TECHMIND RESEARCH
ISSN: 2291-2118
International Journal of Research in Business and Technology
Volume 4 No.2 April 2014

Logistic innovation management: an overview at the top technology innovation management literature

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Abstract - *Owing to the combination of the strategic importance of logistics for the organization, it is necessary to identify who and what has been studied regarding the innovation management applied to logistic. To identify some of these fields, a systematic literature review among the top 10 technology innovation management journals was carried out. The results were presented according to the main characteristics of the studies, authors' affiliations and the top 50 journals referenced by these studies. This study can be used as a reference for new concepts and studies combining management of innovation with the issue of logistics.*

General Terms- *Logistics management, innovation management, systematic literature review.*

Keywords- *Literature Review; Logistic Management; Research Sources.*

1. INTRODUCTION

Development of a specific study area requires identification of the main sources of research, principal journals for publication, principal schools, and, especially, authors and content of studies that have been developed on this topic and available for the scientific community. This can be useful not only for researchers targeting their search and publications, but also for public and private managers to seek new management practices that assist in the formation of public and business policies.

In this sense, this study proposes to identify these elements in relation to the theme of innovation management in logistics. Owing to the combination of the strategic importance of logistics for the organization, especially among the activities of transport, materials management and order processing [1,2,3,4] and the need to managing innovation on the market competitiveness [5,6], it is necessary to identify who and what has been studied regarding the innovation management applied to logistic.

To achieve this combination, this study realized a citation analysis [7] between the publications on logistics management made in the last 10 years (2002-2012) among the top 10 technology innovation management (TIM) journals ranked by [8]. The main results are the main authors, schools, countries, research sources, the characteristics of the studies about logistic innovation management published in the last 10 years and the top 50 journals used by these researchers in their studies.

2. METHOD

To conduct this study with the focal theme of the research, namely, logistics management, a systematic literature review among the top 10 technology innovation management (TIM) journals was carried out.

The research was conducted at the end of 2012 on the top 10 TIM journals ranked by [8], and the time horizon covered was the last 10 years (2002–2012). The source titles, in ranking order, were: Research Policy, Journal of Product Innovation Management, Research-Technology Management, Technovation, R&D Management, Industrial and Corporate Change, IEEE Transactions on Engineering Management, Journal of Technology Transfer, Technological Forecasting and Social Change, and Journal of Engineering and Technology Management.

The research was performed by looking for the documents types: articles, article in press, conference paper, editorial, note, review and short survey. The condition was the presence of at least one of the following strings relating to logistic, constructed from the analysis of the studies presented by [9,4], in topic, article title, abstract, or keywords: distribut*, inventory, logistic, "material handling," "order process*", packag*, "product flow", "product handling", "purchas*", "raw material", "service flow", "supply chain", transport* or warehous*. A total of 14 strings and its radicals, using the "*" to enlarge the possibilities for words with the same root, such as purchasing or purchased, was used for the research.

The databases from Scopus, with more than 23,000 titles on the subjects areas of life sciences, health sciences, physical sciences, social sciences and humanities, and Web of Science, with more than 12,000 journals and 148,000 conference proceedings on the subject areas of social sciences, arts, and humanities, were used. The use of these two databases was necessary to obtain all the top 10

technology innovation management specialty journals. The subject areas of life sciences and health sciences were retained as the collect data to signify that some papers about agricultural management or hospital supply material management could be at the sources.

For data analysis, the statistical software SPSS was loaded at the descriptive statistic to identify the frequencies of authors, source titles, articles, year of the publications and to eliminate possible duplications.

3. RESULT ANALYSIS

During the database searches, based on the second filter, namely, the period of 2002–2012 (the first was the requirement of the study to be among the top 10 TIM journals), 661 studies were identified that contained at least one of the strings relating to logistic in its topic, article title, abstract, or keywords. All of them were evaluated based on their abstracts, and using a third filter, we selected only those related directly to logistics. In this filter, some studies were eliminated, such as the statistical probability distribution, distribution of financial value from innovation, distributed knowledge, logistic growth (LG) model, logistic regression analyses, multi-logistic methodology, data warehouses, etc., resulting in a total of 150 documents. In the fourth and final filter, all these studies were analyzed in depth and 127 of them were found to have directly dealt issues related to logistics, such as transportation, inventory, warehousing, and order processing, and were used in the results analysis.

The following results were presented according to the frequencies at which the studies appeared at the top 10 TIM journals and its statistical analysis, the main characteristics of the studies, authors' affiliations, and the top 50 journals referenced by these studies.

3.1 Frequencies of appearing the documents at the top 10 TIM journals

The Table 1, ordered by frequencies of articles related to logistics, presents the total of document identified at top 10 TIM journals and the representative according to the total of articles published between 2002 and 2012.

Table 1. Frequencies of articles related to logistics on the top 10 TIM journals

Journal	Abbreviated name	Total of article (TA)	Total of articles related to logistics (TL)	Percentage of TL on TA	Percentage on total of TL
Technological Forecasting and Social Change	TFSC	1013	37	3,7	29
IEEE Transactions on Engineering Management	I3EEM	567	36	6,3	28
Technovation	TECH	889	23	2,6	18
Research Policy	RPOL	1256	10	0,8	8
Journal of Product Innovation Management	JPIM	528	7	1,3	6
Journal of Engineering and Technology Management	JETM	199	5	2,5	4
Research Technology Management	RTM	647	4	0,6	3
Industrial and Corporate Change	ICC	499	3	0,6	2
R&D Management	RDM	528	2	0,4	2
Journal of Technology Transfer	JTT	386	0	0,0	0
Total		**6512**	**127**	**2,0**	**100**

As demonstrate in Table 1, only 2% of the articles from the top 10 TIM journal refer directly to logistics management. It is believed that this occurs due to the special characteristics of logistics, because it is basically a management processes, and not necessarily development of new products or services, what may not draw attention in research on technological innovation. The new process development to reduce operational costs and optimize resources can be as important as new products or services development.

The highest occurrence number of articles related to this field, 37, was identified in the Technological Forecasting and Social Change journal, followed by IEEE Transactions on Engineering Management (36), Technovation (23), and Research Policy (10). Other journals occurrence was

minus the 10 papers per journal, including the case of Journal of Technology Transfer with no article selected. Technological Forecasting and Social Change and IEEE Transactions on Engineering Management were noted to be the two prominent journals in relation to this issue, with approximately 30% of the publications for each one.

Together with Technovation and Research Policy, these journals were observed to represent more than 80% of the articles on innovation management in logistics published in the last 10 years among the top 10 TIM journals. Although not directed journals to the literature on logistics management, these can be significant sources on the field combined with innovation.

The Research Policy contents the highest total number of publications on the period (1256), however, the highest percentage of articles related to logistics management is present in IEEE Transactions on Engineering Management, with 6,3% of the total 567 articles, followed by Technological Forecasting and Social Change, with 3,7% of the total 1013 publications.

The statistical analysis of the total of article (TA) and the total of articles related to logistics (TL) demonstrate that, according to Table 2, there is no correlation between these variables identified.

The Bartlett's Test of Sphericity presents a $\chi 2 = 4,245$ (Kaiser-Meyer-Olkin measure of sampling = 0,443, degree of freedom = 3, and significance = 0,236), and presents no significance correlation between TA and TL.

Table 2. Correlation matrix

		TA	TL
Correlation	**TA**	1,000	,453
	TL	,453	1,000
Sig. (1-tailed)	**TA**		,094
	TL	,094	

a. Determinant = ,553

A hierarchical cluster analysis, with the cluster method between-groups linkage and measure square Euclidean distance from Z scores, was loaded to identify the agglomeration schedule between the journals, presented at Table 3.

Table 3. Agglomeration schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	8	10	,235	0	0	3
2	5	9	,376	0	0	5
3	6	8	,722	0	1	4
4	6	7	1,273	3	0	5
5	5	6	2,538	2	4	8
6	1	2	2,911	0	0	8
7	3	4	3,146	0	0	9
8	1	5	8,101	6	5	9
9	1	3	8,784	8	7	0

The dendrogram suggest the possible clusters formed between the journals – Figure 1 and the Figure 2 shows the scale distance between then.

The Figure 2 present the agglomeration of these journals according to the variable analyzed, using the Euclidean distance model. It is possible to identify five different clusters and to see that the Technological Forecasting and Social Change, Journal of Technology Transfer and IEEE Transactions on Engineering Management have a great distance from the other two groups indicated, one formed by Industrial and Corporate Change, Journal of Product Innovation Management and Journal of Engineering and Technology Management, and another formed by Research Technology Management, Technovation, Research Policy and R&D Management. This is certainly due to the large amount of articles on logistics in the first two and the absence of these studies in the third.

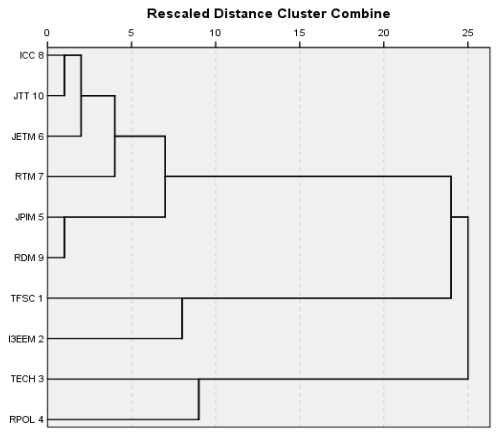

Fig. 1: Dendrogram from the hierarchical cluster analysis

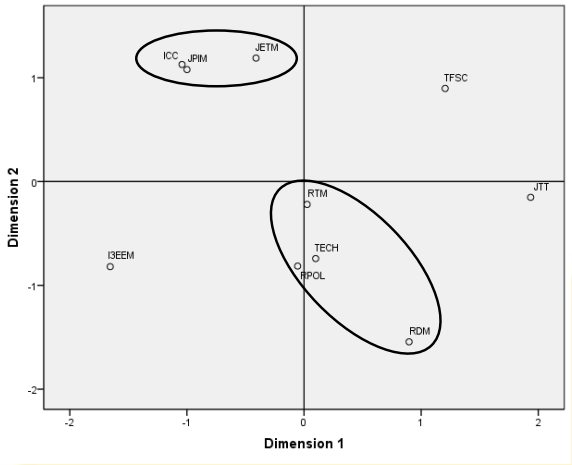

Fig. 2: Journals agglomeration

3.2. The main characteristics of the studies

This topic presents the main characteristics of the studies related to innovation management in logistics, which correspond to subject area of Business, Management and Accounting (53%), Engineering (24%), Psychology (16%), Economics, Econometrics and Finance (4%) and Decision Sciences (4%). Each one of the identified studies is detailed and, in the end, the Table 4 demonstrates the summary of the main themes of these studies and their authors.

One of the most representative group of the identified studies (14%) address the use of alternative energy in transportation, such as hybrid vehicles [10,11,12,13], the use of methanol and ethanol in passenger cars [14,15], fuel-cell vehicles and hydrogen [16,17,18,19,20,21,22], electric vehicles [23,24,25], natural gas vehicles [26,] or another sources of energy alternatives to petroleum to enable the sustainable mobility [27]. It may be noted that most of these studies were developed in the last three years, which shows a recent concern with energy optimizing in transport.

Another representative group, with also 14% of the studies, presents some management practices that contribute to the competitiveness of the supply chain, as the decrease the transportation costs, reduced exchange rate, the mobile supply chain management to identify the firm value chain, the products platforms development, the use of inventory to buffer uncertainties, different stockout duration, randomized local rewiring, delivering just-in-sequence and the just-in-time purchasing (JITP), spreadsheets-based model to demand, forecast and lead time [28,29,30,31,32,33,34,35,36,37,38,39,40]. Additionally, [41] argue the practice to synchronize the production volume allocation along the supply chain, and [42] complements with the possibility to alignment of supply chain according to product demand characteristics. Other proposals, as specifics supply chain governance [43], the assemble-to-order supply chain [44] and some procedures to decide safety stock levels in a supply chain [45] can be found on this field. In this group the IEEE Transactions on Engineering Management is the featured which concentrates most of the identified articles.

The particularities to use the IT systems at supply chain, as radio frequency identification (RFID), electronic data interchange (EDI) and enterprise resource planning (ERP), are presented by [46,47,48,49,50,51,52,53,54,55,56, 57,58,59].

Parallel to the open innovation environment [60,61], several studies have strategies for the innovation process in a collaborative way, as the interorganizational learning, the internal/external integration, the supply network and collaborative innovation on supply chain [62,63,64,65,66,67,68,69,70,71,72,73,74,75], but takes attention the fact that no one of them proposes a systemic process for planning and managing open innovation in logistics. This can be an object for future research at innovation process applied to logistic.

From a study with managers of 43 companies, [76] demonstrates the positive effects of supplier involvement in the innovation process. This involvement can occur from the product design modularity and manufacturing flexibility with the supplier, as demonstrate by [77,78,79,80,81,82,83,84,85,86,87,88,89]. From another side, only [90] demonstrate the important role of the customer in in the innovation process through the customer-centric innovation process. This demonstrates the deficiency of studies on market pull strategy of innovation.

Studies regarding the transport trends and perspectives have been developed to compose the state of art in logistic, as specific effort to concern the aero mobility and the use of small airplane transportation system [91,92,93], or the controlling of carbon dioxide emissions by cars and buses [94]. Proposals to the traffic management infrastructure are presented by [95], as well discussions to scenario of transport infrastructure until the year 2030 [96], the policies insights to sustainable global automobile transport [97] and strategies to transport innovation policies in Europe [98] are discussed. Studies such as these, with about 10 years, may have guided the implementation of recent studies related to the use of alternative energy in transport, as shown at the beginning of this analysis.

Mathematical models to optimize the supply chain resources [99,100] or vehicle fatality risk estimation [101], the purchasing [102] and supply base optimization [103] integrate the studies. A specific model applied to air transportation infrastructure can be found at the [104] study. These authors propose a model which can be used as reference on public policies applied to public transport, and this issue has a great importance to the quality of urban life.

Takes attention the fact that there are not so many selected studies discussing the environmental sustainability of all supply chain. Some of these, as [105], which present some of the major barrier to reverse logistics, ranging from the lack of awareness regarding the reverse logistics to the lack of appropriate performance metrics, and the study of [106] offer some contributions to this theme with

recommending disposal of products at the end of their useful lives. Additionally, [107,108] propose some strategies to this field. This can be due the fact that studies with exporting firms shows that both environmental regulations as the economic pressure are not significant to implement the green logistics management [67].

From the analysis of 42 different transportation projects, [109] present a model for the selection of transportation projects, which considers criteria such as cost, crash rate and traffic rate. Although the study was published in one of the top 10 TIM journals, it directly refers more to the transportation project management and portfolio management than necessarily the management of innovation. Additionally, [110] present some elements that allow the failure or success in transportation projects, such as sociocultural and psychological factors. The same situation related to project management identified in [109,110] studies can be found at [111,112,113]. This last one is applied at selecting suppliers in strategic partnerships.

The supply chain diagnosis, demonstrating levels of quality in supply chain or logistics services, are presented by [114,115,116,117,118]. This latter, in particular, has some features like the form of technology and the nature of information processing that defines the supply chain complexity.

The using of e-commerce to start the product distribution process, which is analyzed from the supply side of supply chain [119,120,121,122,123], from the buyer side of supply chain [124,125,126,127] or both [128] are identified when it comes to starting the movement of products and services in the supply chain from order processing.

The business model innovation is analyzed by [129], from a case of auto insurance, which uses, for example, the motor vehicle monitoring system for determining a cost of insurance and impact directly the personal or cargo transport and by [130] in the case of aerospace control.

The appearance of products, which can be related to package, is discussed by [131] by the evaluation of consumers' process to choice any product. The authors analyze some roles of product appearance and discuss that the influence of shape or size depend of the group of consumers. On this sense, [132] suggest the partnerships networks to develop packaging innovations, but neglect [131] on consumer involvement at this network.

Using the case of Heathrow airport's Terminal 5 project, [133] propose a conceptual framework to technology adoption in mega infrastructure projects. This framework consider some key determinants, as risk analysis, internal and external R&D communication, project milestones and involvement of subject-matter experts. Not just to the airport infrastructure, this framework could be applied at similar projects as train infrastructure projects [134] or road and pipeline infrastructure projects.

Studies applied to the transport regulation and liberalization, as the case of European railway transport sector, specially the Spain case, presented by [135], or transport policies decisions [136] contribute to understand some regulatory mark at the sector.

When [137] discusses about the modal diversion, the author presents some important elements in determining the propensity to switch transport mode, as the sensation of freedom or well-being.

The technology roadmapping, to identify the technologies to be developed and increase the logistics systems, proposed on the study of [138], take attention owing to the socio and technical aspects of transport in Finland which define the required technologies, actors and markets from the user needs.

According to the analysis of these studies, it can be noted that the years 2012 and 2010 were the most significant in the publication of innovation studies applied to logistics. This suggests that the issue is logistics is a recent theme in the innovation literature. It is believed that this importance will be more increased in the coming years due to the need to optimize the logistics resources in international trades.

Table 4. Summary of the m4 ain themes of the studies and their authors

Main focus	Authors	Percentage
Development / use of **alternative energy sources** for vehicles.	Avadikyan and Llerena [10], Börjesson and Ahlgren [14], Collantes [16], Eggers and Eggers [23], Farla, Alkemade and Suurs [27], Higgins et al. [24], Hillman and Sandén [26], Huétink, Vooren and Alkemade [17], Johnston, Mayo and Khare [18], Jun [11], Kosugi, Tokimatsu and Yoshida [19], Köhler et al. [20], Meyer and Winebrake [21], Orbach and Fruchter [12], Sandén and Hillman [15], Steenhof and McInnis [13], Winebrake and Creswick [22], Zubaryeva et al. [25].	14
Practices to supply chain management competitiveness.	Azevedo [28], Bhatnagar and Sohal [29], Eng [30], Green and Foster [31], Helper and Sako [32], Hsieh, Lee and Ho [33], Huang, Zhang and Lo [34], Hung, Ro and Liker [35], Kaynak [36], Kumar and Kropp [37], Ng and Jiao [41], Randall, Morgan and Morton [42], Reeves [43], Shao and Dong [44], Wagner and Silveira-Camargos [38], Wu et al. [39], Yan et al. [45], Zhao, Kumar and Yen [40].	14

The use of **IT** systems at supply chain.	Bi and Lin [46], Chao, Yang and Jen [47], Cheng and Yeh [48], Ellram and Zsidisin [49], Gupta and Kohli [50], Hill, Zhang and Scudder [51], Jeong, Yoo and Heo [52], Lee and Lee [53], Öztaysi, Baysan and Akpinar [54], Tsai and Tang [55], Wang, Wang and Yang [56], Wu et al. [57], Yusuf, Gunasekaranb and Wu [58], Zhu, Mukhopadhyay and Kurata [59].	11
The **collaborative innovation** on supply chain.	Desai [62], Hernández-Espallardo, Sánchez-Pérez and Segovia-López [63], Hollenstein and Woerter [64], Kinder [65], Kumar and Malegeant [66], Lai et al. [67], Maccoby [68], Pathak, Dilts and Biswas [69], Shah, Goldstein and Ward [70], Swink [71], Tatikonda and Stock [72], Vries [73], Xiwei, Stößlein and Kan [74], Wynstra, Corswant and Wetzels [75].	11
Supplier involvement in the innovation process.	Andersen and Drejer [77], Appleyard [78], Bush, Tiwana and Rai [79], Chang et al. [81], Di Benedetto et al. [82], Echtelt, Wynstra and Weele [83], Echtelt et al. [84], Joglekar and Rosenthal [85], Langner and Seidel [86], Nijssen et al. [76], Schiele [88], Ro, Liker and Fixson [87], Sobrero and Roberts [89].	10
Transport trends and **perspectives**.	Cohen [91], McGrath [92], McGrath and Young [93], Paravantis and Georgakellos [94], Pel and Boons [95], Schuckmann et al. [96], Turton [97], Zuylen and Weber [98].	6
Mathematical models to optimize the supply chain resources.	Li, Yamaguchi and Nagai [99], Lu, Lau and Yiu [100], Mao and Chirwa [101], Non et al. [102], Miller and Clarke [104], Talluri and Narasimhan [103].	5
Environmental aspects of logistics and **reverse logistics**.	Lai, Wong and Cheng [67], Mangun and Thurston [106], Ravi and Shankar [105], Tachizawa, Thomsen and Montes-Sancho [107], Zhu, Sarkis and Lai [108].	4
Prioritization of **transportation projects** and factors which determine whether a project succeeds or fails.	Bergh et al. [110], Joshi and Lambert [109], Kull and Talluri [113], Ramani, Quadrifoglio and Zietsman [112], Shang, Tjader and Ding [111].	4
Supply chain or logistics **diagnosis**.	Masson and Petiot [114], Mazzoleni [115], Sohail and Sohal [116], Vachon and Klasser [117], Vivanco-Aranda, Mojica and Martínez-Cordero [118].	4
The using of **e-business** or **e-commerce** to starting the movement of products and services in the supply chain – **the supply side**.	Cheng and Liao [119], Choi, Ellram and Koka [120], De Koster [121], Hu et al. [122], Lefebvre and Lefebvre [123].	4
The using of **e-business or e-commerce** to starting the movement of products and services in the supply chain – the – **the buyer side**.	Cheng, Sheen and Lou [124], Hartley, Lane and Hong [125], Lim, Grover and Purvis [126], Lin and Chan [127].	3
Business model innovation and optimal supply chain framework.	Desyllas and Sako [129], Kumar and Krob [130].	2
Packaging innovations.	Creusen and Schoormans [131], Gobbo and Olsson [132].	2
Technology adoption in **mega infrastructure projects**.	Gil, Miozzo and Massini [133], Han et al. [134].	2
The **transport regulation and policies**.	Marchau, Walker and Wee [136], Peláez, Sánchez-Cabezudo and Kyriakou [135].	2
Customer involvement in the innovation process.	Goodrich and Aiman-Smith [90].	1
The using of **e-business** or **e-commerce** to start the distribution chain – the **buyer-seller correlation**.	Lin, Huang and Lin [128].	1
Modal diversion.	Diana [137].	1
Technology roadmap.	Tuominen and Ahlqvist [138].	1

3.3. Authors' filiations

The author's filiations demonstrates where come from the studies identified and the main schools which develop applied studies of innovation management in logistics.

According to Figure 3, the vast majority of the studies in this area have been developed in the United States (37%), followed by Netherlands (10%), Taiwan (7%), and United Kingdom (7%), which together account for the origin of more than 60% of the studies identified. The remaining 25 countries, with individual representation of less than 5%, together correspond to approximately 40% of the total identified studies. As the same article could have authors from different countries, the average number of studies identified in this percent analysis corresponded to 143 documents.

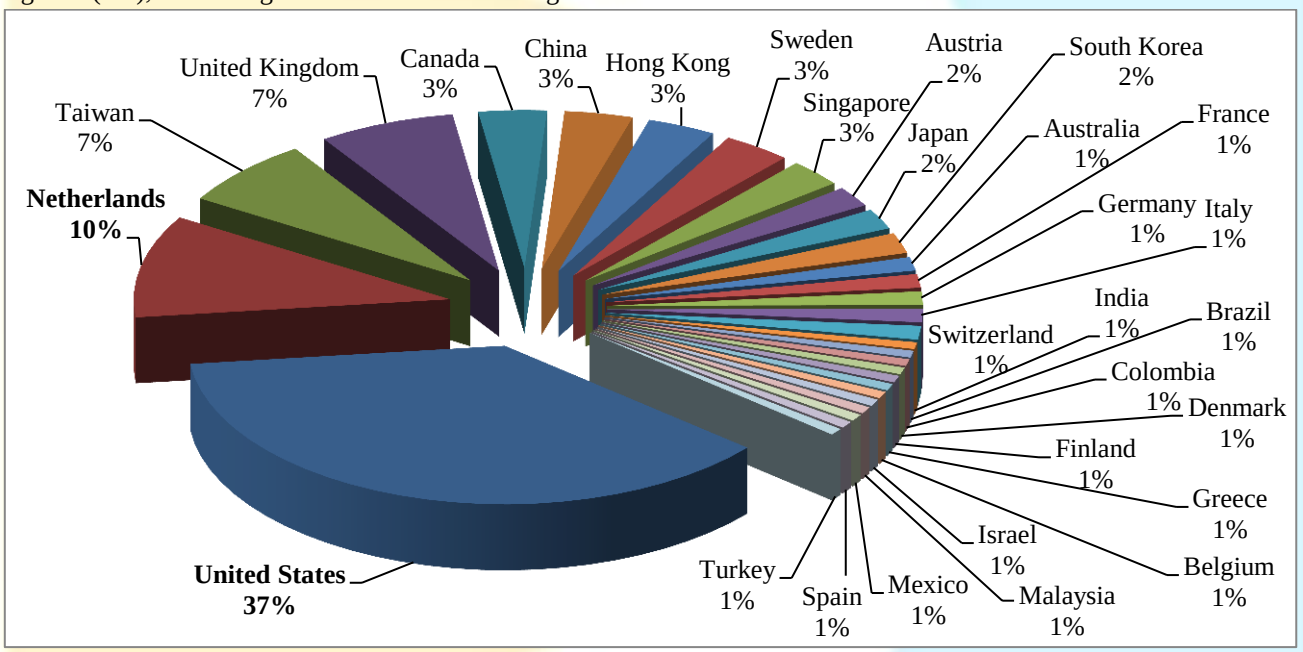

Fig. 3: Author's filiations

Among the schools where major studies have been developed, the Michigan State University (United States) was the one with the highest frequency of publications in this study, 5 in total, followed by Chalmers Tekniska Högskola (Sweden), Arizona State University (United States) and Erasmus University Rotterdam (Netherlands) with 4 each one. The Delft University of Technology (Netherlands), The University of Hong Kong (Hong Kong), Hong Kong Polytechnic University (Hong Kong), University of St. Thomas – Minnesota (United States) and University of Oxford (United Kingdom) present 3 publications each one. All other 149 schools have identified two or one publication each one.

3.4. The top 50 journals referenced at the studies

Considering these 127 studies analyzed in depth, the Table 6 presents the top 50 journals used by these authors in their publications. These journals represent 1742 of the source references used by the authors among the 4936 of the total used. This corresponds to 35.3% of the total references (p = 0,353 and q = 0,647), and assumes a 98% statistical confidence for this sample (Z = 2,33), which confers to this analysis an error margin e = 2.7% (α = 0,0133), according to the Equation 1.

$$e = \sqrt{(Z^2 pq)^{-n}} \quad (1)$$

To identify the major journals used by these authors in their research, a descriptive statistical analysis with the top 50 journals in number of citations from the 127 articles analyzed in depth in this study was carried out. This descriptive statistic is summarized at the Table 5.

Table 5. Summary of descriptive statistic

Valid	Mean	Mode	Standart deviation	Variance	Minimum	Maximum
50	34,84	16,00	24,73068	611,607	13,00	114,00

According to the statistical analysis of the references used by the articles, was identified that among the most used journals analyzed are Management Science, with 114 citations, followed by Research Policy, Technological Forecasting and Social Change and Strategic Management Journal, with 98, 97 and 91 references each one respectively, and the following journals presented at Table 6.

Table 6. Top 50 research sources referenced

Ranking	Journal	Frequency	Percent	Cumulative Percent	Z
1	Management Science	114	2,3	2,3	0.81
2	Research Policy	98	2,0	4,3	0.00
3	Technological Forecasting and Social Change	97	2,0	6,3	0.00
4	Strategic Management Journal	91	1,8	8,1	0.51
5	Journal of Operations Management	75	1,5	9,6	1.41
6	Journal of Product Innovation Management	67	1,4	11,0	1.70
7	Harvard Business Review	63	1,3	12,3	2.00
	IEEE Transactions on Engineering Management		1,3	13,5	2.00
9	International Journal of Operations and Production Management	50	1,0	14,5	2.90
10	Journal of Marketing	43	0,9	15,4	3.19
11	Technovation	43	0,9	16,3	3.19
12	Academy of Management Review	42	0,9	17,1	3.19
13	Academy of Management Journal	40	0,8	17,9	3.49
14	Decision Sciences	39	0,8	18,7	3.49
	European Journal of Operational Research		0,8	19,5	3.49
	Organization Science		0,8	20,3	3.49
17	International Journal of Physical Distribution & Logistics Management	38	0,8	21,1	3.49
	Journal of Marketing Research		0,8	21,9	3.49
19	Industrial Marketing Management	37	0,7	22,6	3.79
20	International Journal of Production Economics	36	0,7	23,3	3.79
21	MIS Quarterly: Management Information Systems	34	0,7	24,0	3.79
22	Journal of Engineering and Technology Management	33	0,7	24,7	3.79
23	Sloan Management Review	30	0,6	25,3	4.09
24	International Journal of Purchasing and Materials Management	29	0,6	25,9	4.09
25	Energy Policy	27	0,5	26,4	4.39
26	American Machinist	25	0,5	26,9	4.39
	Production and Operations Management	25	0,5	27,5	4.39
28	Information and Management	22	0,4	27,9	4.68
29	California Management Review	21	0,4	28,3	4.68
	Industrial and Corporate Change		0,4	28,7	4.68
	International Journal of Production Research		0,4	29,2	4.68
32	Transportation Research Part D: Transport and	20	0,4	29,6	4.68

	Environment				
33	Omega	19	0,4	30,0	4.68
34	Administrative Science Quarterly	18	0,4	30,3	4.68
	Journal of Management Information Systems		0,4	30,7	4.68
36	Purchasing	17	0,3	31,0	4.98
	Technology Analysis and Strategic Management		0,3	31,4	4.98
38	Communications of the ACM	16	0,3	31,7	4.98
	Journal of Consumer Research		0,3	32,0	4.98
	Transportation		0,3	32,4	4.98
	Transportation Research Part A: Policy and Practice		0,3	32,7	4.98
	Transportation Research Record		0,3	33,0	4.98
43	Journal of Business Research	15	0,3	33,3	4.98
	Journal of Supply Chain Management		0,3	33,6	4.98
	Research Technology Management		0,3	33,9	4.98
46	Information Systems Research	14	0,3	34,2	4.98
	Marketing Science		0,3	34,5	4.98
	R&D Management		0,3	34,8	4.98
49	American Economic Review	13	0,3	35,0	4.98
	Industrial Management and Data Systems		0,3	35,3	4.98

Journals in specific topic of logistics (i.e. Transportation, Transportation Research Part A: Policy and Practice, Transportation Research Record or Journal of Supply Chain Management) individually represent less than 0.5% of the sources used by researchers, which can provide evidence that there is a gap on innovation studies published in these journals.

According to the Table 6, with regard to the references used by the 127 articles analyzed, although the top 50 journals represent approximately 35% of the references used, there is a significant amount of studies related to logistics management in some of these journals.

The statistical analysis have been conducted to analyze if there is no statistical significance between the occurrences probabilities of these journals (H0) or if there is a statistical significance (H1). The qui-square test presents the value $\chi 2 = 838.3375$, obtained from the Equation 2.

$$x^2 = \sum_{d=1}^{50} \frac{(PO - PE)^2}{PE} \qquad (2)$$

PO is the *po* (observed occurrences probability) x the population n, and PE is the *pe* (expected occurrence probability) x the population n.

With the freedom degree df = 49 (n-1), and $\alpha = 0,05$ ($\chi 2 = 66.339$), this $\chi 2$ calculated shows that the H0 is rejected, and there is a statistical significance level between the journals occurrences (H1).

The use of Z test was necessary to identify what journals are inside the acceptation area in a Normal distribution curve. To this, the Equation 3 has been loaded.

$$Z = \frac{|po - pe| - 1/2n}{\sqrt{pe(1 - pe)/n}} \qquad (3)$$

The expression 1/2n is the continuum corrected term, used when it is less than |po – pe|, and *n* the number of occurrences analyzed = 1742.

Considering $\alpha = 0,05$, the critical value to Z is 1,96. The Z values, presented at Table 6, demonstrate that only 6 of these 50 journals have its po according to the pe = 0.02, or inside the acceptation area from the Z test. They are Management Science, Research Policy, Technological Forecasting and Social Change, Strategic Management Journal, Journal of Operations Management and Journal of Product Innovation Management. These can be considered by this study the most significant journals referenced on logistic innovation management literature.

4. CONCLUSIONS

This study can be used as a reference both by researchers on logistics management, looking for new concepts and studies related to the development of this field, as managers who want to combine the management of

innovation with the issue of logistics in their companies. The results of this study can guide their research focused on their interest with regard to innovation management in logistics.

An overview of the logistics management, analyzed from the view of innovation management, is presented, where the main authors, schools, countries, research sources and content of these studies on logistics management, published in the last 10 years in the major journals of technology innovation management, are given.

With the use of different strings related to logistics management was identified as many as possible articles in the top 10 journals TIM. It must be noted that only 2% of the articles from the top 10 TIM journal directly refer to logistics management. This demonstrates the lack of studies and research in this strategic area for the socioeconomic development. Despite this fact, it was found that only the journals Technological Forecasting and Social Change, IEEE Transactions on Engineering Management, Research Policy and Technovation account for more than 80% of articles on innovation management in logistics published in the last 10 years among the top 10 TIM journals. This can not only guide the search on this subject, but also the publications from the researchers on this field.

Several studies were identified on development and use of alternative energy sources for vehicles and practices to supply chain management competitiveness, but it is possible to note that among these studies there are no proposals for the systematic process of innovation in logistics. Although [137] propose the technology roadmapping to increase the logistics systems, the authors do not make clear which activities to be performed or the conditions for new technologies to be integrated into processes along the supply chain.

The high percentage of studies originated in the United States suggests that the country has considerable expertise in this subject. In addition to the research questions, it becomes necessary to identify whether other issues such as the county extension or its logistics infrastructure contribute to this representation.

Identifying gaps in specific areas of logistics management, as transport or material management, the open innovation paradigm and trends to increase the logistic resources efficiency can guide future research in order to further enhance this area of management studies.

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ACKNOWLEDGMENTS

National Council for the Improvement of Higher Education (CAPES), National Council for Scientific and Technological Development (CNPq) and The State of Goiás Research Foundation (FAPEG).

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