LOGISTICS SUPPORT OF CSR ACTIVITIES IN THE GLOBAL SUPPLY CHAINS OF THE PHARMACEUTICAL SECTOR

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Abstract

Purpose: Research paper identifies the current trends in the logistics support of the global pharmaceutical industry, including CSR activities. Research results can be a good reference point for decision-makers in the fields of logistics management. The subject matter of the paper is based mainly on the comparison of logistics practices in the area of CSR in the pharmaceutical industry supply chains.

Methodology: To achieve the research goal stated for this study, two research procedures were chosen and implemented:1) documents review (triangulation of sources); 2) literature review with the use of Boolean logic and the chosen procedure, valid for socio-economic research.

Findings: This paper points out that the set of methods and tools used in logistics support of the CSR activities overlap in some part the set of methods and tools for core business activity (commercial sales of medicines).

Implications for practice: Research results can be a good reference point for decision-makers in the fields of logistics management and CSR of the pharmaceutical industry.

Originality/value: This paper is the first about logistics support of CSR activities in the pharmaceutical industry. It shows the similarities and differences between the support of the basic, primary activities and CSR ones. It can be the basis for further theoretical and empirical research.

Keywords: CSR, pharmaceutical industry, logistics, logistics service

Paper type: Conceptual paper

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1. Introduction

I would say that the pharmaceutical industry is hyper-competitive from a global perspective.
Heather Bresch, CEO of Mylan

The pharmaceutical industry is one of the most innovative sectors worldwide, next to automotive and electronic ones. However, its specifics cause many problems in implementing those innovations, especially because of the strict research, development and launch processes, and very low success ratio in creating new medical products. The legal conditions limit the freedom of actions and make it much more difficult to achieve global success than in other sectors.

Those industry characteristics necessitated the creation of a special action framework for logistics support for both core business and other activities, including corporate social responsibility (CSR). The first of those areas is very well described in the current literature, but there is a lack of papers aimed at presenting the other fields of logistics support. This is very important taking into account that in many companies CSR activities consume little less financial resources, and they cannot be directly translated into revenues and financial performance.

The aim of the article is to identify the methods and tools used in logistics support of the CSR activities in the pharmaceutical industry. The subject matter of the paper is to compare the logistics practices in the area of CSR in the pharmaceutical industry supply chains. Research paper identifies the current trends in the logistics support of the global pharmaceutical industry.

In order to achieve the research goal, two research questions were posed:

RQ1: What methods and tools are used in the logistics service of CSR activities in the pharmaceutical industry?

RQ2: Are these methods and tools different from the basic operations in this industry used in logistics services?

According to the authors' knowledge, currently, there is no study integrating the results of research agencies, scientific literature and company reports on CSR activities and logistical support for these activities. Available sources provide only data that requires further analysis, are based on single cases (especially in the area of mergers and acquisitions) and mainly concern only the development of industry in the emerging countries. Research results can be a good reference point for decision-makers in the fields of logistics management and CSR of the pharmaceutical industry.

The remainder of the paper is organized as follows. First, the specifics of the industry itself and its CSR activities are presented. The next part focuses on the methods used to analyze the data gathered from different sources. The results section explores literature and other sources used to identify the logistics

support practices in the chosen industry. The next part contains discussion, general conclusion, study's limitations and an indication regarding the future research directions and plans.

2. Literature review

2.1. Pharmaceutical industry

The global pharmaceutical industry can be divided into three parts. First of them is the (Western) Big Pharma, including established brands from the USA, Europe and Japan and dominating on the global market, developing the new drugs. In addition, in those countries of origin of Big Pharma, the consumption is the highest, has over 40% of the global market and cover over 80% of the world's drug consumption (Tempest, 2010). The second entreprises group is built by companies from the emerging economies (China, India and others) called jointly as Pharmerging, focusing mostly on developing the generic drugs, gaining the foreign direct investments and supporting the national industry (Rehman et al., 2015). The companies originally from the rest of the world create the third group. According to the Statista Group, the global consumption value will increase from 887 bln USD in 2010, trough 1135 bln USD in 2016 to 1430 bln USD in 2020 (Statista, 2017) and the global revenues reached now the level of 1,1 trillion USD. The biggest pharmaceutical market is in the USA (about 41–50% of the global drug consumption), then in China (all Pharmerging countries consume about 20% of drugs. OECD countries consume over 80% of the produced drugs (UNODC, 2017). What is more, the Asian countries, like for other sectors, are attractive destinations for locating production sites of Big Pharma companies. The more detailed analysis of the situation of this sector was made by Szmelter (2019).

The specifics of the industry is created mostly by research and development activities. The IFPMA paper reported that developing the new medicine takes 10–15 years, and there is a very high cost and low success ratio in R&D in the pharmaceutical area (Shaw and Whitney, 2016). Those problems are compounded by the legal constraints, also secondary patenting – trying to prolong the legal protection for the drug for a longer period of time (Sampat and Shalden, 2017). On the other hand, this causes the problems in generic drugs production and access to medicines by less privileged, poorer societies, especially helpful in treating rare diseases. The world's population has to face the two main problems related to this industry: drug overuse in developed countries and lack or insufficient drug access in the developing ones. Both are addressed by the CSR strategies of pharmaceutical companies.

Both the mentioned groups differ in the length of supply chains, their complexity and tools used in the implementation of basic and logistic processes. Additionally, due to the specifics of the sector, industry-dedicated solutions should

be implemented in the supply chains (eg in the case of transport of goods sensitive to temperature changes). In most areas, it is also possible to use universal methods and practices popular in other highly innovative industries, such as the IT and automotive industries (eg Build-to-Order production – BTO, lean management).

2.2. CSR

The Corporate Social Responsibility (CSR) has been a subject of many studies and interpretations, therefore the academic literature provides a range of definitions and approaches to the subject. As for the purpose of the article, the authors decided to adopt the three pillars approach, in which the concept of CSR includes economic, social and environmental issues as evenly important pillars of business market actions. The triple bottom line principle proves that environmental and social actions are crucial for the maximization of profit (Elkington, 1998; Dyllick and Hockerts 2002). According to the principle, the joined social, environmental and economic concerns should generate a synergy of profits for the business and its stakeholders. (Steurer, 2005).

The history of Corporate Social Responsibility can be divided into specific eras, classified by the attitude to the concept, what is presented shortly in Figure 1. At the beginning of 20th-century, Hadley presented the idea of business trusteeship, in which he reminded that business actions have an influence on the local society and hence business leaders become the managers of the public interest. The concept was developed by both theory and business, what may be confirmed by General Electric idea of business obligations towards a wider range of partner than only stakeholders (France and Bureana, 2015). According to Murphy, the post-war period up to the 1950s was the 'philanthropic' era, during which companies donated to charities more than ever noticed. The next period of the 1960s and 70s may be called an 'Awareness & Responsibility period. At that time, business became able to recognize its overall responsibility, and involve in community affairs such as urban decay, and racial discrimination. 1970' brought to the corporations the responsibility in business actions, which could be seen in purposeful managerial and organizational actions, which included examining corporate ethics and using social performance disclosures (Murphy, 1978). In the 1980s and 90's the business interest in CSR shifted to alternative or complementary concepts, theories, and models. In response to the political events and policies (such as Rio de Janeiro Summit and Agenda 2000), the business included environmental responsibility into CSR policies. At the same time, the idea of stakeholders developed and was widely implemented to the business actions. As a result, the CSR initiatives included such fields as education, culture and the arts, health and human services, civic and community, international donees, community partners, and NGO partners. Important is the fact that international corporations introduced common standards of CSR actions, and as

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a result, the CSR policies became global. The last period of CSR development was a global outbreak. The idea integrated social, environmental and economic aspects of the business in standardized actions. CSR reached new organizations and gain popularity as a tool of international corporations, SMEs, governments and universities (Carroll, 2008; Moon, 2005).
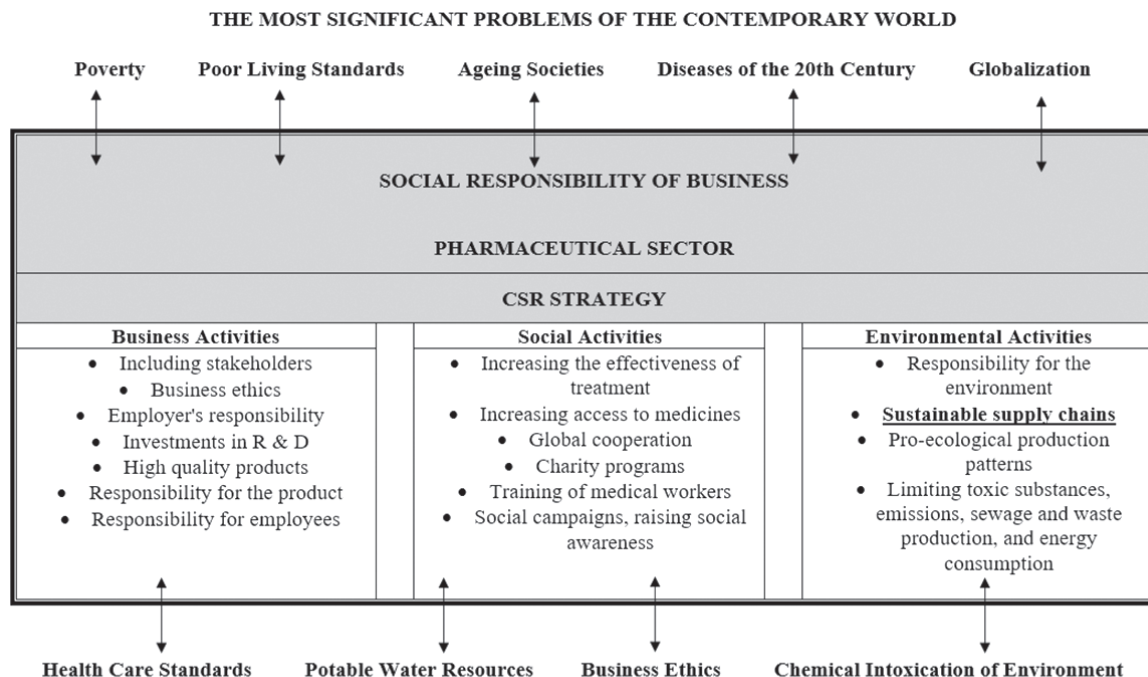
The Trusteeship Period	The Philanthropy Period	The Awareness & Responsibility Period	The Environmental Period	The Outbreak Period
1920'	1940'-50'	1960' - 70'	1980'- 90'	2000'- …
After era of industrialization, the business started to its influence on the society. First attempts of cooperation with stakeholders.	Philanthropy became a permanent tool for large enterprises. The foundations of CSR were based on a charity.	Business became able to recognize its own overall responsibility Serious managerial and organizational actions were taken towards the introduction of CSR on a broad scale.	Increased stakeholder engagement. Introduction of Business Ethics as a standard. Involvement of ecology into business	3 dissemination of the CSR idea. Socio-environmental reports as a standard. Globalization of CSR

Figure 1.
The historical development of the CSR concept

Source: own preparation.

The concept of CSR is connected to the pharmaceutical sector from the very beginning. The first CSR actions towards the health and working and living standards of employees were results of health problems among workers. As the CSR idea developed it touched different aspects of pharmaceutical sector – working conditions, productions standards, business ethics, environmental pollution, etc. still those dimensions were more connected to the economic side of the pharmaceutical industry than to the core meaning of pharmacy. One has to admit that the industry replays to the most crucial problems of the modern world and problems caused by them. This the reason why among the pharma corporations one can find a range of CSR actions directed to the society – from charity actions to social campaigns and training. The pharmaceutical industry is one of the most legally regulated and controlled industries, this may be the reason why the introduction of CSR standards was not problematic in pharma companies. (Leisiger, 2005; Martinuzzi, 2011). Figure 2 shows the global background of CSR in the pharmaceutical industry, as well as examples of CSR tools and action undertaken as the fulfillment of CSR policies.

The role that the pharmaceutical industry fulfills (protection of public health, saving lives, responsibility for public health) obliges it to undertake a number of charitable and social initiatives (donations, social campaigns, prevention health programs) on local and global reach. Therefore, logistics services in supply chains in this industry, also those related to CSR activities, are an important topic in the context of the development of the global economy, especially in most cases related to global supply chains.

THE MOST SIGNIFICANT PROBLEMS OF THE CONTEMPORARY WORLD

Poverty   Poor Living Standards   Ageing Societies   Diseases of the 20th Century   Globalization

SOCIAL RESPONSIBILITY OF BUSINESS

PHARMACEUTICAL SECTOR

CSR STRATEGY

Business Activities	**Social Activities**	**Environmental Activities**

• Including stakeholders
  • Business ethics
• Employer's responsibility
  • Investments in R & D
  • High quality products
• Responsibility for the product
• Responsibility for employees
	• Increasing the effectiveness of treatment
	• Increasing access to medicines
	  • Global cooperation
	  • Charity programs
	• Training of medical workers
	• Social campaigns, raising social awareness
		• Responsibility for the environment
		• Sustainable supply chains
		• Pro-ecological production patterns
		• Limiting toxic substances, emissions, sewage and waste production, and energy consumption

Health Care Standards   Potable Water Resources   Business Ethics   Chemical Intoxication of Environment

3. Method

To achieve the research goal stated for this study, two research procedures were chosen and implemented:

1) documents review, triangulation of sources (OECD database, WHO database, EMIS database, global indices, sustainability reports and CSR reports of companies, others)

2) literature review: a review of the literature with the use of Boolean logic and Denyer, Tranfield, Smart (2003) procedure (modified, see Table 1); analysis of original research papers, case studies and viewpoints with use of the EDS multi-source search engine on the EBSCOhost platform.

Figure 2. The background and CSR dimensions in the pharmaceutical sector

Source: own preparation.

Phase	Stage
I	1. Determining the study purpose
II	1. Determining basic literature (searching in search engines)
	2. Selection of publications for further analysis
	3. Preparing publications database
III	1. Bibliometric analysis
	2. Content (text) analysis
IV	3. Preparing a report (research results)

Table 1. Research procedure

Source: own preparation.

There were the obstacles in the implementation of the second procedure because of the lack of literature sources strictly related to logistics support or logistics activities in the pharmaceutical industry. This resulted in the need to search for sources of literature in 10 rounds (see Table 2). Finally, 38 from 103 identified sources were included in the literature review.

Table 2. The process of literature database creation

Source: own preparation.

* Search rounds: I. using "pharmaceutical"; "CSR" or "corporate social responsibility"; "logistics or "logistical": 1) TI;AB;TX, 2) AB;AB;AB, 3) AB;TI;TX, 4) AB;AB;TX, 5) SU;AB;TX; II. using "pharmaceutical"; "CSR" or "corporate social responsibility"; "supply chain": 6) TI;AB;TX, 7) AB;AB;AB, 8) AB;TI;TX, 9) AB;AB;TX, 10) SU;AB;TX.

Search criteria	Search round no.*									
	1	2	3	4	5	6	7	8	9	10
No. of literature sources	1	3	5	14	3	18	15	15	45	18
After removing duplicates	103									
After abstracts verification	54									
After text analysis	38									

4. Results

4.1. Different (non-scientific) sources

The characteristics of enterprises from Big Pharma and Pharmerging differ mainly in the size of CSR activities (Big Pharma countries are more involved in these activities, also only they are listed in global summaries, e.g. Change the World 2017, The Access to Medicine Index, Dow Jones Sustainability Index, see Appendix 1). Also, companies representing Big Pharma use a wider range of logistics practices in their business. Those are: complexity management (in supply chains), lean management, Build-to-Stock (or Make-to-Stock) activities, differentiation of distribution channels for different kinds of customers (commercial, government, NGOs, own foundations), cold chain management, special Customer Relationship Management practices and systems for NGOs and others, information logistics, using 4th Party Logistics (orchestrator) services in many distribution channels.

The companies well-known for their CSR activities (so in this regard – also the best logistics practices) are (in order of appearance in particular global CSR-related indices): Johnson&Johnson (USA), Merck (USA), Roche Holding (Switzerland), AstraZeneca (UK), Novartis (Switzerland), Sanofi (France), Takeda Pharmaceutica (Japan), Biogen (USA), Bristol-Myers Squibb (USA), Daiichi Sankyo (Japan), Eli Lilly (USA), GlaxoSmithKline (UK), Novo Nordisk (Denmark), Pfizer (USA).

One of the subsequent topics in the pharmaceutical industry is a trend of outsourcing medical research in the process of drug development. This relocation of the industrial production to the Asian countries has an impact on the

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environment, so additional CSR actions should be planned and provided to avoid the negative impact or overuse.

The most-often implemented CSR practices in this industry, for which the logistics support was crucial to be created and practised, also in the information logistics area, are health prevention and treatment programs (eg. for children, pregnant mothers), programs run by foundations, subsidiaries of pharmaceutical concerns and non-governmental organizations, donations, public-private partnership, price differentiation, special licensing for resource-poor countries, increasing product distribution capacity, supply chain support, mHealth initiatives, healthcare campaigns, employee placement programs and targeted research and development.

4.2. Literature sources

Firstly, at the end of the 90s of the 20th century, the sustainability strategies were those of the most interests in the pharmaceutical sector. Over time, sustainability practices were shifted into CSR ones (Schneider et al., 2010). The CSR programs, mentioned mainly in the literature as the case studies for the single companies (Pfizer, Eisai Pharma, Takeda) include the cooperation with NGOs and governments and need to have ready-to-use pricing procedures and distribution channels (Vian et al., 2007; Graya et al., 2011; Witty, 2011; Thorsteinsdóttir et al., 2017). They are a part of the general strategy of the pharmaceutical company and in most cases, have their own functional strategy (CSR strategy) built into the company culture (Smith, 2008), what makes this industry the most leading in CSR practices (Schneider et al., 2010; Toma and Marinescu, 2012). They are also a part of PPP initiatives in CSR (Sturchio, 2008). However, US-origin CSR context and EU-origin CSR context are still different (EU context is more strict), but they tend to each other (van de Pol and de Bakker, 2010). Definitely, CSR practices should be mandatory for all companies (Azim and Azam, 2013; Givel, 2013; Khan et al., 2015; Droppert and Bennet, 2015; Mehralian et al., 2016) and oriented for the long term (Alexandra and Fort, 2014), regardless the region (Rehman et al., 2015; aus der Beck et al., 2016), company size (Min et al., 2017) and the evolutionary CSR stage of the company (O'Riordan and Fairbrass, 2014; Khaleel, 2017; Lau et al., 2018). Mandatory procedures and practices should be stated by international organizations (Shaw and Whitney, 2016).

One of the most important logistics problems is to give the access to medicines in poor countries (Grover et al., 2012), countries with insufficient law (Adobor, 2012) and those with the problem of military conflicts. The procedures are enhanced by providing safety to people helping the most dangerous regions and special ones dedicated to medical food and drugs needed to be stored and transported in special temperature. Those are practices related to the area of humanitarian logistics and military logistics (Greeve, 2008) and requires

complexity management and cold chain management skills (Enyinda et al., 2009; Bishara, 2006) both in a single organization and in the whole supply chain (primary and CSR). Logistics support in CSR activities should be more focused on the emerging economies (Friemann and Schönsleben, 2013, Göpfert et al., 2013).

New financing and pricing models and international commitments (for example the Advanced Market Commitment), including tax exemptions and brakes encourage the private sector to invest in research and development (Witty, 2011). Such cooperation is focused on, among others, joint basic research, enhancing the access to medicines, transferring the technology (Szmelter, 2019). Those kinds of operations need special planning and control procedures. It needs the support of the primary processes, so logistics problems solving (transportation, distribution, planning the operations, sourcing, needs analysis etc.), therefore the mathematical and IT solutions are needed to address specific needs of this part of the market (Sturchio, 2008). Pharmaceutical supply chains are complex. There are many uncontrolled variables in the process of supply chain planning (Sousa et al., 2011; Susarla and Karimi, 2012; Mousazadeh et al., 2015). Friemann and Schönsleben (2013) stated that pharmaceutical logistics should be benchmarked to some extent on the automotive industry. Those are hiring 4PL, lean management, VMI, collaboration with suppliers and data transparency (Friemann and Schönsleben, 2013).

An essential part of the supply chain management in this sector is cold chain management for temperature-sensitive pharmaceuticals. It requires a longer time for planning and execution and also because of the more volatile demand.

Therefore, the logistics practices identified for the CSR strategy are to some extent, the same for the core and CSR activities (see Figure 3) and also focused on the optimization of flows (Sousa et al., 2011), multi-period, multi-site, multi-echelon planning (Susarla and Karimi, 2012; Mousazadeh et al., 2015) and multi-criteria supply chain risk management (Teker, 2017). For the primary, core business and CSR activities, the shift from traditional, Make-to-Stock strategy, to Make-to-Order strategy is visible (Harrington et al., 2017).

Among the concepts, methods and tools used in logistics service in the chosen industry, common for core and CSR activities are 4PL outsourcing, cold chain management, lean management, advanced planning and forecasting, strict cooperation with suppliers and Make-to-Order production. The methods and concepts specific for the CSR activities are enhanced information logistics, dedicated CRM systems, humanitarian and military logistics, separate procurement and distribution channels with special pricing procedures.

The CSR reciprocity is the joint occurrence of the CSR strength of buyers and sellers. CSR reciprocity between buyer and seller firms in a supply chain affects channel tie intensity and channel sales performance (main effects) and that market

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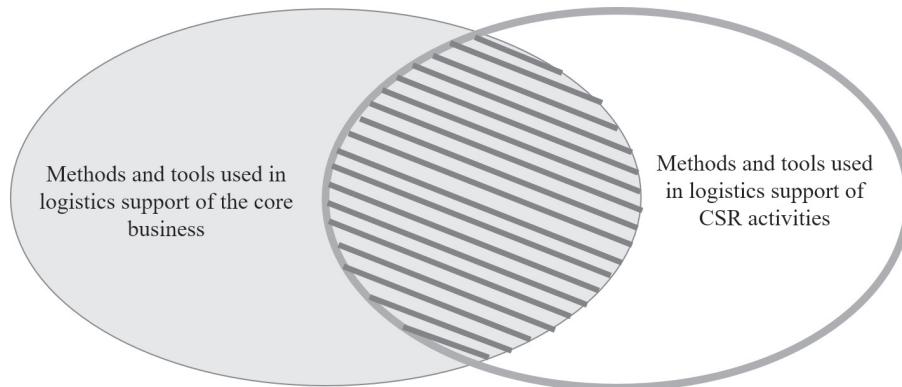
Figure 3. The relations between logistics practices used in core business and CSR activities in the pharmaceutical industry

Source: own preparation.

competition may amplify these influences (moderated effects). CSR reciprocity positively influences channel relationship performance. CSR has no significant influence on channel relationship performance when either buyers or sellers do not exhibit high CSR strength. The positive effect of CSR reciprocity on channel relationship performance is enhanced when the market competition is high rather than low (Luo and Zheng, 2013).

5. Conclusion

This research showed the characteristics of the logistics support of CSR activities. This is the first summary in the literature about this area of logistics activities. It extends current literature by summarising available literature and other sources on the CSR logistics and results from different research approaches, procedures, samples and countries. The research procedure made it possible to address the research questions. The answer for both ones is that the set of methods and tools used to support CSR activities in the pharmaceutical industry partly overlaps with the set used in the core business and contains, for example, lean management, cold chain management, etc. Nevertheless, there is a group of methods and tools dedicated exclusively to CSR operations.

This research has a few limitations. It is, to some extent, based on the current literature, but the search criteria were restricted. In such a research procedure, there is always a risk of omitting the important literature positions. The similar situation applies to other analyzed sources. On the other hand, there was a lack of literature strictly related to the topic of logistics in CSR activity in the pharmaceutical industry.

Despite these limitations, the described research results are promising and provide many future research possibilities, also can serve as a basis for further theoretical and empirical studies. Future research should be conducted to obtain

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more data on logistics in the CSR activities of pharmaceutical companies. The authors hope that these and many other issues in the discusses area will be addressed by other researchers.

References

Adobor, H. (2012), "Ethical Issues in Outsourcing: The Case of Contract Medical Research and the Global Pharmaceutical Industry", *Journal of Business Ethics,* Vol. 105 No. 2, pp. 239–255.

Alexandra Countess of Frederiksborg, Fort, T.L. (2014), "The paradox of pharmaceutical CSR: The sincerity nexus", *Business Horizons,* Vol. 57, pp. 151–160.

Azim, M.I., Azam, S. (2013), Corporate Sustainability Reporting by Pharmaceutical Companies: is it what it seems to be?", *Corporate Ownership & Control*, Vol. 11 No. 1, pp. 754–765.

aus der Beek, T., Weber, F. A., Bergmann, A., Hickmann, S., Ebert, I., Hein, A., Küster, A. (2016), „Pharmaceuticals in the environment – Global occurrences and perspectives", *Environmental Toxicology and Chemistry,* Vol. 35 No. 4, pp. 823–835.

Carroll, A.B. (2008), "A history of corporate social responsibility. Concepts and practices." in: Crane, A., Matten, D., McWillams, A., Siegel, D.S. (Eds.) *The Oxford Handbook of Corporate Social Responsibility*, Oxford, UK, pp. 34–42.

Droppert, H., Bennett, S. (2015), "Corporate social responsibility in global health: an exploratory study of multinational pharmaceutical firms", *Globalization and Health,* Vol. 11 No. 15, pp. 1–8.

Dyllick, T., Hockerts, K. (2002), "Beyond the business case for corporate sustainability", *Business Strategy and the Environment*, Vol. 11 No. 2, pp. 130–141.

"Eisai Pharma gets award for CSR activity" (2014), *Chemical Business*, January, p. 57.

Elkington, J. (1998), "Partnership from cannibals with forks: The triple bottom line of 21st-centry business", *Environmental Quality Management*, Vol. 8 No. 1, pp. 37–51.

Enyinda, I.C., Briggs, C., Bachkar, K. (2009), "Managing risk in pharmaceutical global supply chain outsourcing: applying Analytic Hierarchy Process model", *American Society of Business and Behavioral Sciences Las Vegas*, Vol. 16 No. 1, pp. 1–15.

France, N., Bureana, E. (2015), "History of Corporate Social Responsibility Concept". *Annales Universitatis Apulensis Series Oeconomica*, Vol. 17 No. 2, pp. 30–36.

Friemann, F., Schönsleben, P. (2013), "Global Logistics Excellence and Best Practices in Pharma: Results from an interview series with 11 large, multinational pharmaceutical companies", available at: https://www.research-collection.ethz.ch/, pp. 1–48 (accessed 10 January 2019).

Givel, M. (2013), "Modern Neoliberal Philanthropy: motivations and impact of Pfizer Pharmaceutical's corporate social responsibility campaign", *Third World Quarterly*, Vol. 34 No. 1, pp. 171–182.

Göpfert, I., Stephan, M., Wellbrock, W., Ackermann, M. (2013), "An Empirical Analysis of the Board Composition Concerning Logistics Competencies", *World Academy of Science, Engineering and Technology International Journal of Mechanical and Industrial Engineering*, Vol. 7 No. 3, pp. 602–608.

Gray, J.V., Roth, A.V., Leiblein, M.J. (2011), "Quality risk in offshore manufacturing:

Evidence from the pharmaceutical industry", *Journal of Operations Management,* Vol. 29 No. 7, pp. 737–752.

Greve, J. (2008), "Healthcare in developing countries and the role of business: a global governance framework to enhance the accountability of pharmaceutical companies", *Corporate Governance: The International Journal of Business in Society*, Vol. 8 No. 4, pp. 490–505.

Grover, A., Citro, B., Mankad, M., Lander, F. (2012), "Pharmaceutical companies and global lack of access to medicines: strengthening accountability under the right to health", *Journal of Law Medicine and Ethics,* Vol. 40 No. 2, pp. 234–250.

Harrington, T.S., Phillips, M.A., Singh Srai, J. (2017), "Reconfiguring global pharmaceutical value networks through targeted technology interventions", *International Journal of Production Research,* Vol. 55 No. 5, pp. 1471–1487.

Khaleel, M., Chelliah, S., Rauf, S., Jamil, M. (2017), "Impact of perceived corporate social responsibility on attitudes and behaviors of pharmacists working in MNCs", *Humanomics*, Vol. 33 No. 4, pp. 453–469.

Khan, Z., Lew, Y.K., Park, B.I. (2015), "Institutional legitimacy and norms-based CSR marketing practices: Insights from MNCs operating in a developing economy", *International Marketing Review*, Vol. 32 No. 5, pp. 463–491.

Lau, A.K.W., Lee P.K.C., Cheng, T.C.E. (2018), "An empirical taxonomy of corporate social responsibility in China's manufacturing industries", *Journal of Cleaner Production*, Vol. 188, pp. 322–338.

Lee, P.K.C., Lau, A.K.W., Cheng, T.C.E., "Employee rights protection and financial performance", *Journal of Business Research*, Vol. 66 No. 10, pp. 1861–1869.

Leisinger, K.M. (2005), "The Corporate Social Responsibility of the Pharmaceutical Industry: Idealism without Illusion and Realism without Resignation", *Business Ethics Quarterly*, Vol. 15 No. 4, pp. 579–592.

Luo, X., Zheng, Q. (2013), "Reciprocity in Corporate Social Responsibility and Channel Performance: Do Birds of a Feather Flock Together?", *Journal of Business Ethics*, Vol. 118 No. 1, pp. 203–213.

Martinuzzi, A., Krumay, B., Pisano, U. (2011), "Focus CSR: The New Communication of the EU Commission on CSR and National CSR Strategies and Action Plans", *European Sustainable Development Network*, available at: https://www.researchgate.net/publication/267801215_Focus_CSR_The_New_Communication_of_the_EU_Commission_on_CSR_and_National_CSR_Strategies_and_Action_Plans (accessed 10 January 2019).

Matten, D., Moon, J. (2005), "A Conceptual Framework for Understanding CSR", in: Habisch, A., Jonker, J., Wegner, M., Schmidtpeter, R. (Eds.), *Corporate Social Responsibility Across Europe*, Springer Berlin, Heidelberg.

Mehralian, G., Nazari, J.A., Zarei, L., Rasekh, H.R. (2016), "The effects of corporate social responsibility on organizational performance in the Iranian pharmaceutical industry: The mediating role of TQM", *Journal of Cleaner Production,* Vol. 135, pp. 689–698.

Min, M., Desmoulins-Lebeault, F., Esposito, M. (2017), "Should pharmaceutical companies engage in corporate social responsibility?", *Journal of Management Development*, Vol. 36 No. 1, pp. 58–70.

Mousazadeh, M., Torabi, S.A., Zahiri, B. (2015), "A robust possibilistic programming approach for pharmaceutical supply chain network design", *Computers and Chemical Engineering,* Vol. 82, pp. 115–128.

Murphy, P.E. (1978), "An Evolution: Corporate Social Responsiveness", *University of Michigan Business Review*, November.

O'Riordan, L., Fairbrass, J. (2014), "Managing CSR Stakeholder Engagement: A New Conceptual Framework", *Journal of Business Ethics*, Vol. 125, pp. 121–145.

OECDC (2017), "World Drug Report 2017", available at: https://www.unodc.org/wdr2017/index.html (accessed 14 January 2019).

Rehman, M.S.U., Rashid, N., Ashfaq, M., Saif, A., Ahmad, N., Han, J.-I. (2015), "Global risk of pharmaceutical contamination from highly populated developing countries", *Chemosphere*, Vol. 138, pp. 1045–1055.

Shaw, B., Whitney, P. (2016), "Ethics and compliance in global pharmaceutical industry marketing and promotion: The role of the IFPMA and self-regulation", *Pharmaceuticals Policy and Law*, Vol. 18, pp. 199–206.

Smith, A.D. (2008), "Corporate social responsibility practices in the pharmaceutical industry", *Business Strategy Series*, Vol. 9 No. 6, pp. 306–315.

Sousa, R.T., Liu, S., Papageorgiou, L.G., Shah, N. (2011), "Global supply chain planning for pharmaceuticals", *Chemical Engineering Research and Design*, Vol. 89, pp. 2396–2409.

Statista (2017), "Medicine Spending Worldwide", available at: https://www.statista.com/statistics/280572/medicine-spending-worldwide/ (accessed 28 January 2019).

Steurer, R., Langer, M.E., Konrad, A., Martinuzzi, A. (2005), "Corporations, stakeholders and sustainable development I: a theoretical exploration of business society relations", *Journal of Business Ethics*, Vol. 61 No. 3, pp. 263–281.

Sturchio, J.L. (2008), "Business engagement in public programs: the pharmaceutical industry's contribution to public health and the millennium development goals", *Corporate Governance: The International Journal of Business in Society*, Vol. 8 No. 4, pp. 482–489.

Susarla, N., Karimi, I.A. (2012), "Integrated supply chain planning for multinational pharmaceutical enterprises", *Computers and Chemical Engineering,* Vol. 42, pp. 168–177.

Szmelter, A. (2019), "Global Pharmaceutical Industry: Characteristics and Trends", in: Nozari, H., Szmelter, A. (Eds.), *Global Supply Chains in the Pharmaceutical Industry*, IGI Global, Hershey, Pennsylvania, USA, pp. 57–85.

Teker, S.C. (2017), "The Implementation of Analytic Hierarchy Process in Pharmaceutical Industry for Selection Process of 3rd Party Logistics Service Provider", Öneri*,* Vol. 12 No. 48, pp. 107–124.

Tempest, B. (2010), "A structural change in the global pharmaceutical marketplace", *Journal of Generic Medicines*, Vol. 7 No. 2, pp. 113–117.

Thorsteinsdóttir, H., Ovtcharenko, N., Kohler, J.C. (2017), "Corporate social responsibility to improve access to medicines: the case of Brazil", *Globalization and Health*, Vol. 13 No. 10, pp. 1–11.

Toma, S.-G., Marinescu, P. (2012), "Business Models Based on Corporate Social Responsibility: the Case of Global Pharmaceutical Companies", *Ovidius University Annals. Economics Sciences Series,* Vol. XII No. 1, pp. 1221–1225.

Tranfield, D., Denyer, D., Smart, P. (2003), "A systematic review of literature on offshoring of value chain activities", *British Journal of Management*, Vol. 14 No. 3, pp. 207–222.

Valverde J.-L. (2012), "Corporate responsibility and pharmaceutical fraud", *Pharmaceuticals Policy and Law,* Vol. 14, pp. 129–156.

Vian, T., McCoy, K., Richards, S.C., Connelly, P., Feeley, F. (2007), "Corporate Social Responsibility in Global Health: The Pfizer Global Health Fellows International Volunteering Program", *Human Resource Planning*, Vol. 30.1, pp. 30–35.

Witty, A. (2011), "New Strategies For Innovation In Global Health: A Pharmaceutical Industry Perspective", *Health Affairs,* Vol. 30 No. 1, pp. 118–126.

Appendix 1. Sources review results

Company name	Country	The Access to Medicine Index 2016 Rank	Global 100 Most Sustainable Corporations 2018 Rank	Covalence Ethical Ranking 2009 Rank	Best Global Green Brands 2014 Rank	Global CSR RepTrak 100| 2017 Rank	Green Ranking Global Top 100| 2017 Rank	Dow Jones Sustainability Index 2017 Status	Dow Jones SI industry leader Status	Green Rankings US (100)| 2016 Rank	Indexed in CSR-related rankings
Abbott Laboratories	United States			#5				G			22.22%
AbbVie	United States	#9						G			22.22%
Aetna	United States			#12						#64	22.22%
Allergan	Ireland		#20							#13	22.22%
Amgen	United States			#25						#49	22.22%
Astellas Pharma	Japan	#20		#28							22.22%
AstraZeneca	United Kingdom	#7	#34	#8				S			44.44%
Baxter International	United States			#11				-			22.22%
Bayer	Germany	#12						S			22.22%
Beckton-Dickinson	United States			#16							11.11%
Biogen	United States							S, IM	YES	#5	33.33%
Boehringer Ingelheim	Germany	#16		#6							22.22%
Boston Scientific	United States			#24							11.11%
Bristol-Myers Squibb	United States	#13		#2				-			33.33%
Cardinal Health	United States							IM		#76	22.22%
Celgene	United States									#54	11.11%
CIGNA Group	United States			#22				G			22.22%

Index		The Access to Medicine Index 2016	Global 100 Most Sustainable Corporations 2018	Covalence Ethical Ranking 2009	Best Global Green Brands 2014	Global CSR RepTrak 100| 2017	Green Ranking Global Top 100| 2017	Dow Jones Sustainability Index 2017	Dow Jones SI industry leader	Green Rankings US (100)| 2016	Indexed in CSR-related rankings
Company name	Country	Rank	Rank	Rank	Rank	Rank	Rank	Status	Status	Rank	
Daiichi Sankyo	Japan	#18		#19				S			33.33%
Eisai	Japan	#11						-			22.22%
Eli Lilly	United States	#17	#37	#13							33.33%
Genentech	United States			#23							11.11%
Gilead Sciences	United States	#8									11.11%
GlaxoSmithKline	United Kingdom	#1	#53	#1				G			44.44%
Johnson&Johnson	United States	#2	#92	#7	#12	#34	#22			#11	77.78%
Medco Health Solutions	United States			#21							11.11%
Medtronic	Ireland			#26				IM			22.22%
Merck	United States	#5	#13	#17			#33			#82	55.56%
Merck	Germany	#4									11.11%
Novartis	Switzerland	#3	#64	#3				S			44.44%
Novo Nordisk	Denmark	#10		#9				B			33.33%
Pfizer	United States	#14		#15						#57	33.33%
Roche Holding	Switzerland	#19		#4			#14	G	YES		55.56%
Sanofi	France	#6	#22	#14				B			44.44%
Schering-Plough	United States			#30							11.11%
Takeda Pharmaceutical	Japan	#15	#44	#18				-			44.44%
UCB	Belgium		#4								11.11%
United Health Group	United States			#10						#20	22.22%
Valeant Pharmaceuticals	Canada									#78	11.11%
WellPoint	Canada			#20							11.11%
Zimmer Biomet	United States			#27							11.11%

Appendix 2. Literature review results

Source	Year	Main research problem/topic	Country	Method	Results	Area
Vian et al..	2007	Effects of the Pfizer Global Health Fellows program	many countries	Survey	The Pfizer Global Health Fellows international volunteering program offers instructive lessons about possible roles for corporations in strategic philanthropy and global development assistance. PPP is very needed in the healthcare, so governments, NGOs and private sector must join their forces to fight with global health problems, like pandemics.	CSR
Greve	2008	CSR activities are the basis for win-win situations for all stakeholders	none	multiple sources review	Especially in developing countries the "right to health" is poorly implemented. TNCs could contribute to improvements and partly already do so. Yet, the existing approaches are deficitary, insufficient and not sustainable. The problem calls for more accountability in regard to the access to vital medicines.	CSR
Smith	2008	CSR case studies in the Pharmaceutical industry	UK, Germany	case study	CSR should be strongly supported in the company culture (CRS-based strategies), and focused on employees and customers education, stronger environmental awareness. The UK government should establish laws that force pharmaceutical companies to include informational leaflets in the packaging of all prescriptions.	CSR
Sturchio	2008	Impact of the public health programs led by pharma companies on changing the public health	USA (only one company)	Document review, viewpoint (expert)	Review of public-private partnership (PPP) initiatives as ones to address the current problems of the world's healthcare system	CSR
Schneider, Wilson, Rosenbeck	2010	The evolution of reported sustainability activity in the sector	none	document analysis	Pharmaceutical sector is the leading one in CSR activities. There was a shift from sustainability to CSR. Sustainability related activity has increased in breadth and depth, but activity is now being shifted toward CSR, which is reflective of corporate need to satisfy public sentiment. In most cases it is voluntary and based on benchmarking.	CSR
Van de Pol, & de Bakker	2010	Direct-to-consumer advertising (DTCA) of prescription drugs from a corporate social responsibility (CSR) perspective	USA, EU countries	Document review, viewpoint (expert)	US CSR context and EU CSR context are still different (EU context is more strict), but they tend to each other.	CSR

Appendix 2. continued

Source	Year	Main research problem/topic	Country	Method	Results	Area
Witty	2011	CSR and PPP in the industry	None	Document and literature review	Cooperation mechanisms between pharma industry and non-profit organizations are ready to create and deliver pharma products.	CSR
Adobor	2012	Outsourcing of medical research in drug development	None	Document and literature review	There is no enough control of the clinical research in some countries (the law gaps), for example in Eastern Europe	CSR
Grover, Citro, Mankad, & Lander	2012	Analysis of the access to the medicines	None	Document and literature review	People in certain regions have no access to life-saving drugs because of the high price or no valid distribution channel. The structure of CSR activities of the corporations are ineffective and need to be improved.	CSR
Toma & Marinescu	2012	Business models of CSR	USA (only one company)	Documents and literature review	Business models based on CSR are increasingly implemented in the global pharmaceutical industry and contribute to human well-being	CSR
Azim, Azam	2013	Level of CSR in pharmaceutical companies	Bangladesh	content analysis, survey (companies), interview (stakeholders)	26.67% of listed pharmaceutical companies made some CSR disclosure (75% of them without any quantification of CSR activities). The majority of stakeholders appear to favour mandatory requirements for CSR disclosure.	CSR
Givel	2013	Determining whether each CSR organisational action was an individual initiative or required by government regulation or law	US (one company)	review of multiple sources	Overall, motivations for the current CSR programme favours a neoliberal free market approach, so emphasises providing voluntary and discretionary corporate philanthropy. At present, there are no detailed approaches to realistically meeting the goal of universal provision of quality medicines to all in company's CSR programme. A significant gap exists between general goals of meeting patients' needs first with access to medicines and its CSR organisational and preferred public policy outputs, which do not address the needs of all patients.	CSR
Luo, Zheng	2013	Theoretical framework on the effects of CSR reciprocity on channel performance.	none	secondary sources statistical analysis	The CSR reciprocity is the joint occurrence of CSR strength of buyers and sellers. CSR reciprocity between buyer and seller firms in a supply chain affects channel tie intensity and channel sales performance (main effects) and that market competition may amplify these influences (moderated effects). CSR reciprocity positively influences channel relationship performance. CSR has no significant influence on channel relationship performance when either buyers or sellers do not exhibit high CSR strength. The positive effect of CSR reciprocity on channel relationship performance is enhanced when the market competition is high rather than low.	CSR

Appendix 2. continued

Source	Year	Main research problem/topic	Country	Method	Results	Area
Ale-xandra Countess of Frede-riksborg, Fort	2014	Optimum instrumental benefits accrue to corporate CSR actions when they are undertaken for sincere aims rather than for instrumental ones	none	case study	A framework and tips for pharmaceutical industryfor CSR activities providing a way for pharmaceutical companies to embrace a more robust model of corporate responsibility that could be extended to other industries as well. They should be focused on the long term and be sincere, not instrumental.	CSR
No author	2014	Description of the CSR action of one of the mncs	India	Description	Eisai Pharma was awarded for its CSR action of providing over 2 mln tablets for WHO.	CSR
O'Rior-dan, Fairbrass	2014	CSR practices of major pharmaceutical companies	UK, Germany	case study, survey	CSR needs to be conceptualised, it is not equally defined by different decision--makers in the pharmaceutical industry. Also, there are some evolutionary stages of CSR activities in the industry (accountable companies, innovators, parrots, law abiders). A revised explanatory framework is the main contribution of this paper. By abstracting those factors which influence CSR practice, it provides an analytical tool which is designed to be of practical use for business decision-makers when managing their stakeholder engagement activities.	CSR
Khan, Lew, Park	2015	How these mncs' CSR marketing activities are legitimized, from the institutional perspective	Pakistan	Interview	MNCs show commitment to CSR programs despite underdeveloped and very weak formal institutions, and that lots of these initiatives such as education, health, environmental protection, and civil society/religious organizations are oriented toward norms-based social CSR marketing, i.e. charitable and philanthropic work, civil society-led social media and religious groups also force MNCs to spend more on CSR marketing initiatives. MNCs follow headquarters' global CSR marketing strategies and adapt their CSR programs to the host country's norms, focussing on their product brand value related CSR marketing. However, the MNCs have not taken an integrated approach to CSR marketing, considering the overall institutional environment of the host country.	CSR
Drop-pert & Bennett	2015	CSR strategies – factors	None	Public data analysis, interview	The factors motivating CSR engagement were: reputational benefits, recruitment, employee satisfaction, better ranks in global indices, entering new markets, long--term economic returns, improvements in global health.	CSR
Rehman, Rashid, Ashfaq, Saif & Ahmad	2015	Impact of the industrial relocation on the environment	China, Bangla-desh, Pakistan, India	Literature review	There are many threads for the studied countries in environmental issues regarding the production in the pharmaceutical industry. The worst situation in this regard is in Bangladesh, India and Pakistan, better in China, where the awareness is higher.	CSR

Appendix 2. continued

Source	Year	Main research problem/topic	Country	Method	Results	Area
Aus der Beek et al.	2016	Current state of knowledge about the concentrations of pharmaceuticals in the environment	None (but regional differentiation)	Literature review and metaanalysis	In emerging and developing countries certain pharmaceuticals are detected in surface waters. They may cause ecotoxicological effects in densely populated areas (cities). There is regionalisation of this occurence and monitoring by UN: for example antibiotics in Asia and estrogens in Africa. The publicly available data on national pharmaceutical consumption is not sufficiently detailed for a regional analysis of environmentally relevant pharmaceuticals.	CSR
Mehralian, Nazari, Zarei, Rasekh	2016	The influence of the relationship between CSR and total quality management on the organizational performance	Iran	survey	Social responsibility is significantly associated with the integration of this responsibility into quality management programs. Quality management, in turn, has a significant and positive effect on organizational performance. Managers can strengthen their relationships with stakeholders and, ultimately, improve organizational performance if social responsibility towards stakeholders is embedded in operational routines and processes	CSR
Shaw & Whitney	2016	Role of the international federation (IFPMA) in the creation of ethical standards in the industry	None	Document and literature review	The activities of the IFPMA and its member associations and companies are an example of the broader trend towards greater business ethical frameworks in the pharmaceutical industry.	CSR
Khaleel	2017	How CSR initiatives are perceived by pharmacists and how it influences employees' organizational commitment and (OCB)	Pakistan	interview	CSR was a predictor of affective organizational commitment (AOC) and OCB. AOC fully mediates the relationship between CSR and OCB organizational citizenship behavior	CSR
Min, Desmoulins-Lebeault, Esposito	2017	Adding value by CSR to corporate financial performance (CFP) in the pharmaceutical industry	none	survey	CSR adds value to CFP and should be viewed as a long-term investment. CSR programs should be implemented regardless of company size. CSR is effective because it invests in stakeholder management, such as with customers, government, investors, and activists, creating positive relationships which improve reputation and profitability.	CSR
Thorsteinsdóttir, Ovtcharenko, Kohler	2017	The alignment of CSR activities in Brazil with the Federal Government's health prioritization	Brazil	literature review (case studies)	There are loose connections between Governmental priorities and CSR activities of the pharmaceutical firms. However, there is an opportunity for greater compatibility, which could improve access to medicines in Brazil and build a stronger relationships between the Government and industry.	CSR
Lau, Lee, Cheng	2018	Developing an exploratory taxonomy of CSR practices	China	Survey, statistical analysis	Three clusters o CSR exemplars: CSR exemplars (the highest level of CSR activities), CSR developers (lower than exemplars but higher than minimalists, especially in human resources) and CSR minimalists (focused on business survival). In the pharmaceutical industry, there are mostly CSR exemplars or minimalists.	CSR

Appendix 2. continued

Source	Year	Main research problem/topic	Country	Method	Results	Area
Lee, Lau, Cheng	2013	Employee rights protection and the critical role of suppliers in implementing this initiative	China	total design method, survey, statistical analysis	Employee rights protection should be effective for organizations in different echelons of a supply chain. When adopting them, companies achieve better customer satisfaction and benefit from improved corporate reputation, sales and marketing performance, financial performance. When a supplier implements employee rights protection, its buyer can obtain improvements in financial performance and corporate reputation.	ETHICS, SCM
Enyinda, Briggs, Bachkar	2009	Global supply chain outsourcing trends, drivers, and functions (areas), emerging risks in it, measures to manage it	none	AHP model	The key drivers of pharmaceutical outsourcing R&D are increased complexity of clinical trials and regulatory requirements, increasing data requirements, cost savings, minimizing time to market, rapid access to additional R&D capacity, access to therapeutic expertise, and access to novel enabling technology. Core competencies and well executed outsourcing strategies can enhance returns on capital, reduce risk, improve flexibility, and make firms more responsive to customers' and shareholders' value requirements	LOGI-STICS
Frie-mann, Schön-sleben	2013	Best practices in logistics	None	Interview	The biggest limitations in storage capacities are encountered in the distribution centers. Emerging markets will become more relevant in future and the majority of the companies is already locally operating in some of them.	LOGI-STICS
Göpfert, et al..	2013	Correlation between logistics competencies in executive boards and financial performace	many countries	Content analysis	In Asian companies, logistics is more valued at the executive level. The number of executives with logistics competencies is positively correalated with the financial performance.	LOGI-STICS
Bishara	2006	Cold chain management	None	Document review, viewpoint	There are many guidelines for cold chain management. Due to the presence of multiple uncontrolled variables in the distribution process, developing an appropriate monitoring program is essential.	SCM
Gray, Roth, Leiblein	2011	Quality risk of offshore manufacturing	USA and Puerto Rico	Statistical analysis	Puerto Rican plants operate with a significantly higher quality risk than US plants. The Food and Drug Administration (FDA) should intensify the inspections, especially on the international manufacturing.	SCM
Sousa, Liu, Papageorgiou & Shah	2011	Optimizing the global supply chain planning	None	Statistical analysis	A ready-to-use model of optimizing the flows in supply chains as a response for the various supply chain requirements.	SCM

Appendix 2. continued

Source	Year	Main research problem/topic	Country	Method	Results	Area
Susarla & Karimi	2012	Supply chain planning	None	Statistical analysis	A simple MILP-LP model for multiperiod enterprise-wide planning in a multi--site, multi-echelon, and global network of a pharmaceutical company; it inte-grates procurement, production, and distribution along with the tax differences, inventory holding costs, material shelf-lives, waste treatment/disposal, and other factors	SCM
Mousa-zadeh, Torabi & Zahiri	2015	Supply chain planning (for production and distribution)	None	Statistical analysis	The model for tactical decision-making process to help to make decisions (for example opening of pharmaceutical manufacturing/distribution centers)	SCM
Har-rington, Phillips & Singh Srai	2017	Making shift form make-to--stock strategy into the make--to-order strategy	United Kingdom	Viewpoint and case study	A framework for categorization of the advanced manufacturing technologiest; the shift from MTS (make-to-stock) to MTO (make-to-order) is necessary but there are many obstacles to implement it everywhere.	SCM
Teker	2017	Selection process of the 3PL Provider	None	Statistical analysis	Experience, risk amanagement and relationship referring to trust, reliability and compatibility are the most important criteria in the mentioned process	SCM