Managing the Socially Sustainable Global Manufacturing Network

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Abstract. Footprint decisions in global manufacturing networks have an impact on local society, environment and economy. However, the reverse influence can also be detected: the globally increasing awareness of customers and politics related to socially sustainable manufacturing is driving the design of footprint decisions. This paper exploits the effects of offshoring and reshoring in global manufacturing networks from the social and economic dimensions of sustainability. It presents and examines examples from industrial practice.

Keywords: Production Networks · Sustainability · Offshoring · Reshoring

1 Introduction

Globalization is leading companies to revise their strategies related to their manufacturing footprint for several reasons [1]: Firstly, globalization of the targeted market segment requires the local presence of production and distribution facilities, due to official regulations, for example, or because the customer demands it. Secondly, for the entry into new market segments, the creation of new production facilities or a distribution center for finished products and/or service items is necessary. Thirdly, the increasing strategic importance of short delivery times demands to speed up all business and supply chain processes (e.g. development, order processing, service); one solution can be decentralized adaptation of products and services by completing them locally. Fourthly, the market competition and price sensitivity of customers and management attention to focus on core competencies force manufacturing networks to significantly reduce costs and accordingly to exploit associated options to relocate individual steps in value added to locations with specific know-how or lower costs.

These reasons call for offshoring of processes of the value chain to the country or area close to the customers. By means of industrial examples, this paper exploits the effects of offshoring and re-shoring in global manufacturing networks from the social and economic dimensions of sustainability The customers are part of the society in which the remote location is integrated, and sometimes even part of the local community. This makes the question of the potential for manufacturing to be a bridge towards mutual benefits important [2]. In particular the fourth reason demands to offshore activities to low-wage countries. The

social dimension of sustainability then becomes important related to potential reputation problems in the sales markets [2].

2 Offshoring from Industrialized to Developing Countries

The above presented factors for designing the manufacturing footprint are mainly motivated from an economic perspective. First and foremost, these reasons lead to a strategic decision about centralized or decentralized production. Only then can a profound decision be taken about offshoring. Figure 1 shows more centralized or decentralized design options between two (conflicting) dimensions, taking the example of a product with four operations (or production levels) and subsequent distribution (for detailed discussion and examples from industrial practice see [3]). The integrated approach is particularly advantageous by including the distribution, service and transport network within the strategic redesign of the production network [4].

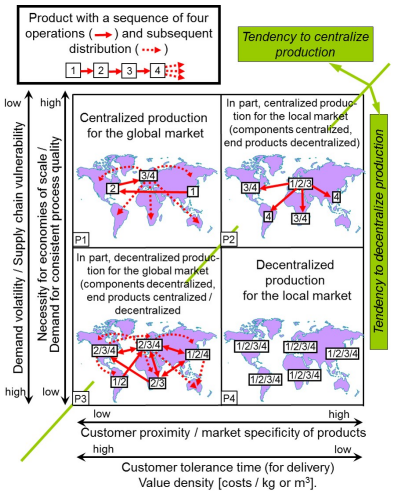

Fig. 1. Concepts for production networks, slightly modified from [2,3,5]

In short, the figure actually systematizes the following eight (or two times four) generic features for designing production networks:

- Demand volatility (Items have continuous demand if it is approximately the same in every observation period. Items have discontinuous demand if many periods with no or very little demand are interrupted by few periods with large demand, for example ten times higher, without recognizable regularity),
- Supply chain vulnerability (Disruptions can arise from either the supply chain partners or the macro-economic environment.),

- Necessity for economies of scale (Are the manufacturing costs of the product low enough?),
- Demand for consistent process quality (Can customer needs be satisfied despite differing process quality?),
- Customer proximity (To sell a product it can be necessary to locate the value-adding processes close to the customers),
- Market specificity of products (Adapting to the market is necessary for functional requirements or for appearance),
- Customer tolerance time (According to [1], this is the time span the customer will (or can) tolerate from the order release to delivery of the product),
- Value density (This variable is defined as item costs per kilogram or cubic meter. Transport costs are of greater consequence if value density is low than if value density is high.)

Where at least part of the production is decentralized, strategic consideration must lead to activities being offshored to the country or region where the potential customers are located (see sectors P2 and P4 in Figure 1). Even in the case of centralized production, some operations can be performed offshore, as shown in sectors P1 or P3 of Figu re 1. In such cases, offshoring can occur for cost reasons, in particular because of lower costs in developing countries. Sometimes, offshoring of a part of the value-added will be required by a country's national legislation before permission to access the market is granted. In the chemical and pharmaceutical industry, for example, it is normal for certain operations to be carried out centrally in a particular country, and for the intermediate product then to be transported to the next location in another country. These are referred to as pipeline products: Production "flows" from one country to another. The location for the last operation is sometimes chosen for tax reasons, as significant overheads (particularly for R&D) will be added to the production cost of the product here (cost of goods sold, COGS).

3 Ambivalent Impact of Offshoring from a Social Perspective

Systematic location planning is of crucial importance due to the ambivalent nature of footprint decisions. Stakeholders have varying needs with regards to social indicators and much work has to be done in identifying representative social indicators throughout the upstream and downstream supply chains [2]. In the following the impact of offshoring decisions on both the original production location and the destination location is investigated from a social perspective on sustainability.

The impact on the society of the offshoring "home" location is multifold [2]: The location is mostly losing professional know-how in the long-term, since the manufacturing processes and associated expertise is transferred to the new location. There are different approaches how to conduct the knowledge transfer such as training the staff of the destination location for some time at the original

location or sending experienced employees of the home location temporarily as trainers to the destination location. The workforce at the home location is reduced e.g. by early retirement arrangements, by lay-off, by retraining or by not replacing open job positions. Local communities are affected for instance by a higher unemployment rate and associated expenses or by migration of citizens. Another implication is that the company's reputation in its home location may suffer as a trustworthy employer, which could hamper recruiting of skilled staff in the long-term. In addition, regulations and requirements with regard to working conditions and emissions, which are introduced with the purpose to protect the environment and the staff, may be one part of the motivation to relocate manufacturing.

Likewise, the social impact on the destination location is multifold [2]: Local communities benefit from a large number of jobs that provide an income and thus a certain amount of prosperity for its local citizens. Thus, they have an interest in manufacturing companies being located in their area. Generally, the interests of society itself may vary (see [6]). For society, it is also a case of "social peace" being brought about by the social well-being of its citizens. That offers considerable potential for manufacturing to be a bridge towards mutual benefits. This regional political stabilization comes about through a stable income and local supplier contracts, and also through improved practical further education for its citizens, which has a positive impact on employability. Therefore, for local communities, the key issue is not the amount of tax that a company will pay in that location. Actually, the opposite is true: Local communities attract multinational companies to invest in their area by offering substantial subsidies [6]. One example is German-based car manufacturer Volkswagen in the USA (see [7]), where local communities made available 1400 acres (5.67 km_2) of land and some infrastructure. In return, Volkswagen made investments of over 1 billion US$ (of which "$379 million local and Tennessean construction contracts awarded, $397 million local and Tennessean car supply contracts awarded annually"), creating employment for "more than 3,200 Volkswagen employees, and more than 9,500 indirect supplier employees" [7]. The economic effect for the local community and for society encompasses "$12 billion expected in income growth in Tennessee, $1.4 billion expected in total tax revenues in Tennessee" [7]. As the website data shows, the economic effect for society is considered by Volkswagen to be part of its double bottom line. The same can be said of Volkswagen's other locations, of other car manufacturers, of their globally active system suppliers, and also of other large companies in other sectors that offshore large amount of their production.

4 Managing Socially Sustainable Offshoring

When offshoring manufacturing from industrialized to developing nations, there are some managerial challenges to consider. These include, firstly, the need to put the right people in place in leadership roles to ensure that the subsidiary maintains the company's global standards. Initially, the senior management po-

sitions are given to people from the company's own home country. They are called "expats". This term highlights the fact that this status involves cultural, language and other social challenges that need to be handled carefully. Secondly, there may be a high level of local staff turnover, which sometimes also involves a loss of intellectual property.

Other managerial challenges associated with offshoring include partnerships with local suppliers or with representatives of local communities or society. Win-win think-ing, an underlying principle of close partnerships (see, for example, [1]) is not always perceived in the same way as it is at home. Oehmen et al. examined the duration of collaboration between Chinese suppliers and Swiss companies [8]. Even with goodwill on both sides, it often lasts for much less time than would be needed to compensate the expense of developing the supplier.

For socially sustainable offshoring, cooperation between a company's corporate social responsibility (CSR) department and national development organizations can lead to an acceleration of the company's CSR learning curve, because the company can gain insights from the governmental organizations in conceptual and operational areas. Furthermore, companies are defining and implementing a "code of conduct" (CoC), which constitute the company's policy and behavioral rules at a normative level towards the sustainability dimensions such as labor standards, health and safety, environment, ethics, and compliance [2]. They normally publish this information on their website. Within the supplier management, companies define and implement a specific "supplier code of conduct" (SCoC). Oehmen et al. conducted a survey (see Table 1) in order to examine the state-of-the-art of SCoCs in the electronics industry related to addressing issues and concerns in a social dimension of sustainability [9].

Table 1. SCoCs - issues addressed and frequency of occurrence (excerpt, acc. to [9]).

No.	SCoC Element and frequency of occurrence (n=24)	
1	***Labor Standards***	
1.01	Forced labor	83%
1.02	Child labor	88%
1.03	Juvenile workers	33%
1.04	Non-discrimination	79%
1.05	Harassment, inhum ane treatment	50%
1.06	Respect and dignity	42%
1.07	Freedon of association	50%
1.08	Working hours, rest periods and breaks	54%
1.09	Minimum wages and benefits	42%
1.10	Overtime compensation	25%
1.11	Recorded terms of employment	17%

An example of industrial practice is the Code of (Business) Conduct of Lafarge-Holcim, a global leader in the building materials industry (cement, con-

crete, aggregates, and asphalt) [5]. With the aim of creating trust, protecting its reputation, lowering costs of doing business and enhancing shareholder value, LafargeHolcim defines the following three areas of integrity in its CoC [5]:

1. Integrity in the workplace focusing on e.g. health and safety, diversity, respect,
2. Integrity in business practices including e.g. anti-bribery, anti-corruption,
3. Integrity in the community addressing e.g. environment, human rights.

The company defined aspirations and targets in three focus areas "climate", "resources" and "communities" (see Figure 2) within its "Sustainable Development Ambition 2030" [10]. To support working with local communities, community advisory panels (CAP) and CSR plans have been set up at country level.

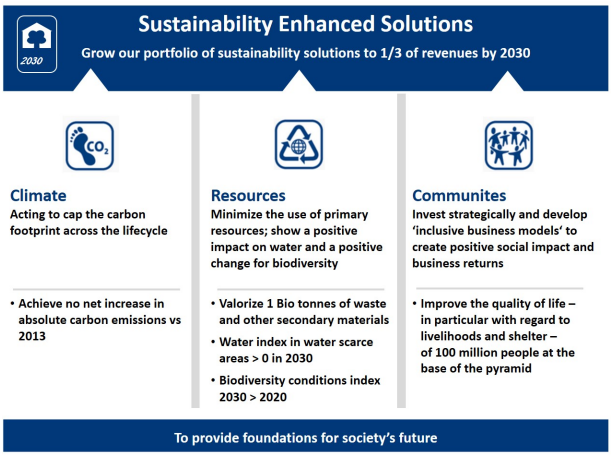

Fig. 2. Sustainable development ambition 2030 of Holcim (according to [10].

5 Effects of Re-shoring

The dynamics of the global environment can cause a change of a company's strategic priorities with the consequence that previously offshored manufacturing activities are re-shored to its original location. Surveys of the Fraunhofer ISI among medium-sized companies in the mechanical and electrical industry (M&E) in Germany (see Figure 3) reveal companies' reasons for both offshoring and re-shoring production activities (mostly from Eastern Europe or Asia). Figure 3 shows the number of companies that re-shored their activities to their home country during the year in question. The other numbers in the chart show the percentage of this number that can be attributed to the specified reasons

(multiple reasons were permitted). The two dominant reasons across the full time period covered by the study were quality (product quality at the offshore location was not good enough) and flexibility (mainly problems with the delivery time). When re-shoring the manufacturing activities, the following effects for the local communities are reported: In a specific instance in China the reshoring has had no negative consequences for the local community [8]. Chinese suppliers that had experienced substantial growth were a cause of the problems mentioned in [8], without actively wishing to be.

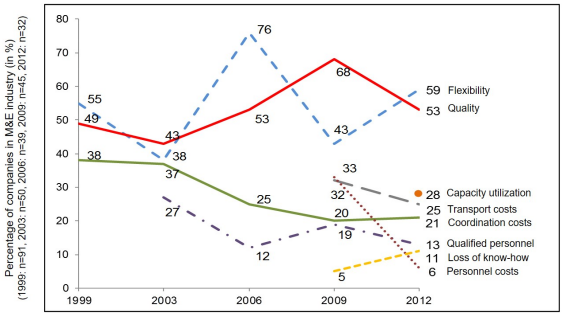

Fig. 3. Reasons for re-shoring (according to [1], data according to [11]).

However, a contrary effect is reported by Lynch et al., which examined social consequences for the local community in countries with a generally declining industrial sector [12]. In the described instance, the car manufacturers Ford, Holden and Toyota intend to stop producing cars in Australia in 2016 and 2017. Local suppliers will therefore lose most of their customers, which will have major consequences for the employment market and for research and development, including for university institutions. The German engineering and electronics company, Bosch, is worth mentioning in this context. Bosch closed their diode production facilities in Germany, and concentrated them in Australia. This offshoring strategy was based on financial incentives provided by the Australian government. These were supposed to run until 2021, but may now end in 2017. For the multinational company, decisions about investments in its Australian subsidiaries have become much harder to make. The policies used by local communities to offer substantial incentives in order to make their area attractive to major companies have a downside here.

6 Conclusions

Globalization results in mainly economic motivated factors to constantly revise a company's manufacturing footprint. In order to achieve holistically economic and

social sustainability in a company's manufacturing, the whole, globally connected network of suppliers, producers, and consumers should be addressed. There are eight generic features for designing production networks. These features lead to a strategic decision about centralized or decentralized production. Offshoring has an ambivalent impact on the original and destination location in a social dimension of sustainability. Thereby, the paper depicted effects and examples from industry practice about managing socially sustainable offshoring and reshoring of manufacturing.

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