Do we need a new bibliometric method in marketing? Case study of variables mapping

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Do we need a new bibliometric method in marketing? Case study of variables mapping

Abstract:
Science mapping is one of the bibliometric analysis methods. This article aims to identify to what extent variable mapping - a new approach to science mapping – can improve research problem formulation and content/thematic analysis for literature reviews. Based on a sample of articles on customer ideation, we compare a traditional approach (keywords mapping) with a variable map prepared manually on the same articles. Seven independent expert judges assessed the usability of both solutions when formulating the research problem and content/thematic analysis. The results show the advantage of variable mapping in the formulation of the research problem and thematic/content analysis.

Keywords: *science mapping, variable mapping, customer ideation*

1. Introduction

Literature review as a research method is gaining popularity (Palmatier et al., 2018). One of the key techniques used in its course is bibliometric analysis out of which science mapping states for visual data presentation (Chen, 2017). The classic approach that dominates today in science mapping consists of mapping areas, keywords, terms, authors, or citations (León-Castro et al., 2021). This approach is also used in relation to the literature review in marketing. The development of technology has resulted in researchers and practitioners using the software capabilities available on the market for this purpose (Aksoy et al., 2021). Bibliometric analysis (including science mapping) helps other researchers to understand the main areas of research within marketing thanks to the possibility of quick analysis of annual literature volume, leading countries, journals, and authors (Wu et al., 2022) and critical subject clusters (structure of research in the specific area), (Avila-Robinson & Wakabayashi, 2018). This enables researchers to find the fields needed for future studies (hot research topics), (Noorbehbahani et al., 2019). The use of science mapping software tools (i.e., VOSviewer, SciMAT, Pajek) in recent publications involves the implementation of a literature review and it is helpful in areas with a relatively high number of publications, such as integrated marketing communications (Takie et al., 2021, Wu et al., 2022) or digital marketing (Aksoy et al., 2021, Leon-Castro et al., 2021, Gao et al. 2021). However, this approach is relatively general and makes it impossible to draw precise conclusions about the studied literature.

This article aims to identify the extent to which the new approach to science mapping, which is variable mapping, takes advantage over the classic science mapping approach in terms of research problem formulation and content / thematic analysis.

2. Theoretical background

Literature reviews are increasingly assuming a crucial role in synthesizing past research findings to effectively use the existing knowledge base and advance a line of research (Aria & Cuccurullo, 2017). The highest methodological rigor is characteristic of the systematic literature review (Tranfield et al., 2003), the structure of which includes all the elements that are selectively used in non-systematic reviews (i.e., to create literature reviews in empirical articles). This article takes a systematic literature review structure as a reference for identifying the review stages at which researchers use the science mapping procedure.

The structure of systematic literature reviews presented in seminal works on this topic includes 5 steps. It consists of the following: 1) topic formulation, where the author sets out the objectives, 2) study design, specifying relevant problems, populations, constructs, and settings of interest, 3) sampling, which aims to identify all potentially relevant studies, 4) data collection, where the authors gather the articles aimed in step 3, 4) data analysis, which uses variety of different methods from purely quantitative (i.e., bibliometrics) to both mixed and qualitative (i.e., content analysis for thematic purposes) and 5) reporting, presenting the results clearly and compellingly, using narratives, tables, and figures (Palmatier et al., 2018). Science mapping covers steps 4 and 5. It helps discovering relationships and structure within the data (data analysis) and presenting the results in a clear and comprehensive form (reporting) (Chen, 2017).

The data analysis part includes bibliometrics and content analysis for thematic purposes. *Bibliometrics* (sometimes understood widely as the whole science mapping process – see Chen, 2017) are treated as a set of tools that uses quantitative approaches and aims to examine and measure text and information (León-Castro et al., 2021). It has the potential to introduce a systematic, transparent, and reproducible review process based on the statistical measurement of science, scientists, or scientific activity (Broadus, 1987; Diodato, 1994; Pritchard, 1969, as

cited in Aria & Cuccurullo, 2017). The use of bibliometrics has been extended to all disciplines, and it is complex because it entails several steps that employ numerous and diverse analyses and mapping software tools (Guler, Waaijer, and Palmblad, 2016, as cited in Aria & Cuccurullo, 2017). The most common forms of bibliometric analysis are co-citations, co-words, co-occurrence of keywords, co-authorship analysis, articles distribution, time-series analysis or performance of academic journals (León-Castro et al., 2021).

Content/thematic analysis is the analysis of the text in terms of the answer to the research question posed. Unlike bibliometric analysis, content/thematic analysis is based on both qualitative and quantitative text analysis. The main quantitative techniques are related to the frequency analysis of keywords, research methods, theoretical perspectives or variables appearing in the text (Czakon, 2013). Content analysis requires an assessment of the quality of the researched publications, ordering the findings and answering the research question.

A map of science is, therefore, a spatial representation of how disciplines, fields, specialties and individual papers or authors are related to one another as shown by their physical proximity and relative locations s (Small, 1999, as cited in Moral-Muñoz et al., 2020). Science mapping software supports bibliometric analysis. Programs such as SciMat, CiteSpace, VOSviewer and others allow one to create maps of co-citations, co-words, co-occurrence of keywords, and co-authorship analysis. However, none of them is based on the analysis of variables, so their usefulness in content analysis is limited.

3. Variables mapping

The functionality of the science mapping software, limited to bibliometrics and keyword analysis, limits its application at the above-defined content analysis phase. Additionally, it does not provide significant support at the first stage of the literature review, i.e., formulating a research problem.

The development of social sciences is based on the development of knowledge about variables. Progress is made by creating new ones, finding new connections between existing ones, and presenting these connections in different contexts. Modeling relationships between variables and their graphical presentation is well known and used in the structural equation modeling (SEM) method (Hair et al., 2013). Without aspiring to the name of the regression meta-analysis, variables mapping uses graphical presentation of relationships between variables. This method enables the presentation of the current state of the science for any selected variable in any area of marketing. This knowledge can be helpful both when formulating a research problem and analyzing the content to solve it.

4. Method

There are several science mapping software types on the market. Some of the most popular are SciMat, VOSviewer and Pajek. Figures 1, 2 and 3 show example keyword maps prepared with them. The following figures are not analytical but only illustrative. Their purpose is to illustrate how the results are presented in this kind of software.

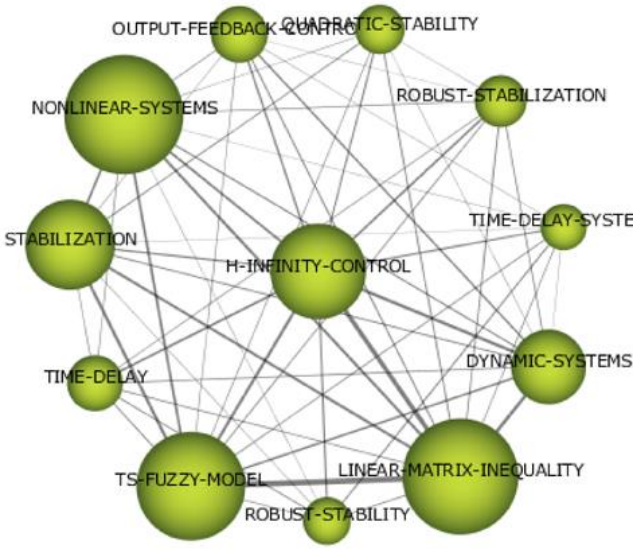

Figure 1. Keyword map made with SciMat[1]

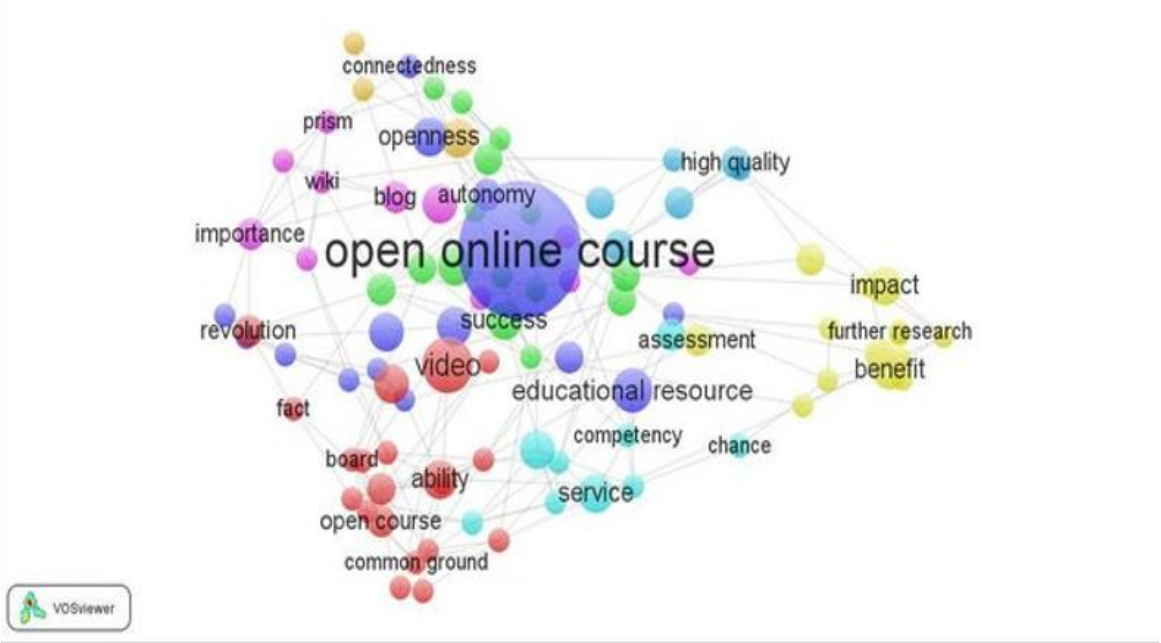

Figure 2. Keyword map made with VOSviewer[2]

[1] Home web page: https://sci2s.ugr.es/scimat/
[2] Home web page: https://www.vosviewer.com/

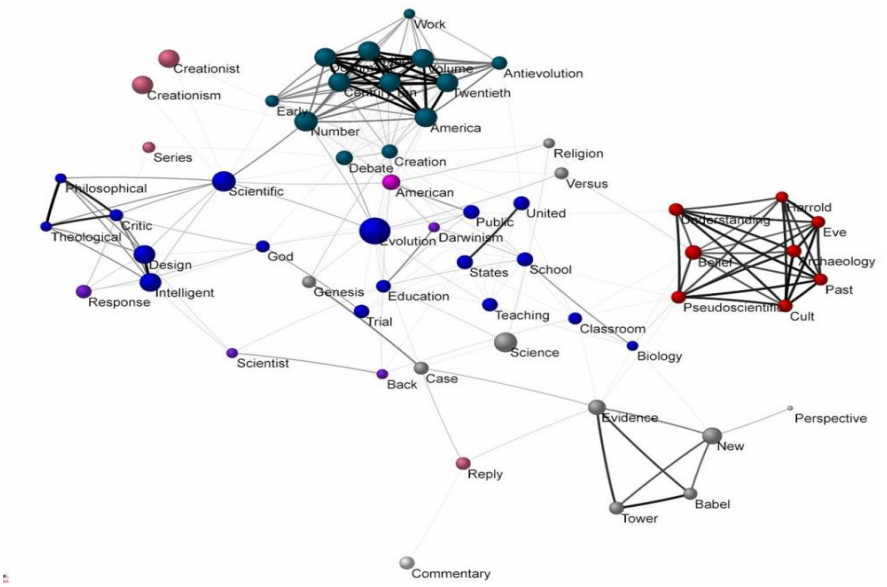

Figure 3. Keyword map made with Pajek[3]

The analysis of the above illustrations (Figure 1, 2 and 3) shows a similar way of presenting the results. Keywords have been grouped, and links between them marked as lines. One can see the clusters marked with different colors and the distances between the keywords, which indicate mutual relations.

This article uses an analysis of mapping results in VOSviewer science mapping software. VOSviewer is one of the most popular visualization platforms used in literature reviews (McAllister et al., forthcoming). The analysis was performed in terms of the usability of variable mapping at the stage of formulating the research problem and content / thematic analysis. The study results (maps) were compared with the map the authors prepared on the basis of the relationship between the variables identified in the analyzed articles. For the purpose of illustration, in this manuscript the subject of the research is a set of 5 example articles on customer ideation, which contains the relationship analysis of the variables, allowing to build a map:

- Chan, K. W., Li, S. Y., & Zhu, J. J. (2015). Fostering customer ideation in crowdsourcing community: The role of peer-to-peer and peer-to-firm interactions. *Journal of Interactive Marketing*, *31*, 42-62.
- Chan, K. W., Li, S. Y., Ni, J., & Zhu, J. J. (2021). What feedback matters? The role of experience in motivating crowdsourcing innovation. *Production and Operations Management*, *30*(1), 103-126.
- Casaló, L. V., & Romero, J. (2019). Social media promotions and travelers' value-creating behaviors: the role of perceived support. *International Journal of Contemporary Hospitality Management*, 633-650.
- Burnham, T. A., Ridinger, G., Carpenter, A., & Choi, L. (2020). Consumer suggestion sharing: helpful, pragmatic and conditional. *European Journal of Marketing*, 726-762.
- Barasa, L., Kinyanjui, B., Knoben, J., Vermeulen, P., & Kimuyu, P. (2021). Innovation and exporting: the case of mediation effects in Sub-Saharan Africa. *Industry and Innovation*, *28*(2), 113-135.

[3] Home web page: http://mrvar.fdv.uni-lj.si/pajek/

Ideation is when a customershares the idea that is getting useful information which can have desirable consequences for employees and their customers and thus for an enterprise (Guan et al., 2018). It is a concept in the field of customer engagement. A small number of articles test the possibility of analyzing unfavorable conditions. Science mapping software such as VOSviewer, Pajek or SciMAT is sensitive to a small number of analyzed sources. Due to the low number of words/terms co-occurrence, the resulting maps are extremely sparse, and their interpretation is difficult and ambiguous.

The analysis in VOSviewer was performed using the terms/keyword co-occurrence option on the basis of the five mentioned articles downloaded from the SCOPUS database in April 2022 and saved in the RIS format. Variable map was made based on the analysis of relationships between the variables read from the analyzed articles. Building the variable map consisted of reading the results from the article and manual preparation of the diagram in MS Word. Following the guidelines for scientific publications in the social sciences, the results are presented in the form of tables or graphs[4] so they are relatively easy to identify. We identified all the relationships (both significant and non-significant) within the object articles and draw them using arrows and rectangles. Then we added the numbers and the type of the relationship and put them above the arrows. Finally we obtained a graph model similar to this widely used for separated field studies, but for many ones.

Additionally, to validate and support our findings, in April 2022 we performed 7 individual interviews with both experienced and beginner management scientists from Poland. We asked them about the usefulness of both maps in the field of research problem formulation and content/thematic analysis.

5. Results

The maps below show the results of the analysis. Both of them were performed for the same set of articles.

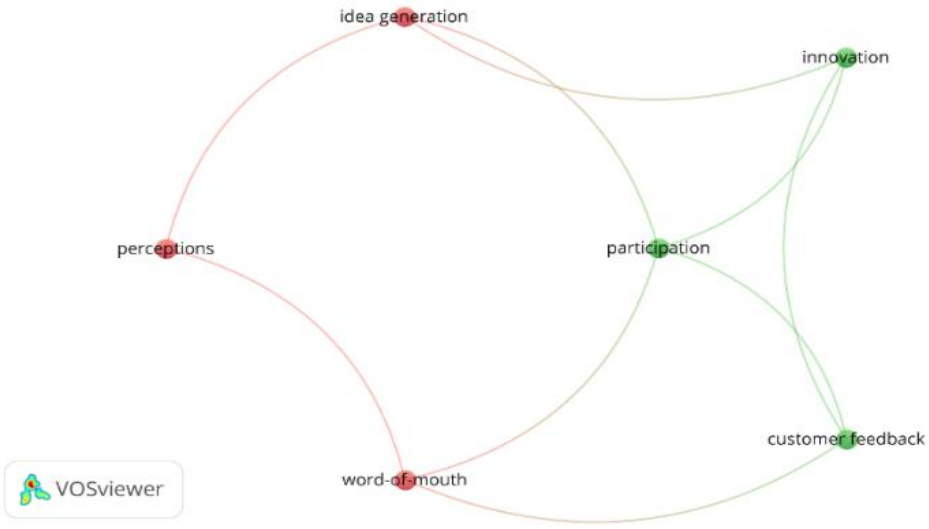

Figure 4. “Customer ideation” analysis in VOSviewer

[4] https://apastyle.apa.org/ [access: 07.04.2022]

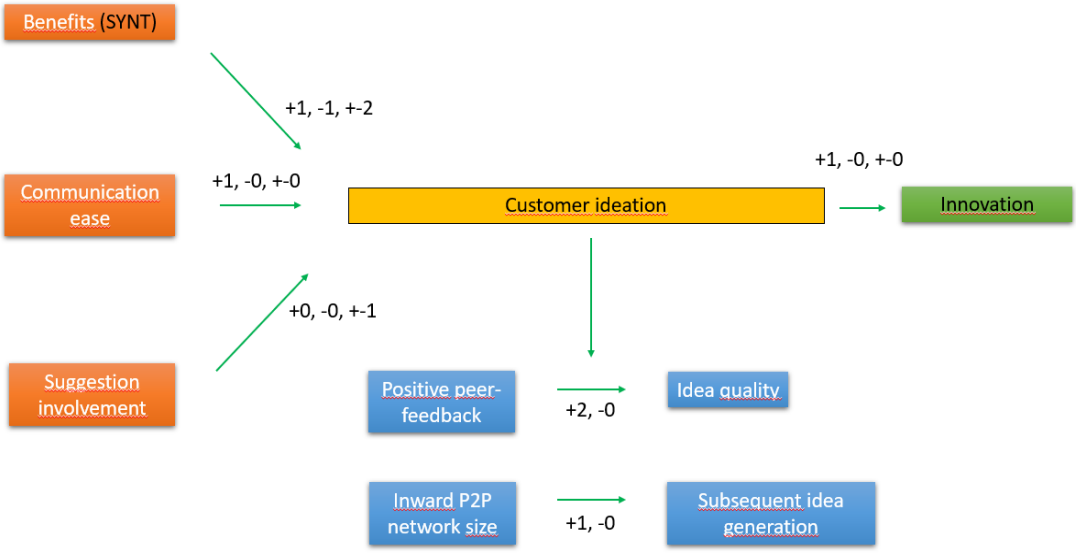

Figure 5. "Customer ideation" analysis done manually, based on variables relationships

The analysis performed with the use of VOSviewer (Figure 4) shows the relationship between the most frequently used keywords. They indicate their mutual relations with a special role of *participation*. The variable mapping result (Figure 5) points to the key variable (*customer ideation*), its antecedents (*benefits, communication ease, suggestion involvement*) and consequences (*innovation*). In addition, it points to the role of customer innovation as a moderator of relationships between *positive peer-feedback* and *idea quality* as well as *inward P2 network size* and *subsequent idea generation*. Finally, the model identifies the number of positive, negative, and insignificant relationships for each pair of variables (the numbers close to the arrows).

The above observations allow to create differences between the classic mapping approach and the variable mapping approach (Table 1).

Feature	**Classic mapping (VOSviewer)**	**Variable mapping**
Identification of relationships between the analyzed concepts	yes	yes
Variable clustering	possible, based on algorithms	not possible
Words analysis	key words, terms	variable names
Focusing on variables	not possible	possible
Concentration on one phenomenon	limited	full
Identification of the direction and strength of relationships between the analyzed variables	not possible	possible
Identification of consequences and	not possible	possible

antecedents of the studied phenomenon		
Concentration on the selected variable as a moderator of other unions	not possible	possible

Table 1. Classic mapping and variable mapping.

The analysis shows the advantage of variable mapping in the formulation of the research problem formulation and thematic/content analysis. In the former, identifying a research gap is visible, owing to the clear and comprehensive analysis of the relationships between the variables. In the later, the analysis of relationships between variables enables the creation of a story with an indication of the directions of relationships between variables, and not only the relationships between keywords.

Additionally, as a result of 7 individual interviews, we obtained opinions on the usefulness of both maps in the field of research problem formulation and content/thematic analysis. Scientists emphasized the readability and precision of variable maps. They justified its direct usefulness in identifying research gaps and building an interesting content narration. They also emphasized a relatively high level of information unambiguity, as opposed to classic maps.

6. Discussion

The article compared science maps made with the classic science mapping approach (VOSviewer) and the variable mapping method. We verified the usefulness of both approaches in research problem formulation and thematic/content analysis. The results of the analysis show that variable mapping in both cases is more effective than classic mapping.

Demonstrating the advantage of the new approach over the current one may be a significant step towards developing thinking about the synthesis of literature and its reviews. General analysis may give way to detailed ones, known from the meta-analysis. Although variable mapping does not aspire to the status of a meta-analytical method, it is worth noting that it is a synthesis of classic mapping as a bibliometric method and a meta-analysis of the version of *meta-analytic path analyses (MAPA)* (Earnest et al., 2011; Hagger et al., 2016; Möller et al., 2009) and *meta-analytic structural equation modeling (MASEM)* (Brown et al., 2008; Carr et al., 2003; Mackay et al., 2017; Zaremohzzabieh et al., 2020). The considerable methodological rigor characteristic for meta-analytical approach makes them impossible to be used for many articles with different characteristics (Tomczyk, 2022). Variable mapping sticks with much less criteria, out of which the most important one is source articles' quality.

The growing popularity of literature reviews and meta-analytical research spurs the development of research methods in this field. Variable mapping seems to be a simple and effective method and acceptable to both supporters of traditional mapping and path meta-analysis fans.

7. Limitations

The variable mapping method has some limitations: 1) it only covers quantitative articles, 2) ambiguous terminology makes it difficult to unequivocally identify the variables, 3) multiple subscale latent variables make it difficult to identify the role of the first-order construct unequivocally.

8. Future research

Future research should include addressing the constraint issues. Moreover, it is necessary to develop software to automate the variable mapping process. Manually creating maps is

highly laborious and time-consuming. Therefore, it is necessary to conduct a series of tests aimed at assessing the reliability of the proposed automation algorithm.

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