A research methodology for systematic literature reviews: application to zone picking and preliminary results

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Abstract: The aim of this paper is to provide a methodology for conducting a systematic literature review (SLR) relating to research field of zone picking and to propose some preliminary results on this topic. The proposed methodology (called DEBABA – see below) has been applied in this paper to the topic of zone picking but can actually be replicated and used by anyone who has an interest to conduct SLRs. The steps followed for the review are as follows: Data extraction (DE) → after having identified the topic of scientific relevance (in this case «zone picking»), it's necessary to perform the bibliographic research on the identified topic. Bibliographic analysis (BA) → statistical (descriptive) analysis on the articles collected. Bibliometric analysis (BA) → quantitative techniques for analysing the data extracted from databases. This method of literature review lays the foundations for carrying out a correct review, by studying the evolution of a topic over time and identifying the most prominent topics and authors, in order to provide a complete overview and classification of the existing research on a particular topic, summarize and synthesize the available knowledge on this topic and identify the limitations of the literature to propose future lines of research. To show its usage, some preminary results of the application of the proposed approach to the topic of zone picking are presented and discussed.

Keywords: literature review – SLR - bibliographic analysis - bibliometric analysis – zone picking.

1. Introduction

Reviews of scientific studies are today a very widespread research methodology, as they allow to acquire a deep knowledge about a topic, integrate various research findings and delineating trends in research field (Peters et al., 2015). In recent years, various review types have emerged and their respective methodologies have been developed to ensure precision of the analysis (Grant & Booth, 2009). One of the most diffused review types is the so-called 'scoping review' (Arksey & O'Malley, 2005), which are useful for categorizing the existing literature in a given field in terms of its nature, features, and volume. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) is another structured approach to literarure reviews (Liberati et al., 2009). The PRISMA approach was developed in the healthcare area and is an evidence-based minimum set of items aimed at helping authors to report a wide array of systematic reviews and meta-analyses. The approach consists in a checklist of 27 items, which guides the author in the development of the review, starting from the selection of studies to be taken into account in the review and ends with the discussion and conclusion of the review itself. Compared to traditional reviews, a systematic literature review (SLR) identifies, selects and critically appraises research, for answering a clearly formulated question (Dewey & Drahota, 2016). A SLR must follow a clearly defined protocol or plan where the criteria are clearly stated before the review is conducted. The purpose of conducting a SLR is to enable the researcher to map existing intellectual knowledge and propose future research studies (Tranfield et al., 2003). Unlike traditional narrative reviews, SLR allows the use of a defined and replicable process that aims to minimize bias by exhaustively searching the literature of published and unpublished studies and by providing an audit trail of the decisions, procedures and conclusions of the reviewers (Cook et al., 1997). Comparing SLR with scoping review, it is possible to notice clear differences: scoping reviews do not aim to produce a critically appraised and synthesized result/answer to a particular question, and rather aim to provide an overview or map of the evidence (Munn et al., 2018). Instead, SLRs are a type of research synthesis conducted by review groups with specialized skills, who set out to identify and retrieve international evidence that is relevant to a particular question and to synthesize the results of this search to inform practice, policy and create the basis for future literature searches (Pearson, 2004; Liberati et al., 2009). SLRs have specific advantages: they draw reliable and accurate conclusions, help to reduce the time delay in the research discoveries to implementation, improve the generalizability and consistency of results, and overall they increase precision

of the results (Greenhalgh, 1997). Moreover, they have been argued to provide the most efficient and high quality method for identifying and evaluating extensive literatures (Mulrow, 1994). In the industrial engineering field, Durach et al. (2017) have delineated an approach for carrying out systematic literature reviews (SLRs) in the supply chain area. The rationale for this new approach is that SLRs have been mainly used in the medicine and helthcare field, while they have made limited contributions to developing knowledge in the supply chain management domain; at the same time, however, research in supply chain management has grown in number and thus, SLRs are appropriate. Similar considerations have been recently highlighed by Snyder (2019) discussing the use of SLRs in the field of business research. What is certainly true is that evaluating the existing knowledge is the starting point of any academic research activities, regardless of the specific discipline, and doing that activity accurately is a prerequisite of all academics. However, this task has become increasingly complex and knowledge production as acceletaed in recent years, at the same time remaining fragmented and interdisciplinary (Snyder 2019). In addition, although SLRs are considered one of the best methods for obtaining a definitive answer to a research question, there are some limitations associated with it, such as location and selection of studies, heterogeneity, loss of information about results important, inappropriate subgroup analyses, conflict with new experimental data and duplication of publication (Gopalakrishnan & Parasuraman, 2013). In line with the considerations above and taking into account recent approaches and findings about literature analyses, this paper proposes a structured methodology for carrying out a SLRs in the logistics field. The review methodology proposed grounds on the SLR approach by Tranfield et al. (2003). This latter is integrated by adding some specific, in-depth and explanatory analyses. To be more precise, the initial step of the proposed methodology involves carrying out a bibliographic research on the zone picking theme through the use of scientific databases (Scopus will mainly be used). This step allows to obtain a significant group of papers on the topic under consideration. Bibliometric analyses and bibliographic analyses are then suggested for deriving value-added information on this set of papers. Bibliographic analyses are statistical (descriptive) analyses conducted through Excel which have the aim of studying the temporal distribution of articles, their distribution between papers and between countries and carry out a frequency-persistency keywords analysis. Bibliometric analyses, on the other hand, are quantitative techniques used for the analysis of data extracted from a database. They allow to highlight the most prominent topic or the most prominent authors in a given study field (in our case the study of zone picking). These analyses are typically conducted using specific software packages (such as Gephi, HistCite). At the end of these steps, the group of papers necessary to carry out the literature review is obtained. This method of literature review lays the foundations for carrying out a correct review, by studying the evolution of a topic («zone picking») over time and identifying the most prominent topics and authors, in order to provide a complete overview and classification of the existing research on a particular topic, summarize and synthesize the available knowledge on this topic and identify the limitations of the literature to propose future lines of research. For testing purpose the application of the proposed method to the specific theme of zone picking is also presented, together with some preliminary results of the review. The topic has been chosen for conducting a systematic literature review because it is a little studied topic in the literature and there are no studies that propose a SLR regarding about zone picking. The authors of the manuscript at hand plan to conduct a detailed literature review on this topic in the future and through the explanation of this SLR methodology they can anticipate some preliminary results.

The remainder of this article is organized as follows. Section 2 details the research methodology adopted for the literature survey. Section 3 and section 4 detail the review results, which include bibliographic and bibliometric analysis on the sample of papers reviewed. Finally, in section 5 the conclusions are carried out.

2. Literature review method

2.1 Phase 1: Search queries

This section illustrates the first steps of the methodological approach for systematic literature reviews, i.e. the creation of the sample of papers relevant to the chosen topic (in this case "zone picking"). The primary database used to search and find an adequate cluster of papers necessary for this review was Scopus (www.scopus.com). In addition to Scopus, the following databases could be used to search for those papers which are not accessible on it: Web of Science (www.webofknowledge.com), Ebsco (search.ebscohost.com) or ResearchGate (www.researchgate.net). As it can be seen from Table 1, for the purpose of this paper different queries were conducted using various combinations of serch keywords (i.e. "Zone picking"; "Zoning" AND "picking"; "Picking zone"; "Simultaneous" AND "zone" AND "picking"; "Pick and pass") and setting the search field as "Article title, Abstract and Keywords". A point which is typically not covered in methodologies for SLRs (e.g. by Tranfield et al. 2003) is the use of the correct keywords in the search. For identifying the correct keywords to use, it is necessary to first read some papers of the topic under study. Indeed, scientific writing does not impose any specific rule to authors for the usage of keywords (Hartley, 2008; Murphy, 2010); as a consequence, what frequently happens is that authors can use various terms for indicating similar concepts, all relating to the topic under investigation. In the case of zone picking, we noticed that many authors use "pick and pass" instead of "zone picking", with the same meaning; this could be recognised only after reading some articles first. Setting possible constraints about the publication year is a further

important point. In general, constraints could also be not set, in case the prospective authors are interested in collecting all relevant papers published on a specific topic. However, in case, e.g., a previous review on a similar (or the same) topic as that targeted by the prospective authors has already been carried out, it is reasonable to collect papers taking the previous review as a reference in terms of time (review period), with the purpose of updating it. In the case of zone picking, no contraints were set for the publication year, as there are no previous reviews on this topic. A total of 120 articles was obtained setting the queries as shown in Table 1. Some articles, especially conference papers, were not available on Scopus and could not be directly accessed or downloaded. This problem was solved by looking for the papers on other databases (the mentioned Web of Science, Ebsco, or ResearchGate) or, in the event that they were not even available there, by directly contacting the authors and asking for a copy of their paper.

Table 1: search queries made on Scopus.

Database	Searching terms	Number of articles
Scopus	"Zone picking"	34
	"Zoning" AND "picking"	39
	"Picking zone"	27
	"Simultaneous" AND "zone" AND "picking"	8
	"Pick and pass"	12

2.2 Phase 2: Inclusion criteria

Some inclusion criteria were defined ad applied to the cluster of papers found (as shown in Figure 1).

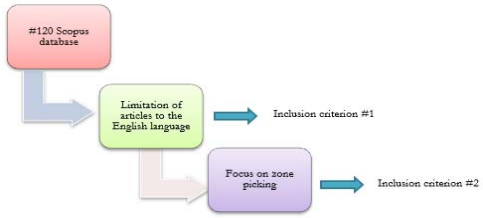


Figure 1: Inclusion criteria applied on the papers' cluster

Figure 1 shows the application of the inclusion criteria: the papers selected were limited to those written in English language (inclusion criterion #1) and whose focus was on the "zone picking" theme applied to warehouses (inclusion criterion #2).

2.3 Phase 3: Data extraction and elaboration

Once the cluster of articles has been obtained, it is possible to proceed with the next step of the proposed methodology, i.e. the extraction of data. For all the papers resulting from the different queries, some basic information has been directly extrapolated from Scopus in CSV Excel format, such as: Author(s), Document title, Year, Source title, Citation count, DOI, Author keywords. Moreover, some elaborations were made on the data extracted. To be more precise, propedeutic to phases 2 and 3, the number of citations per year was calculated. This is a normalized index reflecting the number of times an article has been cited by other articles in one year. It is important to use this index to evaluate the impact of papers instead of the absolute number of citations, since older articles are more likely to have been cited over time. Taking year 2020 as a reference, the number of citations/year is given by:

$$\#\text{citations/year} = \frac{\#Citation}{2020 - Paper's\ pubblication\ year + 1}$$

(1 is added to avoid division by 0).

3. Bibliographic analysis

After collecting a significant number of papers, the next phase is to conduct bibliographic analyses on the cluster of papers found. Bibliographic analyses are statistical analyses that have the following objectives:

1. Study of the theme's evolution: distribution of papers by year and distribution of papers among the various journals.
2. Study of the topic's and subtopics evolution: this is enables by the keywords' analysis, i.e. the study of frequency, that is the number of times a keyword has appeared in the research, and persistency, that is the use of the keyword over time (Fadlalla and Amani, 2015).

3.1 Phase 1: Descriptive analyses on the theme's evolution

To meet the first objective, it is necessary to study the distribution of papers per year and the distribution of papers among the various journals. Regarding the distribution of papers across the years, a pivot table was created in Excel. The result shows the distribution of papers per year related to zone picking theme. These data and trend are shown in Graph 1.

Graph 1: trend of the papers' distribution per year

As Graph 1 shows, time span of the publications ranges from 2000 to 2020, although for the purpose of this study, no constraints were set for the year of the publication of papers. More precisely, a first publication related to zone picking appeared in 2000, followed by a second publication in 2002 (no publications in 2001) and a certain continuity in publications up to the year 2020 with a total of 6 publications. This number is expected to increase over the years, since the trend of publications, as can be seen from the table and the respective graph, is increasing, especially starting from 2019, in which the highest number of publications (10 papers) was observed.

As far as the second aspect of this step, i.e. the study the papers' distribution among the journals, a further pivot table was created using Excel, inserting the journal titles in row and displaying the number of published papers. This allows to derive the papers published by each journal on the topic under consideration. With reference to zone picking, it can be seen that the most prominent journal is the "International Journal of Production Research", with 7 papers published in total. This journal is followed by "Computers and Industrial Engineering" with 6 papers published, and "European Journal of Operational Research" and "Modern Materials Handling" with 5 papers published.

3.2 Phase 2: Topic's and subtopics' evolution: keyword analysis

To meet the last objective of this step, i.e. the study of the topic's and subtopics evolution with respect to the theme "zone picking", a keywords' analysis was carried out. The keywords' analysis is based on the study of the "authors' keywords" field of Scopus, which reflects the keywords defined by the authors when writing their paper. By using the data set elaborated in Excel (see the previous 'Data extraction and elaboration' section), the papers that don't have keywords (i.e. 13 papers) have been removed from this analysis. The total number of papers used for the keywords' analysis is 69. It may happen that different authors use different words to indicate the same concept. For an effective and consistent analysis it is therefore important to always use the same spelling for similar words, as well as to eliminate the distinction between singular and plural in words and keep the same character's formatting for similar words (such as singular/plural, uppercase/lowercase letter). Some of the main substitutions that were performed on the keywords resulting from the sample of papers reviewed are as follows:

- Distribution center; DC → Distribution center
- Order batch, Order batching → Order batching
- Picker routing; Picking route → Picker routing
- Picking zone; Zone picking; Zoning → Zone picking
- Warehouse; Warehousing; Warehousing system → Warehouse.

The goal of the keywords' analysis is to evaluate the frequency with which the keywords appear and their usage in time. This was once again done in Excel using a pivot table. As far as the year, both the "minimum" value (i.e. the first time a keyword appeared) and the "maximum" value (i.e. the last time the same keyword hs been used by authors) were recorded. The result were depicted in a table (Table 2), in which the frequency reflects the total number of times a keyword has appeared, and the persistency represents the usage of the keyword over time (i.e. the number of years in which it has been used).

Table 2: Authors' keywords with frequency and persistency

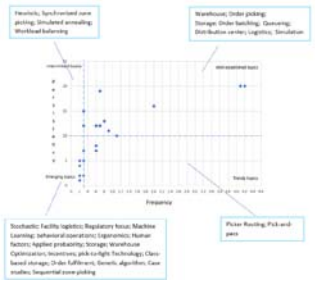
Keywords	Max di Year	Min di Year	Frequency	Persistency
Warehouse	2020	2000	42	20
Order picking	2020	2000	41	20
Zone picking	2020	2004	20	16
Storage	2019	2009	11	10
Order batching	2019	2008	9	11
Logistics	2020	2007	8	13
Simulation	2019	2000	7	19
Queueing	2020	2008	7	12
Picker routing	2019	2011	6	8
Distribution center	2017	2005	6	12
Pick-and-pass	2015	2008	6	7
Heuristic	2017	2002	3	15
Case studies	2020	2015	3	5
Synchronized zone picking	2020	2005	3	15
Sequential zone picking	2018	2011	3	7
Incentives	2016	2014	3	2
Simulated annealing	2019	2007	3	12
Workload balancing	2020	2008	3	12
Cleri-hand storage	2019	2014	2	5
pick-to-light Technology	2020	2016	2	4
behavioral operations	2016	2014	2	2
Ergonomics	2019	2017	2	2
Stochastic	2009	2008	2	1
Facility logistics	2019	2018	2	1
Order fulfillment	2017	2012	2	5
Genetic algorithm	2016	2011	2	5
Human factors	2019	2017	2	2
Regulatory focus	2016	2015	2	1
Applied probabilistic	2011	2009	2	2
Machine Learning	2018	2017	2	1

To be more effective, Table 2 focuses on keywords with a frequency of ≥2 and therefore excludes some keywords that are difficult to group with others. Typically, these keywords refer to very specific or niche topics and have a frequency of 1 each. From Table 2 it is possible to see that the most common keyword is warehouse (with a frequency of 42), followed by order picking (41) and zone picking (20). This result is quite interesting: the word zone picking, despite being the third most used keyword, has not been used a high number of times, despite the fact that it is the central theme of this research. This suggests that zone picking alone is little studied, while it is probably explored in conjunction with the more general theme of order picking. This is also evident from the fact that the number of articles found about zone picking alone is relatively small (69 total articles resulting from the keywords' analysis). van Gils et al. (2018) have also noted that zone picking has in general received little attention in the literature despite its important impact on the performance of order-picking systems. This may be due to the fact that zone picking still has experienced few applications in practice; in turn, this can be justified on the basis of the consideration that order picking (as opposite to zone picking) is the most widespread solution in many real warehouses. Another reason for the limited applications could be the complexity of implementing zone picking in practice. Following the classification suggested by Fadlalla and Amani (2015), the themes that emerged from the analysis of keywords were clustered into into four groups:

- Intermittent topics: topics with a reduced frequency and high persistency, which means that they were used for the first time many years ago.
- Emerging topics: topics with a reduced frequency and low persistency, which means that they were used for few years.
- Well-established topics: topics with a high frequency and high persistency. These are topics well-known and well-established in literature.
- Trendy topics: topics with a high frequency and low persistency. These are sectors that are starting to acquire relevance.

On the basis of this classification, a graph (Graph 2) was created to highlight the subdivision of the keywords into the 4 groups identified for the topic of zone picking, taking into account the frequency and persistency. The

demarcation line dividing persistency into high/low values was obtained by simply dividing the time span of publications by 2, i.e. (2020-2000)/2=10. On the contrary, the demarcation line that divides the frequency into high/low values was obtained by calculating the median of all frequencies, which, with the data available, scores 3. This analysis generates an overview of the main research areas relating to the zone picking theme, as well as the categorization of research themes based on their importance to the scientific community.



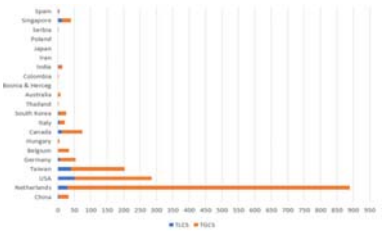
Graph 2: grouping of keywords based on their frequency and persistency

4. Bibliometric analysis

Bibliometry is a discipline that applies mathematical and statistical methods to the study of scientific publications to show their impact within the scientific community. It adopts quantitative techniques for the study of scientific papers extracted from bibliographic databases. Bibliometric analysis allows to highlight the most prominent topic or the most prominent authors in a given study field (in our case, the zone picking field) through citation analysis. This latter is a tool for measuring the importance or impact of an author, paper or publication by counting the number of times that author, paper or publication has been cited by other papers. Furthermore, bibliometric analysis also allows to carry out co-citation analyses. Co-citation analysis was introduced by Henry Small in 1973 as an indicator of similarity between documents. Two documents are said to be co-cited when both are cited from a third document. If documents A and B are both cited from document C, they can be said to be related to each other, even if they are not cited directly and this means that they both work on similar issues. If more papers are cited by other papers, their relationship becomes stronger and stronger. Co-citation frequency is defined as the frequency with which two documents are cited together. The co-citation analysis therefore aims at identifying clusters of authors or research groups working on common themes. Bibliometric analysis can be carried out through specific software packages, such as HistCite, BibExcel, Gephi, VosViewer, or R. Bibliometric analysis allows to study:

- Local/global citations per year: this is the minimum number and the maximum number of times a study has been cited by other studies in the years considered by the research.
- Citations by country: this step allows to analyse the countries from which the main citations about zone picking theme come from.
- Co-citation analysis: this analysis allows to study the importance or impact of an author, article or publication by counting the number of times that author, article or publication has been cited by other studies of this research.

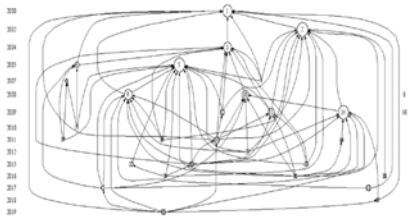
For the purpose of this paper, the key results of a co-citation analysis conducted on the zone picking papers using HistCite and Gephi will be presented. The HistCite software provides a visualization of the timeline of citations, identifies the most cited papers and the impact of these citations (Garfield, 2009). Unlike bibliographic analysis, the data are no longer extrapolated from Scopus but from ISI-Web of Knowledge database in Plain Text format, which is the format encoded by HistCite. HistCite allows in particular to evaluate the "total local citation score" (TLCS) of a paper, i.e. the number of times a paper is cited by the other papers of the research in question, and the "total global citation score" (TGCS), reflecting the number of times a paper is cited by all the papers indexed in ISI-Web of knowledge. In addition to the citations by year, HistCite allows to evaluate the citations by country. In this respect, Graph 3 was created to show the citations of papers in the various countries that have dealt with the study of the zone picking theme. From this graph it is evident that the country from which the publications with more citations come is Netherlands with a total of 889 citations (including "total local citation" and "total global citation") followed by USA (285 citations), Taiwan (203 citations) and Canada (74 citations). This result leads to the conclusion that these countries are strongly interested in zone picking theme. On the contrary, there are countries that appear to be less interested in this topic, as suggested by the low TLCS and TGCS indices; these countries are Hungary, Thailand, Australia, Bosnia, Colombia, Iran, Japan, Poland, Italy, Serbia and Spain. The logical consideration is that zone picking is probably in an early stage of adoption in these countries.



Graph 3: Histogram of citations by country

To demonstrate the evolution of the research over time, a citations map was created (see Graph 4) using the "Graph Maker" tool of HistCite. This tool facilitates the identification of the key research topics on zone picking. For building this graph, the number of articles was limited to 30, as they represent the most relevant and most cited articles of this research. The arrows in the graph indicate the papers that quoted other papers: for example the arrow starting from circle 4 and reaching circle 1 indicates

that paper 4 has cited paper 1. The size of the circles is proportional to the number of citations: the larger the circle, the more the paper is cited.



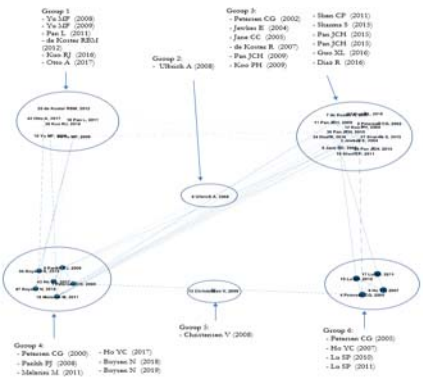
Graph 4: citations map through HistCite

The numbering of papers in Graph 4, i.e. the number placed inside each circle, is clarified in Table 3, which also indicate the local citations score (LCS) and global citations score (GCS) of the papers.

Table 3: papers in the citations map of graph 4.

N°article	Article	LCS	GCS
1	Petersen CG, 2000, PROD OPER MANAG, V9, P319	15	60
2	Petersen CG, 2002, INT J OPER PROD MAN, V22, P781	20	62
3	Javier E, 2004, COMPUT OPER RES, V20, P623	11	28
4	Petersen CG, 2005, INT J OPER PROD MAN, V25, P997	4	32
5	Jane CC, 2005, EUR J OPER RES, V160, P499	20	38
6	Ho YC, 2007, LECT NOTES COMPUT SC, V4707, P621	2	3
7	de Koster R, 2007, EUR J OPER RES, V182, P481	0	640
8	Ulbrich A, 2008, 22ND EUROPEAN CONFERENCE ON M, P434	0	0
9	Pazhh PJ, 2008, TRANSPORT RES E-LOG, V44, P896	11	38
10	Yu MF, 2008, IIE TRANS, V40, P1034	8	16
11	Pan JCH, 2009, COMPUT IND ENG, V57, P201	7	19
12	Koo PH, 2009, OR SPECTRUM, V31, P739	3	21
13	Christensen V, 2009, ECOL MODEL, V220, P2582	0	31
14	Yu MF, 2009, EUR J OPER RES, V198, P480	17	39
15	Lo SP, 2010, 2010 THE 3RD INTERNATIONAL CO, P461	0	0
16	Pan L, 2011, IN C IND ENG MAN, P136	1	3
17	Lo SP, 2011, 2011 INTERNATIONAL CONFERENCE, P482	0	0
18	Meloteo M, 2011, INT J ADV MANUF TECH, V53, P841	3	12
19	Shen CP, 2011, CHIN J MECH ENG-EN, V24, P820	1	1
20	de Koster RBM, 2012, INT J PROD RES, V50, P757	0	30
21	Stamos I, 2013, INT J PRODUCT PERFOR, V64, P870	2	11
22	Pan JCH, 2013, COMPUT IND ENG, V65, P1	2	24
23	Pan JCH, 2013, OMEGA-INT J MANAGE S, V37, P238	3	23
24	Guo XL, 2014, INT J PROD RES, V54, P2405	1	14
25	Diaz R, 2014, INT J PROD RES, V54, P2467	1	4
26	Koo PJ, 2014, APPL SOFT COMPUT, V46, P143	1	13
27	Otto A, 2017, OR SPECTRUM, V39, P943	2	13
28	Ho YC, 2017, COMPUT IND ENG, V113, P241	4	6
29	Boysen N, 2018, EUR J OPER RES, V271, P386	1	6
30	Boysen N, 2019, EUR J OPER RES, V277, P396	3	27

The results provided by the citation map of HistCite which indicated the co-citations of authors and thus suggested possible relationships between the research topucs or groups, can be confirmed using the Gephi software, which allows to carry out a cluster analysis (using the "Force Atlas" layout) to highlight the research groups working in similar fields. In particular, in line with what has been shown in Graph 4, it is expected that the papers (circles) that were located close to each other in that graph will belong to the same cluster after the analysis with Gephi. Using the same settings of Graph 4 (i.e. limiting the papers to 30 which represent those most connected and used in this research work), cluster analysis led to the identification of 6 groups, that can be seen in Graph 5.



Graph 5: cluster analysis.

The dark blue dots in the graph denote the papers which have the highest level of connection, while the light dots represent papers with a low level of connection. This graph is interesting to highlight similar research studies; commenting on this graph in detail cannot be made here because of the constraints in the length of the paper, but it can be anticipated that this preliminary grouping will be the basis for a more detailed review of the literature about zone picking that will be done in future studies.

5. Conclusions

This paper has suggested a set of steps to be followed when conducting a SLR on a scientific topic and applied them to the theme of zone picking, for testing purpose as well as for providing a preliminary overview of the research in this area. From a technical point of view, the key contribution of the paper is to delineate an approach for carrying out SLRs starting from methodology proposed by Tranfield et al. (2003), which is integrated with both practical considerations and a set of analyses derived from the bibliometric discipline and the available literature. To be more precise, the proposed methodology starts from the sample creation and then combines a set of different analyses which are suggested for gaining a complete understanding of the research field. The proposed methododology ground on three basic steps: 1) Data extraction: this phase allows to identify a cluster of scientific studies; 2) Bibliographic analyses: these are statistical (descriptive) analyses that can be carried out on the sample of papers collected or on their metadata; 3) Bibliometric analyses: these are quantitative techniques for analysing the sample of articles and the data extracted from databases. *Via* these three steps, the proposed approach is expected to help generate topic-specific knowledge and analyse the state-of-the-art of the literature, synthesizing existing research and underlining the main themes of the literature, with particular attention to emerging ones that will be useful to identyfing suitable lines for future research activities. Moreover, being general in nature, the proposed approach could actually be replicated in any research field, in which a prospective author is interested in conducting a systematic literature review. From a more practical point of view, the proposed approach has been applied to the specific topic of zone picking, for testing purpose. This choice was motivated by the fact that this theme, as opposite to order picking, has in general received little attention in literature and would actually benefit from a detailed review of the literature; moreover, there are no SLRs on zone picking. In this respect, this paper has also shown some preliminary results from the application of the proposed methodology to this field of research, together with the main implications. Looking at these preliminary outcomes, by observing the trend of publications in time, it can be seen that the attention of academic research on the topic of zone picking has grown rapidly in recent years: 2019 was the year in which the greatest number of published papers was observed. This outcome suggests that the zone

picking literature is expanding, which could be probably related to the advent of e-commerce, being zone picking one of the best solutions suitable for responding to faster deliveries of smaller and more frequent orders. Similarly, the bibliographic analyses allowed to map the keywords (subtopics) covered by the zone picking literature and to group them into four sets, according to the frequency and persistency of the subtopic itself. Finally, the bibliometric analyses, enabled by HistCite and Gephi, allowed to cluster the studies into groups which focused on similar research topics. Commenting on all these aspects in detail was not feasible, because of the constraints in the length of the paper; nonetheless, we can anticipate that these preliminary results will form the basis for a detailed review of the literature about zone picking that we plan to carry out in future studies.

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