



Chapter 11

Optimizing Supply Chain Performance in China with Country-Specific Supply Chain Coordination

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Abstract: The implementation of country-specific supply chain coordination techniques ensures an optimal global supply chain performance. This paper looks at success factors going with a supply chain coordination strategy within the global supply chain of a successful, medium-sized, privately-owned company, one having locations in North America (USA), Europe (Hungary) and Asia (China). Through the shown GSL's Chinese plant, we will endeavor to argue that increased collaboration in the supply network with appropriate supply chain coordination brings down not only the inventory level but can also improve conformance quality and reduce quoted lead times.

Keywords: Innovation, Supply network, Supply chain coordination, China, Specialty lighting



Introduction

Optimal global supply chain performance requires the implementation of country-specific supply chain coordination techniques (Cachon and Fisher, 2000; Fugate et al., 2006; Simatupang et al., 2002; for an industry-specific analysis see, for example, Forgionne and Guo, 2009). This paper examines the challenges of building and coordinating the global supply chain of a successful, medium-sized, privately-owned company, one with locations in North America (USA), Europe (Hungary) and Asia (China). The company, Global Specialty Lighting (GSL - a fictitious name to protect the confidentiality of our data) operates in the specialty lighting industry, being characterized by innovative design and customized manufacturing. The main elements of supply chain coordination, such as order strategies (Hieber and Hartel, 2003; Sepulveda et al., 2008), lot sizing issues (Jansa et al., 2008), flow coordination and information sharing (Sahin et al., 2002) are crucial in this industry - which has become more chaotic during the past decade.

The paper, using insights from GSL's case, looks at: (1) how global supply chain optimization can be achieved through collaboration, and (2) necessary factors for coordination-utilizing opportunities available when having a global spread. As industry characteristics are changing, the challenge is for the group of companies to make rapid responses to partners, including in emergency situations. To maintain speed and quality throughout the supply chain, manufacturing facilities need to operate with state-of-the-art, modern equipment to keep production running smoothly while offering short runs and just-in-time completion to accommodate deadlines.

The Specialty Lighting Industry – The Case of Global Specialty Lighting (GSL)

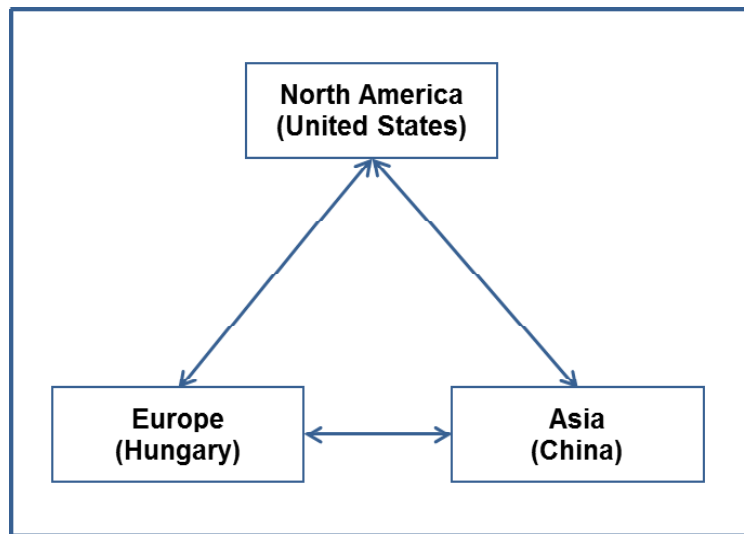
The specialty lighting industry has in it different lighting formats and offerings, which includes commercial, residential or specialty markets; thus there is great variety, yet the manufactured product volume is relatively low. Owing to these two features the specialty lighting segment has higher prices, though products all require extensive, special knowledge - which few operators have. Besides this, in most cases items require the contribution of skilled workers, and there is a lower level of standardization than in a case of 'regular' products. Moreover, customers may have

very specific customization needs. Therefore, the largest lighting companies (like General Electric or Philips) generally avoid taking part in this niche market - rather, they focus resources on their core competency: mass production. However, once a specialty product attains a certain quantity or the ‘customization level’ drops, such a product may become more interesting for the large players.


This explains why specialty lighting companies are concerned with a constant recreation of their niche market, i.e. rather than expanding their operations towards ‘regular’ lighting fixtures. Moreover, due to the very specific customer needs, their strategy is strongly focused on marketing channels. Finally, as innovation is crucial, patents are needed to protect the company’s markets from cheap imitations.

Global Specialty Lighting (GSL) and its affiliated companies and strategic partners are often seen as being innovative designers and manufacturers in the specialty lighting industry. The broad-range of product lines (including health and beauty lamps – like tanning lamps - , T5, T8, T12 lamps, germicidal lamps, specialty fluorescent lamps, medical lamps, LCD backlighting sign tubing and other special base designs) ensures a strong global presence and a global network – one with 1,000 employees and locations in North America, Europe and Asia.

Figure 1. Geographical Locations of GSL’s Main Facilities



Source: authors’ compilation




In the specialty lighting industry, as in many others, industry characteristics are changing: the sales cycle is getting shorter and shorter, and production lead-time cannot be reduced. Also, there is an increased variability in demand, while unsold products attain low residual value. While GSL provides its customers with unmatched flexibility both in design and production (manufactured products have unique specifications and volume as companies take orders with varying quantities), achieving and maintaining such capacities are still challenging, especially with a global supply chain spreading across three continents.

Country-Specific Supply Chain Coordination Challenges: China's Role in Supply Chain Optimization

GSL was founded in 1983, in the United States, and has become an international leader in the design and manufacturing of germicidal and specialty fluorescent lamps. In 1987, the company expanded by creating a subsidiary to concentrate on a very special segment of its niche market: commercial, military and private avionics display backlighting. GSL's lamps are used to illuminate the cockpit instrumentation displays of several Boeing aircraft and – exclusively - NASA's Space Shuttle. After this transition, in 1990, the company saw expansion of its market and built capacity overseas by setting up a manufacturing plant in Hungary, and the main purpose of this company was to meet the growing industrial demand for technical, ceramic parts. This pointed to vertical integration via finding a solution to the classic 'make or buy' problem, since GSL was then able to control its upstream supply chain. This move also created some level of decentralization, as these unique, proprietary products were pooled together in one single structure. In the specialty lighting industry the number of suppliers is limited, so the main benefit for GSL here was to gain more control over its own supplies while producing ceramic bases with its own patents, thereby attaining a valuable intellectual property. This integration gave an opportunity to optimize inventory levels and ensure an uninterrupted just-in-time supply; and there was the continual obtaining of in-depth, valuable market intelligence in the field of ceramic base production.

The expansion continued in 1993, when the company formed a strategic partnership with a Hungarian manufacturer of specialty fluorescent lamps. By the end of the decade, the Hungarian plant had also become a major producer of custom private-brand lamps for tanning equipment manufacturers and major tanning-lamp distributors. In the beginning, the sole objective behind having a Hungarian



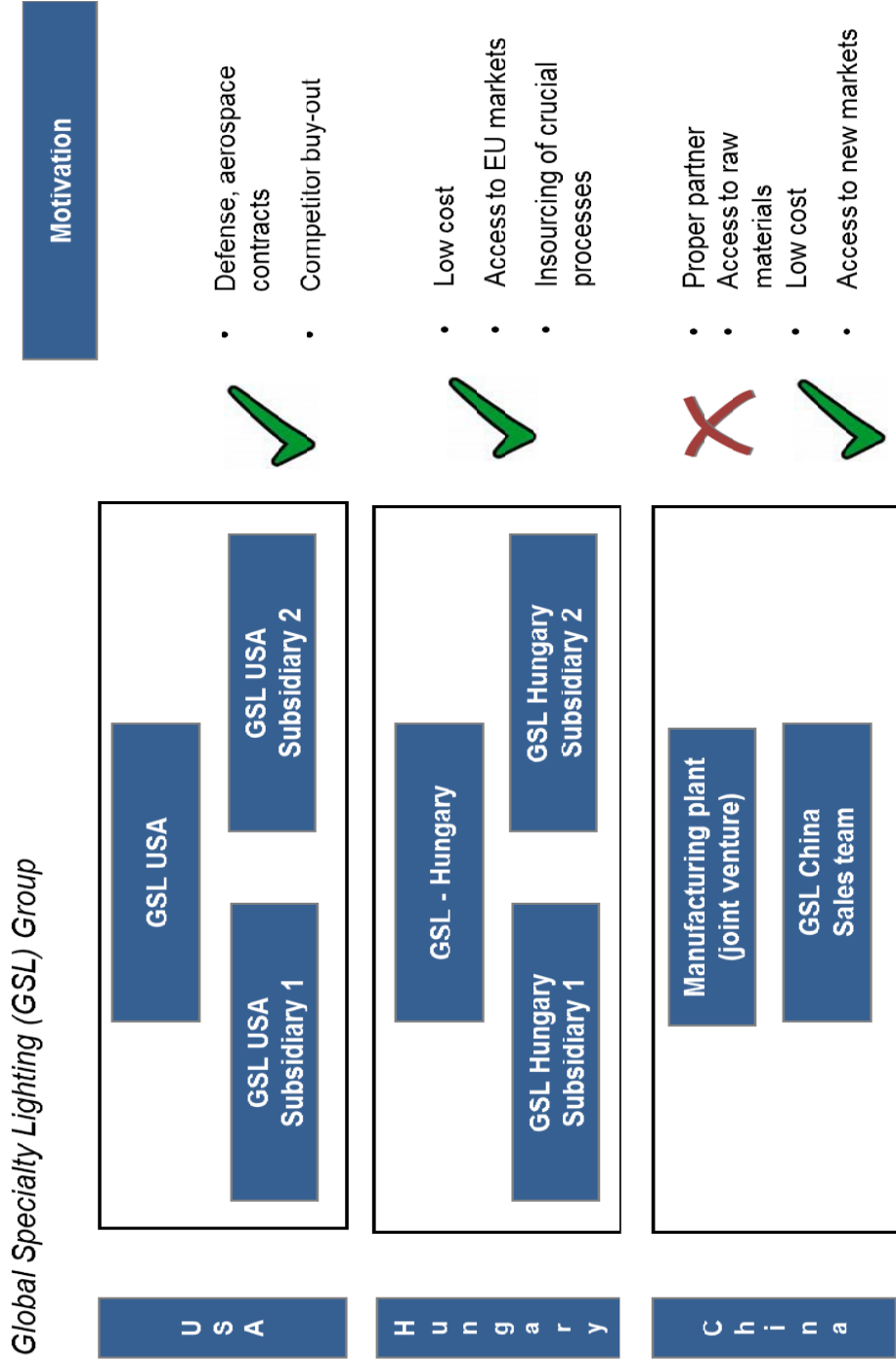
subsidiary was to continue execution of the promising global business strategy, i.e. as demand for tanning, germicidal and specialty lamps grew significantly throughout Europe during this decade.

However, the decision to form this type of inter-company corporate alliance had later benefits, in several ways. First, it complied with the principal intention to satisfy the increasing European demand for specialty lighting products; and it also created a solid knowledge-transfer base between the well-established market of the US and the emerging markets. One example of this is the frequent exchange of engineers between distant manufacturing locations, the practice of which served not only training purposes - it additionally aided the constantly development of new innovative techniques and processes. Alongside this, another positive effect was the constructive differences in management qualities due to the far-apart cultural locations (USA – Hungary), which helped to facilitate a rising effectiveness in the delivering of high quality products while identifying and meeting customer needs with a new cultural range. Finally, it provided a strong basis via which to further stretch vertical integration without significant and additional logistics efforts. The glass factory that was opened in 2001 was built on this concept.

Interestingly, the overseas sister companies kept up an autonomous operational structure in terms of management and engineering efforts. This allowed the group to maintain the distinct image had by each company by preserving the image of their manufacturing good quality, private label lamps with a unique proposition – this without focusing too heavily on marketing their own brand name. Another consideration was to keep each company’s ability to develop best practices while still achieving economies of scale in manufacturing and short-term logistics.

Due to its lean and tight operations, during the financial crisis GSL was able to remain stable, while some of its major competitors were underperforming. This gave the opportunity for a competitor buy-out; and upstream acquisitions continued, too. The latest American and European expansion activities included taking over, for instance, a manufacturer of cold cathode lighting components, neon lighting, U- and long lamps as well as sign tubing. The main reason behind these buyouts were gaining customers, increasing market share and getting access to special technical designs and patents.

Figure 2. Motivation for the Expansion of GSL's Supply Chain



Source: authors' compilation of semi-structured interviews at GSL in 2010 and 2011.

In 1993, GSL patent-protected its ultraviolet water purification system. These product lines become popular as an alternative to chemical treatments at waterworks. This product proved to be one of the major reasons why the company decided to move to China - a need for quality, high-end specialty lighting solutions had greatly increased in Asia. Customers were willing to pay a higher price for products that were manufactured in the United States, and this provided a sustainable growth base.

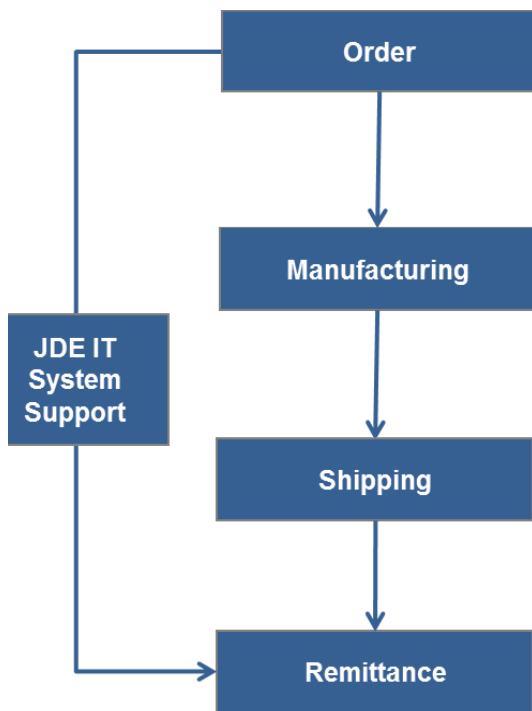
Additionally, following the global trend, GSL planned to exploit low-cost manufacturing opportunities, and with a local partner also set up a manufacturing plant in China. However, China proved to be very different from Hungary, which is not only geographically closer but, also, cultural differences compared to the United States were much lower. Among other things, quality and delivery issues arose, which threatened the brand image and customer loyalty. Besides this, patent protection was always a concern, so after a reasonable time of trying to solve the

problem, GSL decided to suspend manufacturing operations there for undefined period. GSL needed to re-evaluate the roots of the problems, as the company does plan to increase its presence in the country - Chinese sales are steadily growing and China is a major source of the rare earth materials that are crucial for the manufacturing process.


Although every GSL product line is slightly different, the supply chain can be described by five main elements: (1) Order, (2) Manufacturing, (3) Shipping, (4) Remittance, (5) JDE IT system support.

All GSL companies prepare a regular product, manufacturing and quality development plan annually, and these affect all areas of product and quality development, even those not

Figure 3. Supply Chain of GSL's Specialty Products



Source: authors' compilation based on company (GSL) data



directly connected with technology or manufacturing (education, computer engineering, measuring systems, etc.). During the recent crisis, these plans focused on sourcing and inventory problems. The reason behind the need to rethink the level and positioning of inventories was the fact that the required delivery time in the market is shorter than the manufacturing lead time. Due to the “perishable” nature of the products (unsold products have low residual value), the positioning of work-in-process inventory buffers became crucial. The shorter sales cycles created coordination problems as production lead-times could not be reduced, which led to increased variability in demand. In this environment the main competitive advantage is to provide unmatched flexibility in both design and production (manufacture products to unique specifications and in varying quantities). Meeting these criteria and maintaining achieved capacities are challenging, especially (as said) with a global supply chain crossing three continents.

There are major issues that created differences in the successes of the Hungarian and Chinese plants - and the chief coordination-related factors were closely connected to the following challenges:

- Although the technology and abilities were exported, the Chinese facility did not respond rapidly and flexibly to changing customer needs or to strict international quality standards. Shipments of half-finished lamp bodies for further processing from the Hungarian to the US factory (further processing means etching, basing or quality inspection) provide a good example: one plant’s underperforming will greatly affect other work locations as well.
- With the Chinese plant, GSL built a different inter-corporate relationship than it did with the Hungarian plant. Instead of a sister company, a joint-venture was formed. That meant that GSL’s local partner had complete control over several crucial managerial decisions. When optimizing a supply chain that is country-specific, identification of sourcing factors should be among the very first steps, i.e. to help to prevent problems that might otherwise remain hidden (as, for example, in the case of staffing issues). Once these factors and processes have been identified, GSL could then have decided if it was necessary to re-insource an activity or component that had previously been transferred or outsourced.
- The spread of geographical locations means a great risk for specialty lighting products as inventory levels are low due to the fact that special features are not known in most cases until the order had been made. The risks lie partly in external factors (disruptions from disasters etc.) but



mostly relate to the short lead time (a maximum of 2 weeks lead time for orders). Lot sizing and minimum order quantities were great performance considerations as related to the Chinese supply chain.

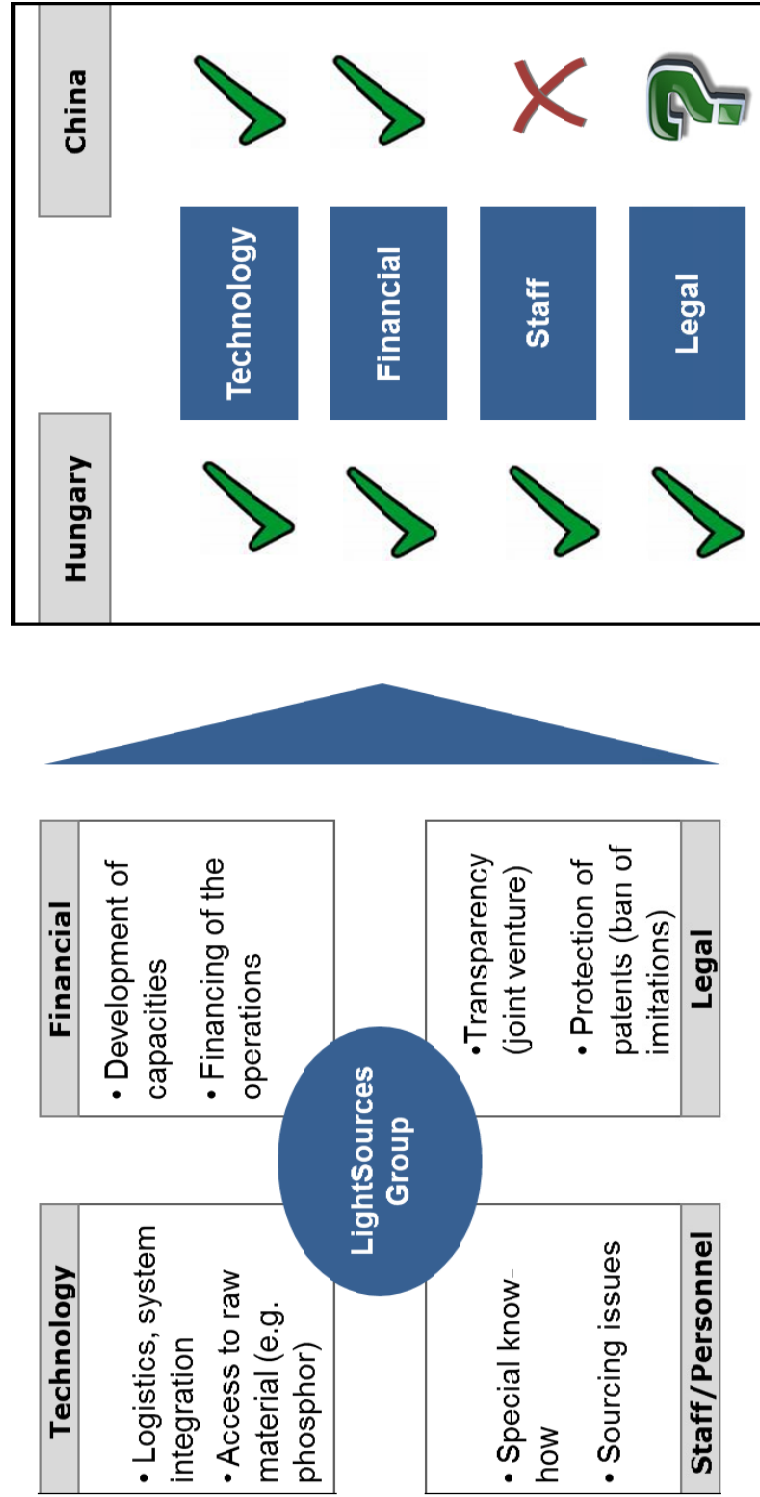
- Manufacturing issues were present as the utilization (capacity-load) rate was not always optimal. While tracking was extremely strong in the US (especially in the case of the military and aerospace) and good in Hungary, in China this daily tracking was less effective. In addition, the tradition to apply lean practices and closely monitor inventory and replenishment cycles with the Kan-Ban system was less well handled in China, reasons for which could be traced back to a lack of control mechanisms and other staffing problems.

- Shipping combines a wide range of shipping services (road, rail, sea or air); and GSL plants were operating under a weekly-daily schedule - yet risks existed in connection with the ongoing service information.

- Finally, there was another factor that made a difference between the Hungarian and Chinese plants: managing the power factor within a supply chain. In China, GSL had much less influence on the joint venture, which affected its overall performance (while even unbalancing an optimized global supply chain).



Figure 4. Assessment of GSL's Overseas Supply Chains



Source: authors' compilation



The identified key factors can be grouped into four categories (technology, financial, staff-personnel and legal issues). Based on GSL's case, developing a lean but flexible supply chain is a challenge (especially in the case of customized specialty products); all these four elements therefore have to meet up to thus optimize the global supply chain.

Conclusions

The specialty lighting industry is a highly differentiated, low volume industry, and is characterized by having within it innovative design and customized manufacturing. This paper – looking at these criteria – has listed those elements that are necessary to keep a hold on global and local capacities, which may be especially challenging in the case of specialty lighting products, as related demand is often unpredictable with short notice periods. Besides, in general, the company handles goods with a higher contribution margin, while manufacturing must be flexible (what and how much to make); also, set-ups and machinery set-up amendments need to be fast, even though the product is highly customized.

Based on the case of GSL's we are able to identify the factors necessary to implement a successful supply chain coordination strategy that supports GSL's strategic positioning in the market. A certain level of localization is required to maintain innovative abilities and utilize more diverse ways of operating. The most important success factors become visible when GSL's European and Chinese plants are compared. Increased collaboration in the supply network (even given a high level of integration) with appropriate supply chain coordination can help make operations leaner (for example, bring down not only inventory levels) but can also improve conformance quality and reduce quoted lead times.



References

- Cachon, G. and Fisher, M. (2000): Supply chain inventory management and the value of shared information, *Management Science*, 46(8): 1032–1048.
- Forgionne, G., Guo, Z. (2009): Internal supply chain coordination in the electric utility industry; *European Journal of Operational Research*, 196(2): 619-627
- Fugate, B., Sahin, F., Mentzer, J. (2006): Supply chain management coordination mechanisms, *Journal of Business Logistics*, 27(2): 129–161.
- Hieber, R., Hartel, I. (2003): Impacts of SCM order strategies evaluated by a simulation-based ‘Beer Game’ approach: the model, concept, and initial experiences; *Production Planning & Control*, 14 (2): 122–134.
- Jansa, R., Degraeveb (2008), Z.: Modeling industrial lot sizing problems: a review; *International Journal of Production Research*, 46(6): 1619–1643
- Sahin, F., Robinson, E.P. (2002): Flow coordination and information sharing in supply chains: review, implications and directions for future research; *Decision Sciences*, 33(4): 505–536.
- Sepulveda Rojas J.P., Frein, Y. (2008): Coordination and demand uncertainty in supply chains; *Production Planning & Control*, 19(7): 712-721
- Simatupang, T., Wright, A., Sridharan, R. (2002): Knowledge of coordination for supply chain integration; *Business Process Management Journal*, 8(3): 289–308