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Smart Logistics and Supply Chain Management – an Indicator-driven Literature Analysis

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Objective

The goal of the presented study is the identification of research activities and research directions in the field of smart logistics and supply chain management during the last decade. Based on the results of a pre-study where retrievals in five different discipline-relevant databases were performed, we *(i)* determine one relevant major database for the systematic screening process, *(ii)* select keywords as indicators for smart manufacturing, *(iii)* perform systematized retrievals (complete enumeration, combinatorial approach), and *(iv)* provide a discussion of results.

Approach and Method

We have used indicators for smart manufacturing to determine a predefined set of keywords, which was applied in the search process. In an explorative pre-study an extensive screening process was performed on a broader scale in five different databases (cf. Rovenský, 2016), whereas – based on its results – we determined one major database, systematised and refined the method, and applied it on a well-defined time horizon of the last decade (i.e. published work between 2007 and 2016). The chosen approach for the study presented is methodically based on Bauer and Strauss (2016) and on Kryvinska et al. (2013) and demonstrates the application of pre-defined indicators for smart manufacturing.

Selection of Database

In our analysis we performed the search for literature in the scientific database of Springer (SpringerLink, link.springer.com). The choice of this database was substantiated by an explorative pre-study (Rovenský, 2016), which had performed some retrievals across five major databases, i.e. ACM, IEEE, Inderscience, SAGE, and

SpringerLink. The pre-study had generated some information what we interpreted for our study: Inderscience together with SpringerLink have delivered a number of hits in terms of factor 50 to 100 higher than the remaining other three databases (cf. line 2 in Table 1). Although Inderscience delivered most hits in total, it had not generated any results when retrievals consisting of triplets of key words were performed (cf. marked line 11, 12, and 13 in Table 1). For this reason, we chose SpringerLink for our study.

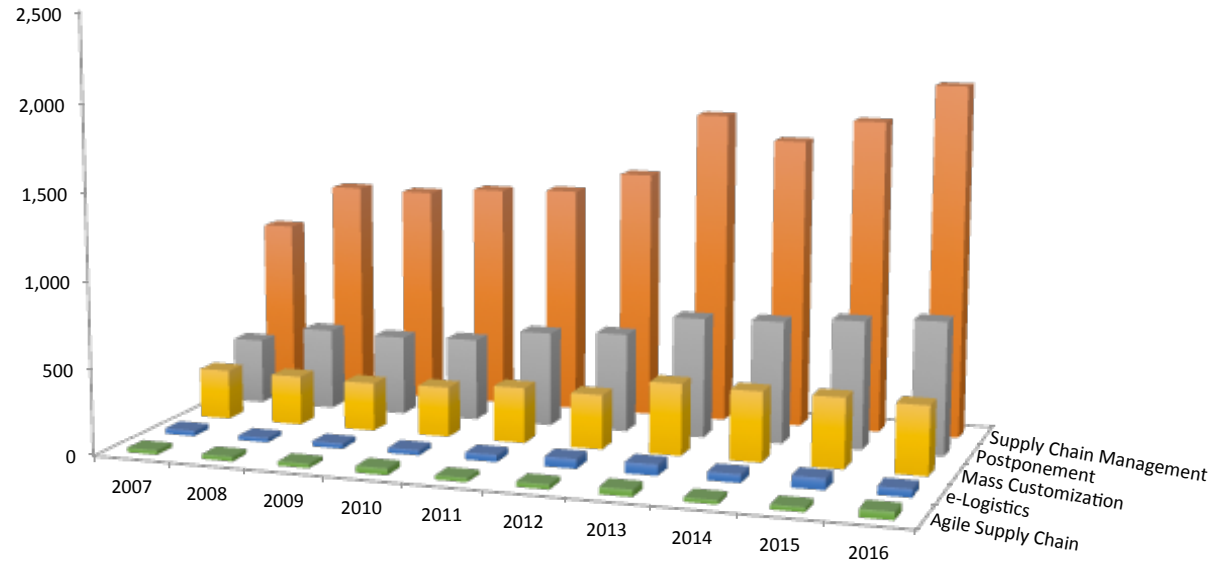
Table 1. Number of hits for exemplary combinations of keywords in five databases (source: Rovenský 2016).

Keywords	IEEE	SpringerLink	ACM	SAGE	Inderscience	Total
Supply Chain Management + e-Logistics	10	284	0	0	2127	2421
Supply Chain Management + Mass Customization	58	2215	51	37	2123	4484
Supply Chain Management + Postponement	19	815	26	22	2115	2997
Supply Chain Management + Agile Supply Chain	63	274	0	8	2065	2410
e-Logistics + Mass Customization	0	39	0	0	12	51
e-Logistics + Postponement	0	25	0	0	24	49
e-Logistics + Agile Supply Chain	0	13	0	0	64	77
Mass Customization + Postponement	4	397	1	12	20	434
Mass Customization + Agile Supply Chain	7	65	0	1	60	133
Postponement + Agile Supply Chain	0	65	1	2	70	138
Supply Chain Management + e-Logistics + Mass Customization	0	30	0	0	0	30
Supply Chain Management + e-Logistics + Postponement	0	22	0	0	0	22
Supply Chain Management + e-Logistics + Agile Supply Chain	0	12	0	0	0	12
Total	161	4256	79	82	8680	13258

Choice of Keywords

Based on five pre-defined keywords, which are interpreted as indicators for smart activities in logistics and supply chain management, we perform a systematic literature analysis. (We use the term “keyword” also for constructs of several words, which form a standing term, like for example “supply chain management”). These selected terms are “supply chain management”, “postponement”, “mass customization”, “e-logistics”, and “agile supply chain”. The systematization refers to time and (combinatorial) completeness of the five chosen terms. We analysed the keywords and their combinations on a yearly basis over the last decade, which covers the years from 2007 until 2016. The reason for the decision to perform the retrievals by mid of 2017 was the assumption that at that point the major part of relevant publications from 2016 was collected, included and accessible in SpringerLink. The combinatorial completeness implied pairwise retrievals, triplets, and quadruplets.

Figure 1 shows graphically the results when each single search term is used for retrieval; it shows the number of publications available via SpringerLink during the period of 2007 until 2016. Due to the absolute numbers of publications found through our approach “Supply chain management“ turns out to be the most elaborated topic out of the five keyword candidates, whereas “e-logistics” and “agile supply chain” appear least. Comparing the most and least frequent terms reveals a disparity of about factor 50.



Keywords	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	total
Supply Chain Management	1.020	1.283	1.276	1.312	1.329	1.449	1.821	1.688	1.821	2.043	15.042
Postponement	383	476	464	479	551	575	698	710	744	772	5.852
Mass Customization	291	288	282	291	322	316	415	406	406	397	3.414
e-Logistics	32	27	31	31	42	57	64	49	67	48	448
Agile Supply Chain	26	27	26	38	25	29	41	25	28	46	311
total	1.752	2.101	2.079	2.151	2.269	2.426	3.039	2.878	3.066	3.306	

Figure 1. Results – absolute number of hits using single indicator keywords for smart manufacturing over 10 years (from 2007 to 2016) in SpringerLink.

Results and Discussion

We performed a combination of each of the five keywords with each other keyword. In a first step, we formed pairs of keywords (10 alternatives), in a second step we formed triplets (10 alternatives), in a third step we formed quadruplets (5 alternatives); for reasons of completeness we performed a retrieval with the entire set of keywords. The keywords were *(i)* combined by using the operator "AND" ("with all the words") and *(ii)* used in quotes. Table 2 is structured in three major horizontal parts referring to the pairwise retrievals, triplets, and quadruplets, respectively. The leftmost column shows each keyword combination. Note, that we applied always the same notation and spelling during retrieval; only for reasons of layout requirements and – as a consequence – readability, we substituted in the table some of the used search terms (which was always applied in full in retrievals) by an acronym (e.g. SCM for supply chain management). The two rightmost columns show the total amount of items over time per retrieval and a rank of queries to provide some insight into the most common keyword combinations in decreasing order. Note, that the rank has only limited explanatory power, as in general pairs appear more frequent than quadruplets, and – as the combination of keywords "filters" the results – we can observe an overall decrease in hits when the number of

terms in a retrieval were increased. Whenever identical values of combinations occurred in the column "sum" equal ranks were assigned. The procedure of data cleansing (cf. Bauer and Strauss, 2016, p. 164) was performed on the results of quadruplets and yielded only one item. The systematization of retrievals is based on combinatorial principles (sampling without replacement), and leads to 10 (10 and 5, respectively) different retrievals when combining keywords pairwise (as triplets and as quadruplets, respectively).

Table 2. Results – absolute number of hits using combinations of indicator keywords for smart manufacturing over 10 years (from 2007 to 2016) in SpringerLink.

Keywords	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	sum	rank
Supply Chain Management + e-Logistics	16	18	19	14	15	31	31	21	24	21	210	5
Supply Chain Management + Mass Customization	62	69	68	64	70	82	86	61	79	73	714	1
Supply Chain Management + Postponement	33	56	45	66	45	62	59	49	61	62	538	2
Supply Chain Management + Agile Supply Chain	17	20	24	26	19	23	33	21	19	35	237	4
e-Logistics + Mass Customization	4	1	2	1	1	2	2	4	5	3	25	12
e-Logistics + Postponement	1	3	0	0	0	1	3	2	2	2	14	15
e-Logistics + Agile Supply Chain	3	2	1	0	0	1	1	1	0	1	10	17
Mass Customization + Postponement	27	15	22	21	23	34	37	29	26	29	263	3
Mass Customization + Agile Supply Chain	5	5	3	8	7	4	10	2	4	9	57	8
Postponement + Agile Supply Chain	4	5	7	9	4	5	11	3	3	8	59	7
SCM + e-Logistics + Mass Customization	3	1	1	1	1	2	2	2	4	2	19	14
SCM + e-Logistics + Postponement	1	3	0	0	0	1	3	1	1	1	11	16
SCM + e-Logistics + Agile Supply Chain	3	2	1	0	0	1	1	1	0	1	10	17
SCM + Mass Customization + Postponement	16	12	14	17	17	22	24	11	12	17	162	6
SCM + Mass Customization + Agile Supply Chain	4	5	3	6	6	4	7	2	3	7	47	10
SCM + Postponement + Agile Supply Chain	3	5	7	9	4	4	9	3	2	8	54	9
e-Logistics + Mass Customization + Postponement	1	0	0	0	0	1	2	1	1	2	8	19
e-Logistics + Mass Customization + Agile Supply Chain	1	1	0	0	0	0	0	0	0	1	3	21
e-Logistics + Postponement + Agile Supply Chain	1	1	0	0	0	0	0	0	0	1	3	21
Mass Customization + Postponement + Agile Supply Chain	4	1	2	5	3	1	6	2	1	4	29	11
SCM + e-Logistics + Mass Customization + Postponement	1	0	0	0	0	1	2	0	1	1	6	20
SCM + e-Logistics + Mass Customization + ASC	1	1	0	0	0	0	0	0	0	1	3	21
SCM + e-Logistics + Postponement + ASC	1	1	0	0	0	0	0	0	0	1	3	21
SCM + Mass Customization + Postponement + ASC	2	1	2	5	3	1	4	2	1	4	25	12
e-Logistics + Mass Customization + Postponement + ASC	1	0	0	0	0	0	0	0	0	1	2	25
SCM + e-Logistics + Mass Customization + Postponement + ASC	1	0	0	0	0	0	0	0	0	1	2	25

Table 2 shows the entire set of results of our analysis in detail. We can observe that both terms "e-Logistics" and "Agile Supply Chain" perform as a strong filter, as any retrieval containing those keywords only generates few items if any. This is not surprising as the single keywords had led to a relatively low number of items compared to the two major terms, which were "supply chain management" and "postponement" (cf. Figure 1). The final results represent the number of items, when quadruplets were applied in the retrievals (cf. third major row in Table 2); this has led to 39 publications, which are listed in the bibliography; there they are marked with an asterisk. Only two publications match the entire set of keywords within the selected time horizon, i.e. Mourtzis (2016) and Chandra and Grabis (2007).

Conclusion

The study at hand presents preliminary results of work-in-progress. The study provides relevant literature in the field of smart logistics and supply chain management during the last decade. In our approach we performed retrievals in a single database, i.e. SpringerLink, which was selected on the criteria of combinatorial abilities and relevance in the scientific discipline. Selected keywords have been chosen as indicators for smart manufacturing.–Our systematic approach has delivered 39 scientific publications that form the basis for further analysis. Further work will explore alternative databases like Inderscience, ACM, and IEEE, and will explore alternatives and foster methods in determining relevant terms as indicators (for example by the use of Google Scholar). Accuracy, dynamics over time, and interdependences of terms will be subject for further research activities.

References

Bauer C., Strauss C. (2016) Location-based Advertising on Mobile Devices: A Literature Review and Analysis, Management Review Quarterly (MRQ), Springer Berlin Heidelberg vol 66(3) pp. 159-194.

*Bretzke W.-R., Barkawi K. (2013) Strategies and Concepts to Promote Sustainability. In: Sustainable Logistics. Lecture Notes in Logistics (LNLO), Springer, Berlin, Heidelberg, pp. 85-434.

*Carvalho H., Azevedo S.G., Cruz-Machado V. (2012) Agile and resilient approaches to supply chain management: influence on performance and competitiveness, Logistics Research, vol 4(1-2) pp. 49-62.

*Chandra C., Grabis J. (2007) Scope of Supply Chain Configuration Problem, in: Supply Chain Configuration Concepts, Solutions, and Applications, Springer, pp. 17-45.

*Dias J.C.Q., Calado J.M.F., Osório A.L., Morgado L.F. (2008) Intelligent Transport System Based on RFID and Multi-Agent Approaches. In: Camarinha-Matos L.M., Picard W. (eds) Pervasive Collaborative Networks. PRO-VE 2008. IFIP – The International Federation for Information Processing, vol 283. Springer, Boston, MA pp. 533-540.

*Doukas M., Psarommatis F., Mourtzis D. (2015) Planning of manufacturing networks using an intelligent probabilistic approach for mass customised products, The International Journal of Advanced Manufacturing Technology, vol 74(9–12), pp. 1747–1758.

*Helo P., Kitaygorodskaya N., Salminen S., Jiao R. (2009) Designing and Modeling Agile Supply-Demand Networks. In: Dekkers R. (eds) Dispersed Manufacturing Networks. Springer, London pp. 111-129.

*Hofmann E., Beck P., Füger E. (2012) CM4: Activity Allocation and Supply Chain Process Definition. In: The Supply Chain Differentiation Guide – A Roadmap to Operational Excellence. Springer, Berlin, Heidelberg pp. 125-140.

*Hofmann E., Beck P., Füger E. (2013) CM2: Manufacturing Strategy and Supply Chain Management, in: The Supply Chain Differentiation Guide – A Roadmap to Operational Excellence. Springer, Berlin, Heidelberg, pp. 81-105.

*Ibrahim R., Kennedy D. (2007) Supply chain management program first- and second-order effects model: a new strategic tool, The International Journal of Advanced Manufacturing Technology vol 34(1-2) pp. 201-210.

*Ivanov D., Sokolov B. (2010) Conceptual Frameworks for Supply Chain Management, In: Adaptive Supply Chain Management, Springer, London, Chapter 2, pp. 19-33.

*Koh S., Wang L. (2010) Overview of Enterprise Networks and Logistics for Agile Manufacturing. In: Wang L., Koh S. (eds) Enterprise Networks and Logistics for Agile Manufacturing. Springer, London, pp. 1-10.

Kryvinska N., Olexova R., Dohmen P., Strauss C. (2013) The S-D Logic Phenomenon-Conceptualization and Systematization by Reviewing the Literature of a Decade (2004-2013), Journal of Service Science Research, The Society of Service Science and Springer, vol 5(1) pp. 35-94.

*Liebetruth T. (2016) Prozessorganisation, in: Prozessmanagement in Einkauf und Logistik - Instrumente und Methoden für das Supply Chain Process Management, pp. 155-191.

*Lu R., Storch R. (2011) Designing and Planning for Mass Customization in a Large Scale Global Production System. In: Fogliatto F., da Silveira G. (eds) Mass Customization. Springer Series in Advanced Manufacturing. Springer, London pp. 3-27.

*Mehrsai A., Karimi H.R., Thoben K.D. (2013) Using Cloud, Modularity, and Make-to-Upgrade Strategy for Integrating Customized-Oriented Supply Networks. In: Prabhu V., Taisch M., Kiritsis D. (eds) Advances in Production Management Systems. Sustainable Production and Service Supply Chains. APMS 2013. IFIP Advances in Information and Communication Technology, vol 414. Springer, Berlin, Heidelberg, pp. 441-449.

*Mishra N., Kumar V., Chan F. (2010) A Multi-agent Framework for Agile Outsourced Supply Chains. In: Wang L., Koh S. (eds) Enterprise Networks and Logistics for Agile Manufacturing. Springer, London, pp. 207-226.

*Morrissey M., Khare A. (2013) Environmental Sustainability Practices in Supply Chains Case of North American High-Tech Industry. In: Kersten W., Wittmann J. (eds) Kompetenz, Interdisziplinarität und Komplexität in der Betriebswirtschaftslehre. Springer Gabler, Wiesbaden, pp. 221-242.

*Mourtzis D. (2016) Challenges and future perspectives for the life cycle of manufacturing networks in the mass customisation era, Logistics Research vol. 9(1) pp. 1-20.

*Nath A.K., Saha P., Salehi-Sangari E. (2008) Transforming Supply Chains in Digital Content Delivery: A Case Study in Apple. In: Xu L.D., Tjoa A M., Chaudhry S.S. (eds) Research and Practical Issues of Enterprise Information Systems II. IFIP International Federation for Information Processing, vol 255. Springer, Boston, MA pp. 1079-1089.

*Oeser G. (2012) A Framework for Risk Pooling in Business Logistics, in: Bogaschewsky R., M. Eßig, R. Lasch, W. Stölzle: Supply Management Research: Aktuelle Forschungsergebnisse 2012, Gabler, Wiesbaden, pp. 153-193.

*Rezazadeh P. (2011) Measuring Leanness and Agility Status of Iranian Food Industries Supply Chains Using Data Envelopment Analysis. In: Chaki N., Cortesi A. (eds) Computer Information Systems – Analysis and Technologies. Communications in Computer and Information Science, vol 245, Springer pp. 179-191.

Rovenský D. (2016) The Use of E-Logistics in Supply Chain Management with the goal of Mass Customisation. Bachelor thesis, spring term 2016, Department of *electronic business*, Faculty of Business, Economics and Statistics, University of Vienna.

*Rutsch A., Schumann CA., Tsering G., Wolle J.W. (2010) Why Contract Logistics Providers Fail to Act as Demand Chain Leaders. In: Huang G.Q., Mak K.L., Maropoulos P.G. (eds) Proceedings of the 6th CIRP-Sponsored International Conference on Digital Enterprise Technology. Advances in Intelligent and Soft Computing, vol 66. Springer, Berlin, Heidelberg, pp. 1435-1444.

*Scholz-Reiter B., Mehrsai A. (2010) Superior Performance of Leagile Supply Networks by Application of Autonomous Control. In: Vallespir B., Alix T. (eds) Advances in Production Management Systems. New Challenges, New Approaches. APMS 2009. IFIP Advances in Information and Communication Technology, vol 338. Springer, Berlin, Heidelberg pp. 333-341.

*Scott C., Lundgren H., Thompson P. (2011) Guide to Strategy in Supply Chain Management, Springer, pp. 111-123.

*Sharifi H., Ismail H., Reid I. (2009) Framework for Developing an Agile Future-Proof Supply Chain. In: Dekkers R. (eds) Dispersed Manufacturing Networks. Springer, London, pp. 131-153.

*Terlunen S., Barreto G., Hellingrath B. (2015) Application and Evaluation of Multi-criteria Clustering Algorithms for Customer-Oriented Supply Chain Segmentation. In: Dethloff J., Haasis HD., Kopfer H., Kotzab H., Schönberger J. (eds) Logistics Management. Lecture Notes in Logistics. Springer, Cham pp. 121-133.

*Turban E., King D., Lee J. K., Liang T.-P., Turban D. C. (2015) Order Fulfillment Along the Supply Chain, in: Electronic Commerce: A Managerial and Social Networks Perspective, Springer International Publishing, Springer Texts in Business and Economics, Springer, Cham, pp. 559-594.

*Vrat P. (2014) Systems Approach and Supply Chain Management, in: Materials Management: An Integrated Systems Approach, Springer India, New Delhi, pp. 357-378.

*Wadhwa S., Mishra M., Saxena A. (2007) A network approach for modeling and design of agile supply chains using a flexibility construct, Int. Journal of Flexible Manufacturing Systems, vol 19(4) pp. 410-442.

*Yücesan E. (2007) Impact of Information Technology on Supply Chain Management. In: Jung H., Jeong B., Chen F.F. (eds) Trends in Supply Chain Design and Management. Springer Series in Advanced Manufacturing. Springer, London pp. 127-148.

*Yücesan E. (2016) Impact of Technology on SCM: A Brief History of IT for SCM. In: Competitive Supply Chains. Palgrave Macmillan, London pp. 116-134.

*Zebardast M., Malpezi S., Taisch M. (2013) Mass Customization in Supply Chain Level: Development of a Conceptual Framework to Manage and Assess Performance. In: Prabhu V., Taisch M., Kiritsis D. (eds) Advances in Production Management Systems. Sustainable Production and Service Supply Chains. APMS 2013. IFIP Advances in Information and Communication Technology, vol 415. Springer, Berlin, Heidelberg, pp. 81-90.