figure 7 and Figure 8. In these diagrams, the nodes' size is relative to the number of articles allied with each theme.

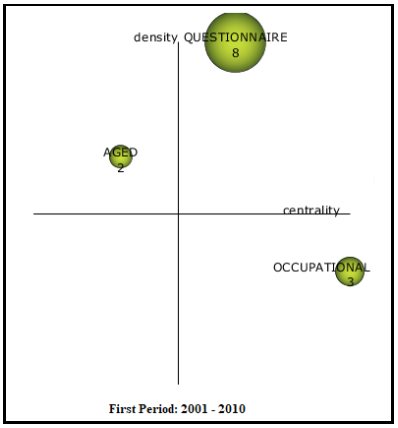

Figure 7. Significant themes during the first period of study (2001-2010)

The first period (2001–2010) as shown in Figure 7 has been inadequate, and only a few major themes have emerged. The themes are "questionnaire" (motor themes), "aged" (highly developed and isolated themes) and "occupational hazards" (basic and transversal themes).

Throughout this period, attention was focused on the theme "questionnaire". This is because, between 2001 and 2010, safety motivation research emerged and was compellingly necessary for safety behaviour and change implementation, as indicated in Figure 3.

A "questionnaire" provides the basis for identifying "occupational hazards" that is an essential basic and transversal theme throughout this period from the motor theme perspective. However, previous research has examined safety performance without considering safety motivation, safety compliance, and safety participation (Pedersen & Kines, 2011). Therefore, questionnaires related to safety motivation are focused on employees to review whether employees feel safe is essential or beneficial, rather than whether they comply with the rules.

Peeters et al. (2008) suggested that age and work-related factors influence work motivation and further research is needed to understand the underlying factors. Young workers are often less aware of risks and hazards and may not have the confidence to speak up about the health and safety issues that affect them (Nykänen et al., 2019).

This is due to the way organisations assess and evaluate the safety and the extent to which compliance with safety goals is rewarded and supported (Panuwatwanich et al., 2016). From this perspective, it can be inferred that employees' safety motivation and age can significantly influence workplace safety. However, it can be seen in Figure 7 that the theme "aged" is a combination of safety motivation themes that are well developed but not linked to other themes.

Three significant motor themes found during the second period of analysis are "managers", "occupational-injuries", and "human". "Managers" is among the most common thematic categories related to performance measures. The role of managers is vital in creating worker safety motivation because safety regulations are not always followed. Thus, safe work environments require safety motivation by both employees and leaders. Managers must be aware of the need for interventions and decide that the workplace will participate (Rydell et al., 2014).

Figure 8. Significant themes during the second period of study (2011-2020)

"Human" is another motor theme to be investigated that consequential from "questionnaire" and "aged" themes but is associated with the most significant number of citations. This theme's emergence could be explained by unsafe human behaviour as a priority in preventing and controlling accidents (Li et al., 2015).

The human mind influences behaviour through psychology and the most unsafe behaviour is performed without proper thinking, making workers vulnerable to accidents at work (Ma et al., 2021). "Cholinesterase-inhibitors" is considered highly developed and isolated subjects during the second period and is of marginal importance for safety motivation research.

"Work-environment" and "safety-compliances" were considered as emerging or declining themes. These

themes appear weakly developed and may represent emerging or disappearing. "Work-environment" is close to the themes "occupational hazards" from the previous period as basic and transversal themes.

It is claimed that unsafe working environments and occupational hazards can be both unhealthful for employees and costly for organisations; hence, safety motivation is essential to enhance safety behaviour (Hedlund et al., 2016).

Regarding "survey" it is a concept that was a basic and transversal theme during the second period of analysis. "Survey" has a good connection with "questionnaire" from the first period of analysis. However, during the second period, "managers" are considered an essential theme in safety motivation research.

The conceptual evolution of safety motivation research was explained by the keyword overlapping graph shown in Figure 9, and the map of thematic evolution in Figure 10.

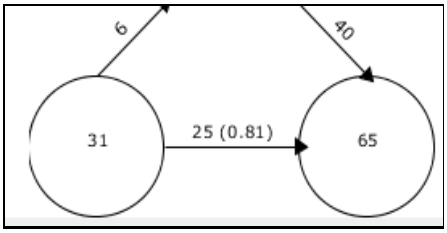

Figure 9. The keyword overlapping graph

Figure 9 shows the number of keywords has increased over time. This represents a continuation of the emphasis on expanding safety motivation research. The number of emerging safety-motivated themes is high, suggesting that safety motivation research is constantly developing and expanding. As a result of the complexity, dynamic, and uncertain nature of safety motivation research, this is an expected trend.

The evolution map of research on "questionnaire", "aged", and "occupational-hazard" supports the argument that these issues have received relatively more attention in the literature. These three topics were addressed in the study. In the second period, "humans" are very closely related to "questionnaire" and "aged", "safety compliance" and "surveys" are closely related to "questionnaire", while "work-environment" is very closely associated with "occupational-hazard".

Figure 10. The map of thematic evolution

Table 5 reproduces the three thematic areas' performance measures and observes how the three areas overlap and are not always mutually exclusive. With regards to the three persistent thematic areas, noteworthy points include:

- As the dominant thematic area, "questionnaire" has mainly related to safety behavior and accidents during the first period. Since the second period, however, more attention has been paid to "human" and "managers".
- The second prominent thematic area is focused on "aged". During the second period, its scope has expanded to also deal with human factors.
- Finally, the third thematic area is focused on "occupational-hazards". Although it is less prominent in performance measures (see Table 5), it has maintained a stable position as an essential theme for the second period.

Table 5. Performance thematic development of safety motivation research

Thematic areas	Periods	Number of documents	Number of sum citations	h-index
Questionnaire	2001 - 2010	8	2547	8
	2011 - 2020	50	728	16
	Total	58	3275	24
Aged	2001 - 2010	2	159	2
	2011 - 2020	46	686	14
	Total	48	845	16
Occupational-hazard	2001 - 2010	3	121	3
	2011 - 2020	2	147	2
	Total	5	268	5

4. CONCLUSION

The bibliometric review promotes established directions on safety motivation research, assessing newly emerging trends, and studying research evolution.

Based on a bibliometric review of 46 years of research (1974-2020), the findings could provide beneficial information for the occupational safety and health researchers and professionals, as below:

- The number of publications on safety motivation research had fluctuated, and the highest number of publications was 27 in 2020.
- The term "safety climate", "safety motivation", "safety behavior", "safety knowledge", and "occupational safety" have more incredible occurrences, more strongly associated, and are related to other terms.
- The Journal of Applied Psychology, Safety Science, Journal of Safety Research, Journal of Occupational Health and the Accident Analysis and Prevention are the top five sources that have had a more significant impact.
- Griffin, M.A, Nordfjærn, T. and Rundmo, T. were among the successful author in writing a total of four publications. Neal, A. (211 citations) became the most active author, followed by Griffin, M. A. (209 citations). The article was written by M.S. Christian, J.C. Bradley, J.C. Wallace, and M.J. Burke entitled "Workplace Safety: A Meta-Analysis of the Roles of Person and Situation Factors" issued by the Journal of Applied Psychology got the highest number of citations of a total of 740 citations, equivalent to 61.67 citations per year.
- "Human" and "Manager" are among the most common thematic categories related to performance measures, which is a continuation of the emphasis on expanding safety motivation research. The number of emerging safety-motivated themes is high, suggesting that safety motivation research is constantly developing and expanding.
- The map of research on "questionnaire", "aged", and "occupational-hazard" shows that these issues are viewed in a more significant number of academic papers.
- "Humans", which are closely related to "questionnaire" and "aged", are often associated with "safety compliance", while "occupational-hazard" is closely associated with "questionnaire".

The bibliometric analysis makes it possible to understand the state of the art of a specific area or subject. However, a host of drawbacks relevant to the research method sought and how the documents have been categorised cannot be ignored.

In this respect, it is essential to note that other databases could have been used for analysis, such as Google Scholar and Microsoft Academic. The nature of a bibliometric review per se is therefore limited. Only publications that follow the search refinement ("safety motivation") set out in the methodology have been included.

This report's major shortcoming is restricting scientific results and not helping different organisations comprehend safety motivation research completely. Confining the results of the Scopus database is a further constraint. Further research should be conducted to assess the correlation of safety motivation patterns between quality measurement and occupational and health management success at specific workplace

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