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MAPPING KNOWLEDGE DOMAIN OF "TRANSPORT": A BIBLIOMETRIC STUDY OF ITS STATUS QUO AND EMERGING TRENDS

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Abstract. Transport plays an important role in human society. Due to its significance, the research journal TRANSPORT was established with the aim of developing and reinforcing the performance of national transport system based on theoretical and empirical investigations. The analyses such as transport policy, transport system fundamentals, multiple transport methods and traffic safety are all within the research scope of TRANSPORT. Therefore, this paper focuses on learning the development of this multidisciplinary journal by using the bibliometric tools. After analysing 704 papers published from January 2007 to June 2019 on TRANSPORT, the development of this journal is comprehensively analysed from the perspectives of its status quo and emerging trends. Specifically, the current status is introduced based on the general journal information, the publication and citation number, the citation structure and the significant contributors in terms of author, journal, institution and country. As for the emerging trends, the citation burst detections and the timeline view analysis are presented to give some deep insights of the hot research streams in certain time periods. This paper makes the contribution to provide a knowledge map of the journal TRANSPORT's research domain to help researchers learn this journal and transport-related issues clearly and directly. It can be also considered as the reference source for further investigations.

Keywords: transport, publishing, bibliometric, knowledge map, emerging trend.

Introduction

According to the explanation of "transport" in "The Cambridge Dictionary of Philosophy" (Audi 2015), it is defined as the movement of human beings, goods or cattle from one place to another. Look back on history, each evolution of transport leads to tremendous change in human society and civilization. From the Silk Road to the European Age of Exploration, from the invention of the steam engine to the launch of Apollo program, what we have eliminated is not merely geographic distances, but the gap between known and unknown. Therefore, transport plays a significant role for world development from different perspectives, making it more prevailing to research on transport-related issues. As one of the journals in this research area, TRANSPORT published its first issue (under the new title) in 2002. Later on, this journal releases many research outputs in different directions such as transport policy, transport system and traffic safety with the aim of developing and improving the national transport system through theoretical and empirical investigations. As a result, we are motivated to conduct a bibliometric study of the research published on TRANSPORT with regard to its status quo and emerging trends. This study makes contributions to provide access to a better understanding of transport-related issues. In addition, it helps researchers know more about the growth and aims of this journal.

To achieve the above aim, this paper is organized as follows: Section 1 introduces the basic information of TRANSPORT, then publications, citation numbers and citation structure of this journal are analysed in Section 2. Further, Section 3 gives some details about the significant contributors in terms of the influential papers, countries, institutions, and authors. The above sections comprehensively analyse the status quo of TRANSPORT. The emerging trends and hot spots of the research published on this journal are presented in Section 4. The conclusion is given in the last section.

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#Managing Editor of the TRANSPORT – the manuscript was handled by one of the Editors, who made all decisions related to the manuscript (including the choice of referees and the ultimate decision on the revision and publishing).

1. Basic information about TRANSPORT

In order to describe the current status of TRANSPORT, a general picture about its scopes and editor information is given. From the website of TRANSPORT, we can find that this journal is an international peer-reviewed journal including the main aspects of transport. It also provides a source of information for the engineer and the applied scientist. The detailed focuses of the publications can be found in Table 1. From this table, it can be seen that this journal focuses on many issues related to transport, such as transport policy, transport system, transport tools, transport economics and management, transport educology and history, etc. Obviously, these issues include all the hot and useful directions in the transport field.

We can also find that the first issue of this journal was published (under the new title) in 2002. From 2002 to 2005, this journal published papers bimonthly, namely 6 volumes every year. Then, this journal published papers quarterly from 2006 to 2017, namely 4 volumes every year. In 2018, it published 5 volumes. Until June 2019, 81 volumes were released. Moreover, this journal was indexed in *Clarivate Analytics Web of Science* in 2007. Now, TRANSPORT is indexed in many famous databases such as *Science Citation Index Expanded* (*SCI-Expanded*), *Ei Compendex*, and *Scopus*. In the *SCI-Expanded* database, this journal ranks 22/25 in the *Transportation Science & Technology* filed and belongs to a Q3 journal. In the *Scopus* database, this journal is classified as the Q2 journal. Note that this study focuses on the papers published in TRANSPORT and indexed in *Clarivate Analytics Web of Science*, and the analysed publications were published from January 2007 to June 2019.

Table1. The focuses of the TRANSPORT publications

Rank	Focuses
1	transport policy
2	fundamentals of the transport system
3	technology for carrying passengers and freight using road, railway, inland waterways, sea and air transport
4	technology for multimodal transportation and logistics
5	loading technology
6	roads, railways
7	airports, ports
8	traffic safety and environment protection
9	design, manufacture and exploitation of motor vehicles
10	transport energetics
11	fuels, lubricants and maintenance materials
12	teamwork of customs and transport
13	transport information technologies
14	transport economics and management; transport standards
15	transport educology and history

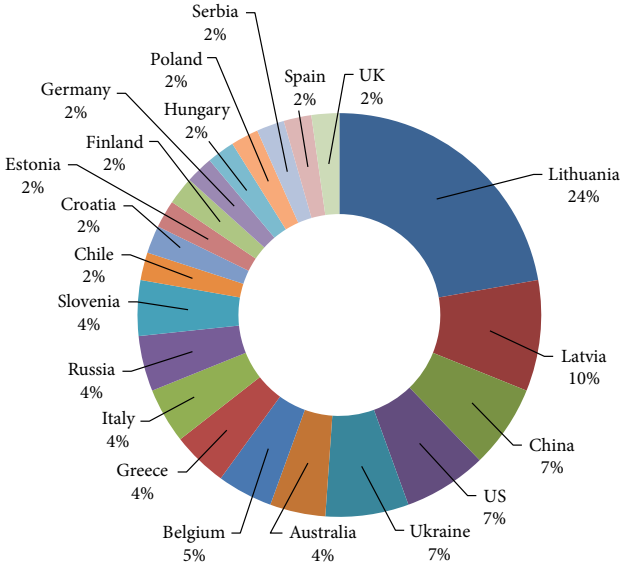

Figure 1. The national distribution of all the editors

In Table 2, we present the editor list of TRANSPORT. According to this table, we can find that Prof. Olegas Prentkovskis from Vilnius Gediminas Technical University has been elected Editor-in-Chief of the journal. Assoc. Prof. Raimundas Junevičius and MSc. Paulius Skačkauskas are respectively Deputy Editor-in-Chief and Managing Editor of this journal.

Figure 1 further presents the geographical distribution of the editors of this journal. From Table 2 and Figure 1, we can find that the editors come from different countries and institutions, showing that this is an international academic journal.

2. Research methodology

The betweenness centrality is a significant parameter for bibliometric tools such as *CiteSpace* and *VOSviewer* to investigate vital co-citing networks (Yu *et al.* 2019b). According to Chen (2004) and Yu *et al.* (2019c), the centrality can be considered as a node that quantifies the importance of its position in a network. Therefore, the centrality is calculated and defined as follows:

$$Centrality\left(node_i\right)=\sum_{i\neq j\neq k}\frac{\delta_{ik}\left(i\right)}{\delta_{jk}},$$

where: δ_{jk} represents the number of short paths between the nodes j and k; $\delta_{ik}\left(i\right)$ means the number of the short paths that cross the node i.

According to the betweenness centrality, this paper that makes significant contributions in specific areas or journals can be found. In addition, comprehensive investigations provided by the timeline and the burst detection are also identified based on betweenness centrality. Moreover, some key terms and indexes should be adjusted to present the analytic results more clearly and directly. For example, in terms of time slice, we select 1 year per

Table 2. The editor list of TRANSPORT

	Name	Country	Institution
Editor-in-Chief	Olegas Prentkovskis	Lithuania	Vilnius Gediminas Technical University
Deputy Editor-in-Chief	Raimundas Junevičius	Lithuania	Vilnius Gediminas Technical University
Managing Editor	Paulius Skačkauskas	Lithuania	Vilnius Gediminas Technical University
Associate Editors	Ying-En Ge	China	Shanghai Maritime University
	Kasthurirangan Gopalakrishnan	US	Iowa State University
	Georges Kouroussis	Belgium	University of Mons
	Vidas Žuraulis	Lithuania	Vilnius Gediminas Technical University
	Raimundas Junevičius	Lithuania	Vilnius Gediminas Technical University
	Paulius Skačkauskas	Lithuania	Vilnius Gediminas Technical University
Editors	Andrus Aavik	Estonia	Tallinn University of Technology
	Andrii Bieliatynskyi	Ukraine	National Aviation University
	John D. Bullough	US	Lighting Research Center, Rensselaer Polytechnic Institute
	Gintautas Bureika	Lithuania	Vilnius Gediminas Technical University
	Ivan Dyakov	Russia	Ulyanovsk State Technical University
	George Anastasios Giannopoulos	Greece	Hellenic Institute of Transport, Center for Research and Technology Hellas
	Sarfaraz Hashemkhani Zolfani	Chile	Catholic University of the North
	Mirano Hess	Croatia	University of Rijeka
	Valentin Ivanov	Germany	Ilmenau University of Technology
	Jolanta Janutėnienė	Lithuania	Klaipėda University
	Jadranka Jović	Serbia	University of Belgrade
	Igor Kabashkin	Latvia	Transport and Telecommunication Institute
	Uroš Klanšek	Slovenia	University of Maribor
	Iryna Klymenko	Ukraine	National University of Transport
	Pavlo Maruschak	Ukraine	Ternopil Ivan Pul'uj National Technical University
	Gabriella Mazzulla	Italy	University of Calabria
	Enrique Onieva	Spain	University of Deusto
	Sergey Panin	Russia	Institute of Strength Physics and Materials Science, Siberian Branch of Russian Academy of Sciences
	Orazio Pellegrino	Italy	University of Messina
	Carlo Giacomo Prato	Australia	University of Queensland
	Laurencas Raslavičius	Lithuania	Kaunas University of Technology
	Josep Maria Salanova Grau	Greece	Hellenic Institute of Transport, Center for Research and Technology Hellas
	Wafaa Saleh	UK	Edinburgh Napier University
	Marek Sitarz	Poland	University of Dąbrowa Górnicza
	Juris Smirnovs	Latvia	Riga Technical University
	Edgar Sokolovskij	Lithuania	Vilnius Gediminas Technical University
	Maksym Spiryagin	Australia	Central Queensland University
	Ulla Pirita Tapaninen	Finland	University of Turku
	Ádám Török	Hungary	Budapest University of Technology and Economics
	Elen Twrdy	Slovenia	University of Ljubljana
	Jānis Vība	Latvia	Riga Technical University
	Yonggang Wang	China	Chang'an University
	Dali Wei	US	Institute of Transportation Studies, University of California Berkeley
	Frank Witlox	Belgium	Ghent University
	Irina Yatskiv (Jackiva)	Latvia	Transport and Telecommunication Institute
	Shengyang Zhu	China	Southwest Jiaotong University

slice from January 2007 to June 2019. The appropriate thresholds are adjusted in the modelling and visualizing procedure to make the major results clear to see.

3. The publications, citation numbers and citation structure of TRANSPORT

In this section, the status quo and the development of TRANSPORT are analysed based on the annual publications and the citation number of this journal. It is believed that the publication and citation numbers can directly reflect the general development trend of TRANSPORT. In addition, the citation structure is presented to see the impact made by this journal in each year.

3.1. Data collection and analysis

We utilize two influential bibliometric analysis tools in this paper, namely *CiteSpace* and *VOSviewer* to present the network mapping and visualize the knowledge domain of TRANSPORT. Here, *CiteSpace* is a knowledge domain visualization software developed by Chen (2004). It is broadly utilized in different research areas such as computer science (Morar, Agachi 2010; Niazi, Hussain 2011; Yu *et al.* 2019a, 2019d), medicine (Chen *et al.* 2012), psychology (Zhang *et al.* 2015), economy (Cui, Zhang 2018), and management (Ekanayake *et al.* 2019). Similarly, *VOSviewer* is a broadly used bibliometric tool, which was developed by Van Eck and Waltman (2007) to construct and view bibliometric maps. There are also many bibliometric investigations using *VOSviewer* from the perspectives of social science (Heersmink *et al.* 2011), computer science (Kozak *et al.* 2015; Stopar, Bartol 2019), neurosciences (Yeung *et al.* 2017), environmental health (Sweileh 2017), bioscience (Zhao *et al.* 2018), and sustainable logistics (Qaiser *et al.* 2017). It can be found that these two bibliometric analysis tools are different and can achieve different functions respectively. Therefore, both of these two tools are used in this paper.

In addition, *Clarivate Analytics Web of Science* is chosen as the data source, which includes the significant databases such as *SCI-Expanded*, *Social Sciences Citation Index* (*SSCI*), *Arts & Humanities Citation Index* (*A&HCI*), *Emerging Sources Citation Index* (*ESCI*). By searching the journal name "TRANSPORT", the amount of 704 publications on TRANSPORT are found. These papers have been published from January 2007 to June 2019. There are two reasons for this paper to select this research period:

1) this journal was indexed by *Clarivate Analytics Web of Science* in 2007;
2) the most up-dated data on *Clarivate Analytics Web of Science* are available in June 2019.

Figures 2a and 2b respectively list the annual distributions of the TRANSPORT citations and publications from January 2007 to June 2019. Due to the fact that even though TRANSPORT published the first issue in 2002, it was collected by *Clarivate Analytics Web of Science* until 2007. As can be seen from Figure 2, the number of the publications from 2007 to 2017 is relatively stable. It should be pointed out that the research outputs in 2018 reached the peak with 113 papers, which is about twice as many as those previous years. The publications in 2018 focus more on public transport and sea transport.

Moreover, Figure 3 shows the types of the TRANSPORT publications. From Figure 3, we can further find that all the publications in TRANSPORT are divided into 5 types according to the results given by *Clarivate Analytics Web of Science*. Articles occupy a large proportion of the whole publications with 670 papers, while 15 papers belong to the type of reviews and 10 papers are editorial materials. Moreover, 7 papers are classified as corrections. Additionally, there are only 2 papers about biographical items.

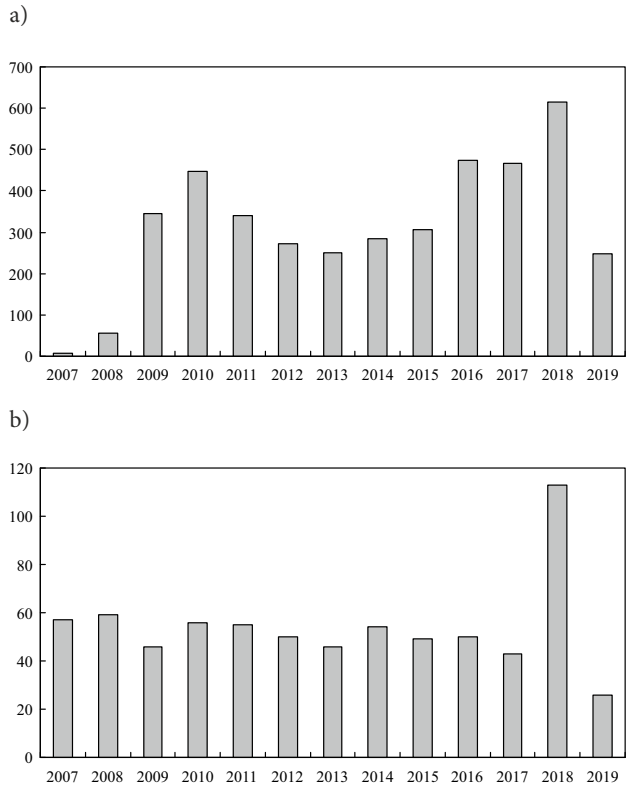

Figure 2. Distribution of the TRANSPORT publications and citations from January 2007 to June 2019: a – the citation number; b – the publication number

Figure 3. Types of the TRANSPORT publications from January 2007 to June 2019

3.2. Citation structure analysis of TRANSPORT

A key index to make an appraisal of the impact of an academic journal is its citation number. Thus, the impact factor of a journal is calculated and released annually to show its significance in specific research area. Therefore, in this subsection, we further analyse TRANSPORT on the aspect of citation structure.

First, we find that the citation number of TRANSPORT has two rising periods from 2007 to 2010 and from 2013 to 2018, respectively. In addition, the citation number of TRANSPORT in 2018 rose at the maximal point. Note that the publication and citation numbers of TRANSPORT in 2019 are incomplete. As a result, it means that the more people paid more attention to the research published in this journal in recent years and the previous papers in TRANSPORT have great impact on the study for current research area.

Second, Table 3 is given to demonstrate the annual publication characteristics of TRANSPORT, which could clearly present the detailed information of the TRANSPORT publications. In Table 3, "TP", "TC" and "AC" respectively mean the Total Publications, the Total Citations, and the Average Citations per paper in each year until 2019. Besides, "≥100", "≥50", "≥20", "≥10" and "≥5" represent different intervals of the citation numbers. These interval numbers are used to count the number of papers that reach the corresponding citations from January 2007 to June 2019.

Moreover, *h*-index is a useful parameter that can accurately evaluate the literature in terms of academic achievement. If the value is high, the achievement will be great (Díaz *et al.* 2016). From Table 3, it can be seen that as time goes by, the *h*-index roughly become lower. Similarly, AC roughly declines with the year. The publications in 2008 have the most TC, AC and *h*-index. In addition, according to the data from *Clarivate Analytics Web of Science*, there is 1 paper published in 2008 and it reaches the standard of "≥100", which means that the paper has been cited more than 100 times. Hence, the publications in 2008 contribute a lot to TRANSPORT. Moreover, the publications in 2008, 2010, and 2011 achieve the standard of "≥50", we will concretely introduce and analyse these papers in the following section.

4. Influential papers, countries, institutions, and authors of TRANSPORT

To further comprehensively show more information about TRANSPORT, the most influential papers, countries, institutions and authors are analysed in the following content.

Table 4 is provided to show the top 20 most cited papers in TRANSPORT from January 2007 to June 2019. We find that all the 20 papers were published before 2014. In particular, the paper "Multi-objective decision-making for road design" (Brauers *et al.* 2008) has the most TC with 108, which is far more than other listed papers. This paper focuses on developing and implementing a kind of way for multi-objective optimization of multi-alternative decisions in road construction and determines the best road design. The paper "A new fuzzy additive ratio assessment method (ARAS-F). Case study: the analysis of fuzzy multiple criteria in order to select the logistic centers location" (Turskis, Zavadskas 2010) is ranked at the second indicating the paper that makes significant impact on this field and the following authors. Turskis and Zavadskas (2010) introduced a new method to help people choose the best site, which also could be suitable for the field of construction, economics, technology and sustainable development.

Moreover, in Table 4, the author Sivilevičius is listed frequently. His most cited paper is "Modelling the interaction of transport system elements", which analyses

Table 3. TRANSPORT publication characteristics from 2007 to June 2019

Year	TP	TC	AC	*h*-index	≥100	≥50	≥20	≥10	≥5
2007	57	597	10.47	14	0	0	7	23	42
2008	59	763	12.93	15	1	3	8	27	43
2009	46	475	10.33	13	0	0	6	18	34
2010	56	514	9.18	11	0	2	4	15	38
2011	55	369	6.71	10	0	2	3	12	27
2012	50	260	5.2	9	0	0	0	7	26
2013	46	241	5.24	8	0	0	2	7	14
2014	54	271	5.02	8	0	0	2	7	19
2015	49	221	4.51	8	0	0	0	6	22
2016	50	177	3.54	6	0	0	1	2	13
2017	43	133	3.09	6	0	0	0	4	10
2018	113	97	0.86	4	0	0	0	0	3
2019	26	5	0.19	1	0	0	0	0	0
Total	704	4123	–	–	1	7	33	128	291
Percentage	–	–	–	–	0.14%	0.99%	4.69%	18.18%	41.34%

Notes: TP – total publications; TC – total citations; AC – average citations; *h*-index – Hirsch index.

the interaction of separate TS elements, it is concluded that there is no common model could be used to all types of interaction (Sivilevičius 2011). The 20 papers are all of great benefit to TRANSPORT.

Table 5 is provided to demonstrate the top 10 most influential countries of the TRANSPORT publications. As the country that subsidizes and publishes this journal, Lithuania is obviously the most influential country.

Table 4. Top 20 most cited papers in TRANSPORT from January 2007 to June 2019

Rank	Title	Author(s)	Year	TC	AC
1	Multi-objective decision-making for road design	Brauers *et al.*	2008	108	9.0
2	A new fuzzy additive ratio assessment method (ARAS-F). Case study: the analysis of fuzzy multiple criteria in order to select the logistic centers location	Turskis *et al.*	2010	77	7.7
3	The effect of iso-butanol-diesel blends on engine performance	Al-Hasan *et al.*	2008	64	5.3
4	Multiple-criteria decision support system in highway infrastructure management	Šelih *et al.*	2008	58	4.8
5	Modelling the interaction of transport system elements	Sivilevičius	2011	54	6.0
6	The criteria for identifying the quality of passengers' transportation by railway and their ranking using AHP method	Sivilevičius, Maskeliūnaitė	2010	51	5.1
7	Multiple criteria decision-making techniques in transportation systems: a systematic review of the state of the art literature	Mardani *et al.*	2016	47	11.8
8	Research on dry port concept as intermodal node	Jaržemskis, Vasilis Vasiliauskas	2007	47	3.6
9	Research on the quality of passenger transportation by railway	Maskeliūnaitė *et al.*	2009	40	3.6
10	Automobile transport system analysis and ranking in Lithuanian administrative regions	Jakimavičius, Burinskienė	2007	40	3.1
11	Developing a new hybrid MCDM method for selection of the optimal alternative of mechanical longitudinal ventilation of tunnel pollutants during automobile accidents	Hashemkhani Zolfani *et al.*	2013	33	4.71
12	The use of AHP and rank correlation methods for determining the significance of the interaction between the elements of a transport system having a strong influence on traffic safety	Podvezko, Sivilevičius	2013	33	4.7
13	Improvement of road safety using passive and active intelligent vehicle safety systems	Jarašūnienė, Jakubauskas	2007	31	2.4
14	Logistics freight center locations decision by using Fuzzy-PROMETHEE	Elevli	2014	28	4.7
15	Key factors affecting rail service quality in the northern Italy: a decision tree approach	De Oña *et al.*	2014	28	4.7
16	The impact of transport on the competitiveness of national economy	Mačiulis *et al.*	2009	28	2.6
17	The calculation and measurement of the natural frequencies of the bucket wheel excavator SchRs 1320/4×30	Gottvald	2010	27	2.7
18	Principle and benefits of third party logistics approach when managing logistics supply chain	Vasilis Vasiliauskas, Jakubauskas	2007	27	2.1
19	Measuring efficiency in transport: the state of the art of applying data envelopment analysis	Markovits-Somogyi	2011	26	2.9
20	Investigating traffic accidents: a collision of two motor vehicles	Prentkovskis *et al.*	2010	26	2.6

Table 5. Top 10 most influential countries of the TRANSPORT publications

Rank	Country	Continent	TP	TC	AC	*h*-index	≥100	≥50	≥20	≥10	≥5
1	Lithuania	Europe	242	2041	8.43	20	1	4	20	68	129
2	China	Asia	104	345	3.32	9	0	0	0	7	24
3	USA	North America	39	125	3.21	6	0	0	0	4	10
4	Serbia	Europe	36	117	3.25	5	0	0	1	3	8
5	Hungary	Europe	34	239	7.03	10	0	0	3	10	18
6	Poland	Europe	31	139	4.48	8	0	0	0	6	12
7	Turkey	Asia	27	183	6.78	8	0	0	2	6	15
8	Iran	Asia	26	181	6.96	8	0	0	2	7	12
9	Italy	Europe	25	136	5.44	7	0	0	1	2	13
10	Ukraine	Europe	24	130	5.42	7	0	0	0	4	10

The TP, TC, AC and *h*-index of the publications in Lithuania are all above those in other countries. Even more, there are 4 papers of Lithuania have been cited above the standard level of "≥50". In addition, among the 10 countries, there are 6 countries come from Europe that occupies the most proportion, the following is Asia. Notably, although Hungary is in the fifth place, the AC and *h*-index are second only to Lithuania. It is found that Hungary concentrates on the research in the scope of TRANSPORT and makes significant contributions to the growth and aims of this journal.

Figure 4 is given to show the country co-authorship network of the TRANSPORT publications. As we know, the co-authorship analysis is one of the most useful and practical method to study the relationship of cooperation (Reyes-Gonzalez *et al.* 2016). As a result, we set the threshold value of the minimum number of documents at 5, then 27 countries were selected. *VOSviewer* is used to present the country co-authorship network map. In the calculation process, the size of the node is determined by the publications' weights. More publications owned by a country leads larger label value of this country. Moreover, the line between each two countries denotes that they have connections, and the line's thickness reflects how close is the cooperation between these two countries. From Figure 4, we can find that Lithuania is the main contributor of TRANSPORT. It has 19 links and its total link strength is 52, which means that Lithuania has cooperated with other 19 countries, and 52 publications were written on the basis of the collaboration between Lithuania and the 19 countries. The following nation is China with 6 links and 20 total link strength. Nowadays, due to the development of international academic communication, there is an increasing number of collaborations among different countries to work on transport-related issues.

Table 6 lists the 10 most productive and influential institutions in TRANSPORT. It is obvious that the Vilnius Gediminas Technical University is the most influential institution in this journal. It has the highest TP, TC, AC and *h*-index values. It should be noted that although the publication number of Aleksandras Stulginskis University (currently Vytautas Magnus University) in this journal is relatively small with only 21 papers, the AC value of these papers is 7.62, which means the 21 papers are all influential and crucial for further research. In addition, among the 10 institutions, 40% of the institutions are from Lithuanian. Therefore, the published studies from Lithuanian institutions greatly impact the research of TRANSPORT.

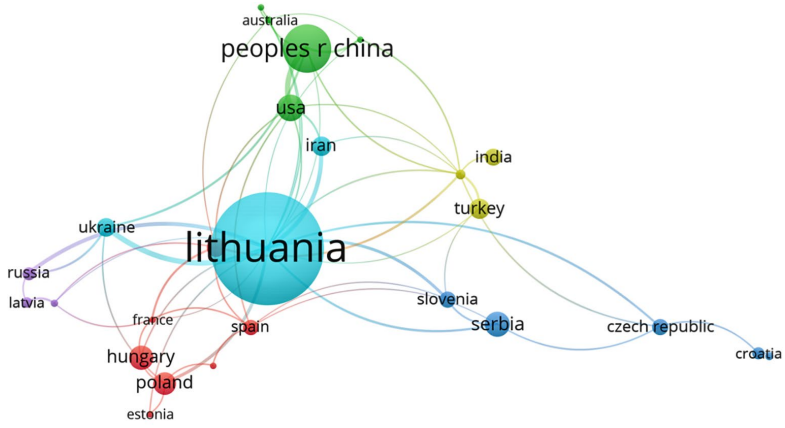

Figure 4. Country co-authorship network of the TRANSPORT publications

Table 6. The most productive and influential institutions in TRANSPORT

Rank	Institution	Country/territory	TP	TC	AC	*h*-index
1	Vilnius Gediminas Technical University	Lithuania	173	1661	9.6	19
2	University of Belgrade	Serbia	34	111	3.26	5
3	Budapest University of Technology and Economics	Hungary	31	204	6.58	9
4	Klaipėda university	Lithuania	29	120	4.14	6
5	Kaunas University of Technology	Lithuania	28	176	6.29	9
6	Aleksandras Stulginskis University (currently Vytautas Magnus University)	Lithuania	21	160	7.62	8
7	Southeast University	China	19	56	2.95	4
8	Indian Institute of Technology System	India	16	82	5.13	6
9	National Aviation University	Ukraine	14	68	4.86	5
10	University of Pardubice	Czech Republic	13	89	6.85	5

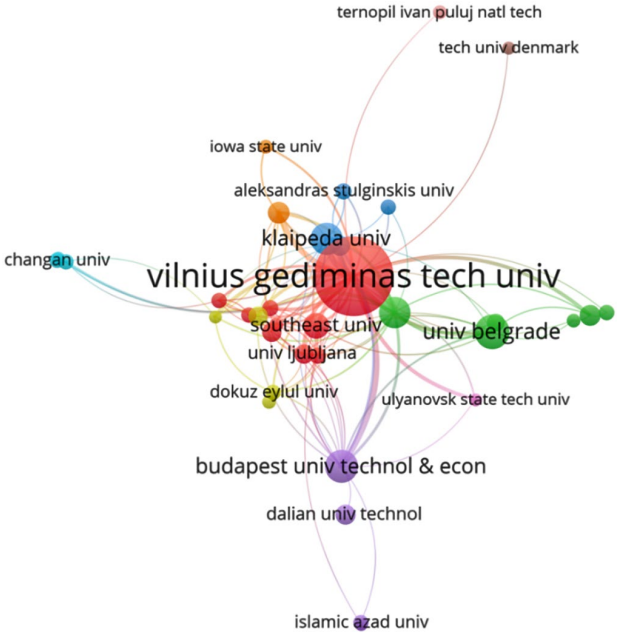

Figure 5. Organization citation network of the TRANSPORT publications

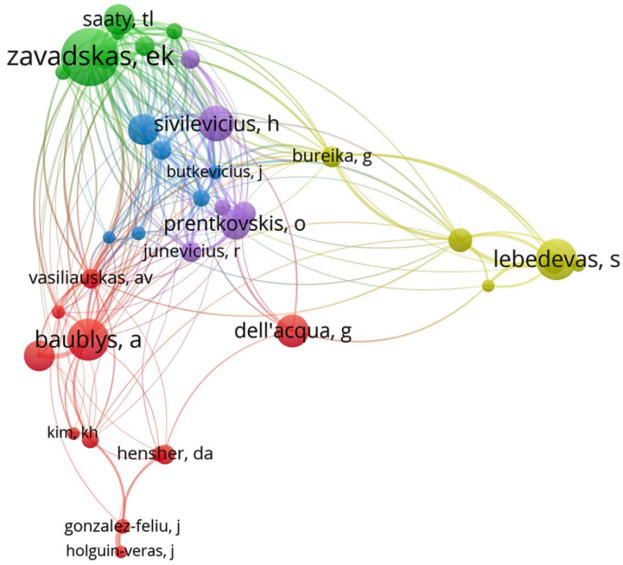

Figure 6. Cited authors' co-citation network of the TRANSPORT publications

The organization citation network is summarized in Figure 5. Similarly, we set the threshold value of the minimum number of documents at 5. Then, there are 36 organizations can be selected. Obviously, the Vilnius Gediminas Technical University is the predominant institution, and its link is 31 and total link strength is 342, which means that the papers from the Vilnius Gediminas Technical University have been cited by other 31 institutions with the total citations of 342.

Another important part of the author analysis is the cited authors' co-citation analysis, which is introduced by Small (1973). The cited authors' co-citation network is presented in Figure 6. Here, we set the threshold value at 20, namely the authors who have been cited for over 20 times. Then, there are 36 authors who meet this threshold.

5. Burst detection and keywords analysis of TRANSPORT

Kleinberg (2002) pointed out that citation burst analysis is used to dig out the explosive data in the certain period of time. It can help us find out the hot topic in a specific research field. Therefore, in the following content, we use the citation burst analysis to show the burst detection of TRANSPORT. The results are shown in Table 7.

Table 7 lists the top 15 journals that are frequently cited by the papers published on TRANSPORT. It is noted that the last column of Table 7 shows the citation bursts intensity of the cited journals from 2007 to 2019. The red colour means that the intensity of citation bursts exceeds the set threshold. Therefore, the first cited journal with the strongest citation burst is *Transport and Telecommunication*, and the citation bursts began in 2007 and ended in 2010. *Journal of Civil Engineering and Management*, *Journal of Business Economics and Management* and *Baltic Journal of Road and Bridge Engineering* have the longest duration for 4 years. *Journal of Civil Engineering and Management* involves the areas of civil engineering and management. *Journal of Business Economics and Management* focuses more on economics, finance, investment and marketing. *Baltic Journal of Road and Bridge Engineering* was established in 2006, and its impact factor in 2017 was 0.622. It is a multidisciplinary journal, which devotes to road and bridge engineering research. It can be seen that there are small differences among the shown burst durations. The research in TRANSPORT can be related to diverse areas.

Similarly, we complete the burst detection in terms of keywords, which can be seen from Table 8. The last column of Table 8 shows the citation bursts intensity of keyword from January 2007 to June 2019. The red colour means that the intensity of citation bursts exceeds the set threshold. The red colour means that the intensity of citation bursts exceeds the set threshold. Thus, it can be found that "transport", "terminal", and "automobile" are the earliest burst keywords in 2007. Then, the keywords of "automobile", "network", and "efficiency" have the longest duration for 5 years. In addition, the keywords "design" and "public transport" have received the citation burst recently, which means that these two keywords are still influential for current research. The emerging trends in terms of the research objects and methods change in different time periods. For instance, in the early years, automobile was frequently investigated as a research object from different perspectives. After that, the research objects such as "railway" "biofuel", "ethanol", "Vilnius City", "road", "behaviour", "ship" and "design" have been broadly discussed. Regarding to the research methods in this journal, the

Table 7. Top 15 cited journals with the strongest citation bursts

Rank	Cited journals	Year	Strength	Begin	End	2007–2019
1	Transport and Telecommunication	2007	3.3667	2007	2010	
2	Transportation Science	2007	3.0974	2007	2009	
3	Journal of Civil Engineering and Management	2007	7.384	2008	2012	
4	Informatica	2007	3.3114	2008	2010	
5	Atmospheric Environment	2007	2.7557	2009	2010	
6	Journal of Business Economics and Management	2007	3.806	2009	2013	
7	Modern Physics Letters A	2007	3.2617	2009	2010	
8	Energy & Fuels	2007	3.1516	2009	2010	
9	Journal of Environmental Engineering and Landscape Management	2007	5.1503	2009	2012	
10	Baltic Journal of Road and Bridge Engineering	2007	3.8197	2009	2013	
11	Technological and Economic Development of Economy	2007	11.3297	2009	2012	
12	Solid State Phenomena	2007	4.7393	2010	2011	
13	Inžinerinė Ekonomika – Engineering Economics	2007	5.7325	2010	2013	
14	International Transactions in Operational Research	2007	3.1561	2010	2011	
15	Applied Mathematics and Computation	2007	6.0593	2011	2013	

Table 8. Top 20 keywords with the strongest citation bursts

Keyword	Year	Strength	Begin	End	2007–2019
Transport	2007	3.4933	2007	2008	
Terminal	2007	2.6521	2007	2009	
Automobile	2007	2.7169	2007	2011	
Ranking	2007	3.2058	2008	2011	
Logistics	2007	2.8149	2008	2009	
Railway transport	2007	3.2638	2009	2010	
Biofuel	2007	2.7454	2009	2012	
Ethanol	2007	3.2638	2009	2010	
Parameter	2007	3.9427	2009	2011	
Vilnius City	2007	3.2729	2010	2011	
Network	2007	3.5477	2011	2015	
Efficiency	2007	2.6559	2011	2015	
AHP	2007	2.95	2012	2015	
Road	2007	4.7392	2013	2016	
Behaviour	2007	3.6612	2014	2016	
Ship	2007	3.1286	2014	2016	
Mode choice	2007	2.8476	2014	2015	
System	2007	4.4169	2015	2017	
Design	2007	3.5895	2016	2019	
Public transport	2007	2.7828	2017	2019	

papers that focus on "ranking", "parameter", "AHP" and "mode choice" have gained more attention.

Keywords analysis is a useful tool to derive the hot topics in a research field. Figure 7 is a visualized keyword network of TRANSPORT publications. It is found that the keywords of "model" and "system" occur the most with 95 and 79 times, respectively. Then, the authors pay more attention to modelling and developing system in this journal. To further show the keywords of this journal, we also list the cluster network of keywords of TRANSPORT in Figure 8. These keywords are divided into 7 clusters by category. The largest cluster is "operational parameter", which includes 58 keywords, suggesting that most of authors focus on operational parameter. The following cluster is "strong influence" and the third largest cluster is "urban area". Therefore, the influences related to transport issues and the relative urban constructions are also the crucial research directions of this journal.

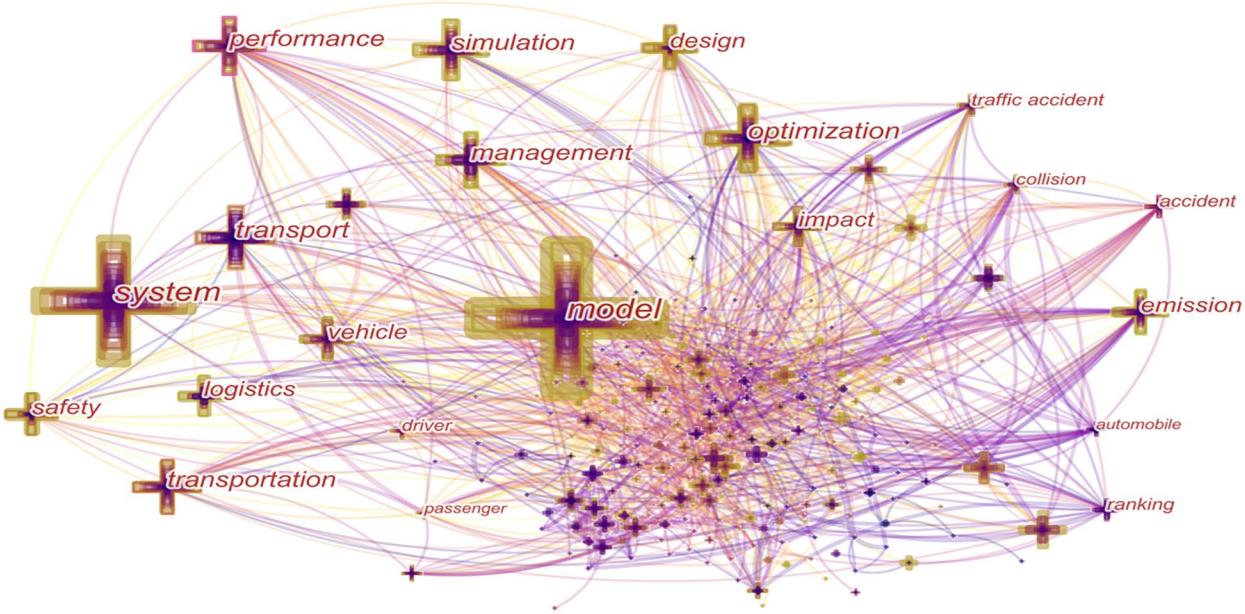

Figure 7. A visualization of the keywords network

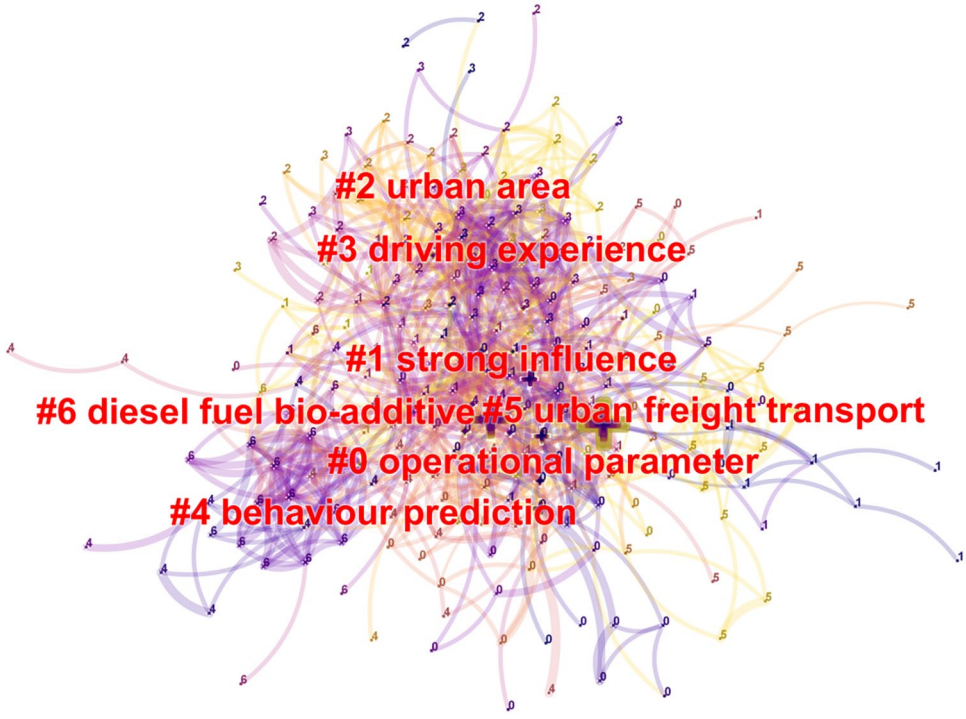

Figure 8. Cluster network of keyword research of TRANSPORT

Lastly, Figure 9 is given to show the timeline view of the keywords. It clearly illustrates the hot topics of this journal's research in different periods. At the initial phase, from 2007 to 2010, the authors of this journal focused on the keywords "urban transportation", "terminal", "train", "braking parameter", "supply chain management logistics", "vehicle", and "TOPSIS method". Then, from 2010 to 2013, the keywords "genetic algorithm", "road pavement", "road safety", "road tank", "road accident", and "service" occurred the most, which reflects that the authors cared more about traffic safety in this period. From 2013 to 2016, the keywords "heterogeneous traffic", "optimization method", "information system", "intelligent transport system", "stability", and "operating speed" were studied, indicating that the authors devoted to developing the transport system. From 2016 to 2019, the authors focused on "automation", "injury severity", "neural network", "bus rapid transit", "perceived value", "customer satisfaction", and "numerical simulation", which means they pay attention to transport service. Compared with the keywords in these periods, it can be found that with the development of transport, the hot topics continually change over time.

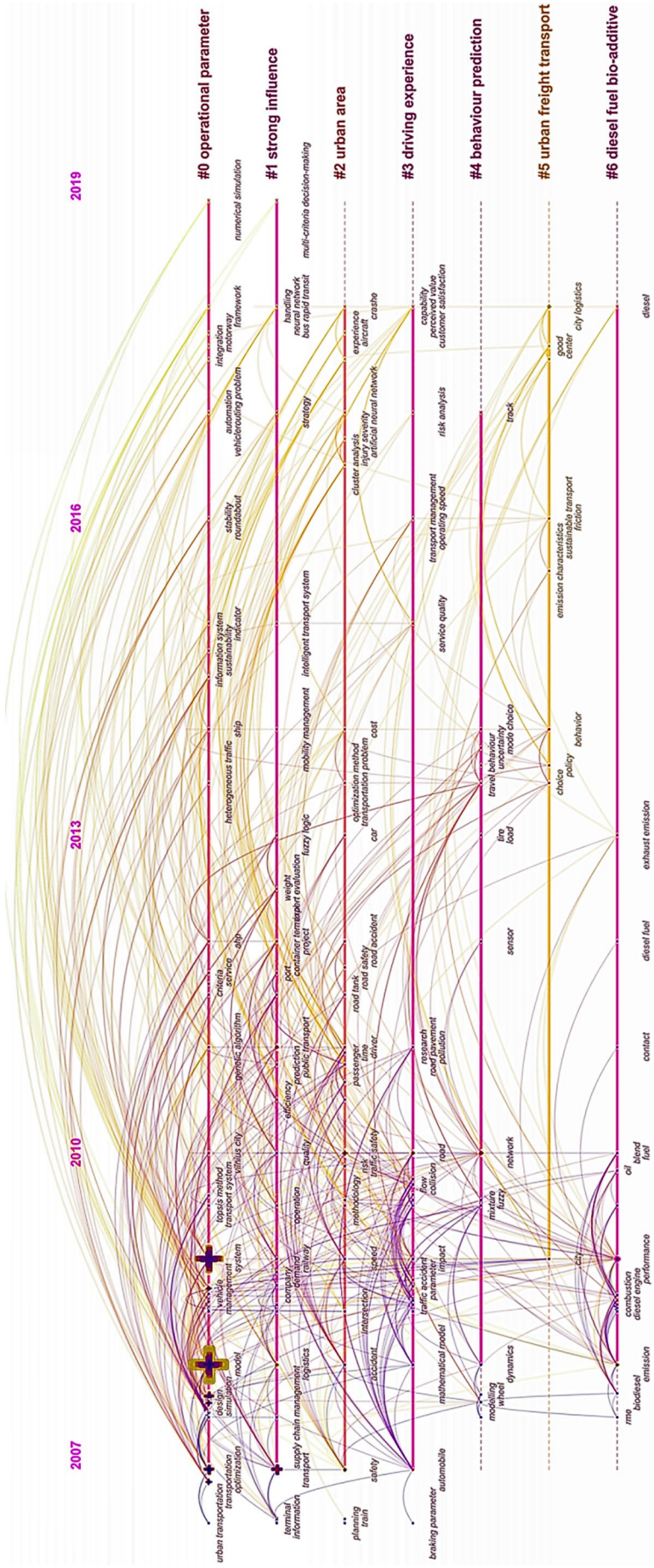

Figure 9. Timeline view for the TRANSPORT keywords

Conclusions

This paper has provided a comprehensive bibliometric overview and visualizes the research domain of the famous journal TRANSPORT. To do so, two bibliometric tools have been used to analyse the data retrieved from *Clarivate Analytics Web of Science*. In this paper, we have firstly summarized the editor team, the history publications, the citation numbers and citation structure of all the publications, the influential contributors on the aspects of papers, countries, institutions and authors, the burst detection analyses of cited journals, and the keywords and keyword analysis of TRANSPORT based on its 704 papers from January 2007 to June 2019. It can be found that many papers were published in 2018 with a large number of citations. The paper "Multi-objective decision-making for road design" (Brauers *et al.* 2008) is the most influential paper. As for the top 20 keywords with the strongest citation bursts, the keywords "automobile", "network" and "efficiency" receive the longest burst durations. In 2007, the emerging trends of the research outputs in this journal can be related to automobile, which is a commonly used transport way in people's daily life. In recent years, the emerging trends of this journal tend to be "design" and "public transport", indicating that technological innovations and public awareness have also attracted researchers' attention. In terms of the keywords analysis, "model" and "system" have occurred the most. In the keyword cluster network, we have found that "operational parameter" is the biggest cluster. Finally, from the timeline view analysis. It can be seen that the hot topics of this journal continually change over time and the authors pay more attention to transport service recently.

Through the above analyses, the current status and the emerging trends of the research published on TRANSPORT can be comprehensively learned, which helps researchers know more about this journal and transport-related investigations directly. Further research that involves diverse angles of an area's knowledge domain should be provided to present more deep insights.

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Author contributions

Prof. Wei Zhou and Prof. Zeshui Xu are the main authors, which are responsible for the preparation of the manuscript.

Managing Editor of the research journal TRANSPORT MSc. Paulius Skačkauskas is responsible for the editing and the revisions of the manuscript.

Disclosure statement

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