DISTRIBUTION OF SPARE PARTS AT GAMBRO

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Abstract *This article serves as a short summarized version of a master's thesis which constituted the final element of the author's Master of Science programme in Industrial Engineering and Management at Lunds Institute of Technology, Sweden. The study described and analyzed in the thesis was carried out at Gambro Lundia AB, more specifically within the Supply Chain Management Group which is a part of the Gambro Global Supply organization. The work with the thesis started in late August 2009 and ended in early January 2010.*

Introduction

Companies are constantly seeking new ways to compete with each other. In today's business environment, the importance of after-sales service is very high. Lost revenues due to disservice can be enormous. When customers buy a product they expect a certain quality, that the product will function as promised both in terms of efficiency and life-time and that, in case of breakdown or failure, the responsible company will take care of the problem and make the product functional again in a fast and timely manner. Service therefore becomes an inevitable part of a company's value creation activities if it is going to compete with other companies and the goal is to triumph.

The requirements for planning the logistics of spare parts differ from those of other materials in several ways: service requirements are higher as the effects of stockouts may be financially remarkable, the demand for parts may be extremely sporadic and difficult to forecast, and the prices of individual parts may be very high. On the other hand, material and time buffers in production systems and supply chains are decreasing. These characteristics set pressures for streamlining the logistics systems of spare parts.[1]

Problem discussion

At Gambro Lundia AB, the management of spare parts has for a long time been a problematic process. In the past there have been attempts to solve the main issues regarding spare parts, but the desired results have been absent. These failures have made it clear that there is no easy way to rearrange an existing organisation and change the established processes in a one-step manner. Instead, incremental but carefully prepared changes towards a final goal seem to be the most appropriate solution.

Spare parts have a tendency to follow very irregular demand patterns and it is very difficult, if not impossible, to forecast the future need for spare parts. One main challenge at Gambro is the fact that the order pattern of spare parts is not functioning in a satisfying way. It can be observed that the sales companies replenish their local stocks of certain spare parts in a low frequency manner which, when aggregated, cause occasional high demand peeks at the DC level. These peeks, especially generated by big

[1] Huiskonen (2001)

orders from the big markets, often result in stock-outs at the DC warehouse. This in turn leads to a situation where the DC is no longer able to supply the subsequent orders in a timely manner. Globally the inventory is sufficient to meet the actual demand, however because the majority of the inventory is not located at the DC level the distribution to the needing part is often ineffective and in many cases nonexistent for quite some time. This and other challenges or problem areas are in effect causing low customer service levels and high inventory levels around the world, with the latter also resulting in a high percentage of obsolescence as spare parts are withdrawn, outdated, revised or replaced by another spare part.

In order to master these problems as well as others that have arisen in the area of spare parts management, Gambro has launched different projects constituting small steps towards a final goal where the issues regarding spare parts management and distribution are expected to be eliminated or at least brought down to a minimum. One of these steps is the implementation of direct delivery of spare parts to the different local markets around the world. Recently, direct delivery of spare parts was introduced on the UK market and at the time of this writing, the same process is being carried out in the Benelux countries. The UK and the Benelux countries represent, together with some other markets, the "SAP-countries", implying that the local sales representatives are working in the ERP-system SAP, as does the DC in Lund. This is a great benefit when distribution restructurings are carried out, such as direct delivery, because all the information is organized in and is being sent through one and only one system. This is however not the case with the big countries of France, Germany and Italy. Each of these countries use their own local ERP-system, different from SAP, and the consequence of this is that the direct delivery solution used in the case of the UK and the Benelux countries cannot be directly applied to these countries.

In order to make a good decision on what the next action steps should be when it comes to improving the management and distribution of spare parts to the big markets, there is a need to examine and define the available possible solutions with respect to the current organisational, administrative, geographical and physical setup. A general purpose of the thesis has therefore been to examine and evaluate the possibilities to solve the problem with fluctuating demands on spare parts from the local sales offices in the three big markets in Europe. Since the desired future scenario of the spare parts distribution at Gambro has already been decided upon, and since this scenario comprises a direct delivery distribution organisation as it has been implemented in the UK, it is implied that this is also the desired future state of the big markets. A secondary, more specific, purpose of the thesis has therefore been to investigate what the possibilities are to implement direct distribution of spare parts to these countries and what the implications of such an action would be.

Research approach

The specific purpose of this master's thesis is of a quite practical sort. In a way, Gambro has already defined the future desired distribution structure, direct distribution to all customers and service vans, which consequently limit to some extent the possibilities of applying general theories to the problem. Instead, the stated purpose implies that an investigational approach is more suitable for this specific thesis and therefore it is not possible, or useful, to claim that the approach for the thesis is deductive, inductive or abductive in its scientific meaning. There are however other research approach concepts that are more applicable to the specific subject of the thesis. One set of research approaches that are defined differently from the

ones mentioned is the one comprising the analytical, the systems and the actors approach.

Based on the purpose of the thesis and the above mentioned research concepts, it seems as though a good choice would be the systems approach. In addition to this, the discussion in the relevant literature regarding the objectives of this approach further confirms this belief. The objectives of the systems approach can be described in five levels: to determine the type of system, to describe, to determine relations, to forecast and to guide[2].

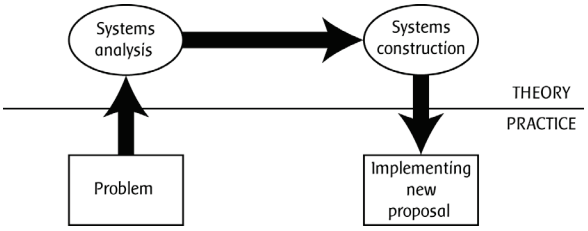

Figure 1 The goal-means oriented systems approach research process[3]

The process plan illustrated in figure 1 applies well to the specific nature of the subject of the thesis. The bottom left part of the figure indicates that there is a problem in the system. In the next step of the process, the systems analysis, the problem is formulated and described as it occurs in the existing reality. Simply put, a description of the system is made. After reproducing the problem by means of the systems analysis, a new systems proposal is drawn up, which represents the systems construction part of the process in figure 1. The last part of the suggested process, the implementation of the new proposal, is outside the scope of the thesis and will therefore not be addressed in any detailed manner.

If we look at the specific subject of the thesis we can define the Gambro distribution organization as the system to be studied. The main components of this system are shown in figure 2.

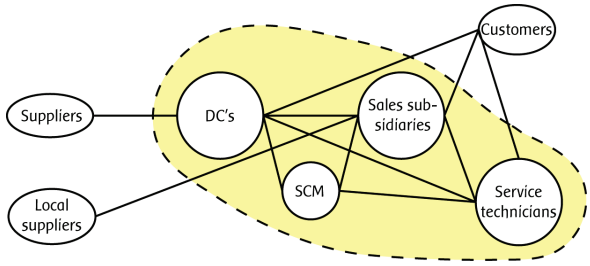

Figure 2 The system of the thesis

In the thesis quantitative and qualitative methods have been combined in order to achieve a good compromise. Of course, due to the limited scope of the subject and especially the limitation in time, a need to select the most relevant sources of information has evolved and these choices have in turn affected the methods being used. The main sources of primary data have been interviews and discussions with Gambro personnel at different key positions in the organization. A couple of trips to some relevant physical locations have also been carried out. Extracts of relevant and selected data from the relevant systems for the specific purpose of the thesis could also be classified as primary data. The secondary data sources used in the study comprise some internal material, such as presentations, reports as well as general information on the company intranet. The academic literature and articles that have been used also refer to this category.

For the analysis part of the thesis, a large amount of information was extracted and analyzed both numerically and qualitatively. Discussions with key individuals regarding this information and the results from the analysis were carried out and based on these a number of possible future distribution scenarios were constructed. These were then analyzed from different perspectives, with an emphasis on those organizational and administrative implications they would result in if implemented.

[2] Arbnor & Bjerke (1997)
[3] ibid.

Empirical findings

Gambro has, due to its policy, made an obligation to its customers to be able to support a machine, comprising among other things a continuous supply of spare parts, for a period of ten years after the manufacturing of the specific machine or model has ceased. There are in principle two ways that spare parts reach the end customer. The first is the situation where the end customer, such as a clinic or hospital, orders the necessary spare part by contacting the technical service organization for the relevant market. This is usually done by the clinics' or hospitals' own technician, responsible for maintaining and repairing the sites' machines. The second way is that a Gambro service technician is called upon by the clinic or hospital due to a failure on a machine or that the service technician visits the customer to perform regular maintenance activities, usually once per year, on a machine.

There are two distribution centers for spare parts: DC Lund and DC Mirandola. Both distribution centers are responsible for order handling, warehousing and shipping of spare parts from the DC to the local warehouses around the world. The local warehouses are usually located in a close geographical proximity to the local sales subsidiaries. In most cases there is one sales subsidiary for each country. The sales subsidiary is responsible for all the selling activities performed in their respective market as well as providing for the necessary technical service. This part is usually the responsibility of a dedicated technical service organization, one of the sales subsidiary's branches, responsible for the supply of spare parts as well as providing for the repair and maintenance needed in each market.

The typical scenario is that each sales subsidiary has its own branch organization dealing with technical service. The term technical service can in broad terms be said to constitute repair and maintenance of monitors. The importance of this function needs no emphasis, as it should be obvious that the quality of the service that technical service is providing has an immediate effect on the value perceived by the customers. Taking into consideration the competitive market that Gambro is a part of, it is evident that a well functioning technical service organization is one of the many key prerequisites to gain success.

When studying the order pattern of the local sales subsidiaries and comparing the magnitude as well as the frequency of these orders to the true consumption in the local markets, it can easily be shown that these are often not synchronized and are in most cases not following a similar pattern. The local sales subsidiaries have a tendency to order large quantities from the DCs even though their demand at the local market is not nearly as big. In practice this can result in order quantities from the sales subsidiaries to the DCs comprising a true local demand of several months. If one takes into consideration the fact that not one country but several or perhaps all the big countries are ordering in the same way, it is easy to imagine that this kind of ordering will cause availability problems at the DC level. Although the DCs could maybe in many cases handle the demand peaks of one market once in a while, the situation would probably be very difficult or impossible to handle if several markets' demand peaks would occur at the same time or in close proximity to each other. What happens then is a fast depletion of the DC stock by one of the peaks and all other orders that have not been fulfilled are put on backorder. The time that these backorders will have to wait in order to be fulfilled can then be as high as several weeks or a couple of months, depending on the lead time in manufacturing. This of course results in poor customer service levels and in the worst case, an inability to fulfill agreed service contracts and in the long run non-returning customers.

Solution development

Since a direct distribution structure such as the one implemented in the UK or the other SAP countries cannot be applied to the German, French or Italian market because of several reasons discussed in the thesis, a different distribution structure would have to be thought of.

Discussions with all the involved people on this matter resulted in basically two spare part distribution structure alternatives that from at least a theoretical point of view would be feasible. These have been defined as:

- Consumption-based replenishment of the local sales warehouses using QlikView
- Direct Delivery to customers and service technicians from Malmö warehouse

The distribution alternative concerning a consumption-based replenishment of spare parts to the local sales warehouses has one main purpose, namely to eliminate or at least reduce the demand peeks that appear at the DC level because of the high quantity orders from the back office personnel in Germany and France.

As the name of this solution suggests, the local warehouse stock would in this scenario be replenished with the quantities that had been consumed during a certain period of time and the quantities in the orders to the DCs would be closer to the real demand. The basic idea behind this solution is to assign a target level quantity at the local warehouse on every spare part that is sourced from one of the two DCs. When the actual inventory of a certain spare part would be less than the target quantity, a replenishment quantity that would make the actual inventory reach the target level would be proposed and eventually shipped from the DCs to the local warehouses.

The main advantage with this solution when implemented is of course that the demand peaks at the DC level will be reduced or even eliminated. This will in turn improve the availability of spare parts at the warehouses in Malmö and in Mirandola. There are however other advantages as well. One is the fact that everything will be continued as normal from an end customer and service technician point of view. They will not be aware of this change since their order processes and their information flow will function in the exact same way as they are today. Another advantage with this method is that it is quite straightforward and easy to understand and communicate throughout the organization. The setup and implementation of this solution will also not require any major monetary investments or working hours, thus making it both fast and simple. There will however be some increased workload at the DCs and at the local warehouses related to the picking and packing/unpacking of products. This is due to the fact that every weekly order will naturally contain more orderrows than today.

Figure 3 shows how the flow of information would be arranged in the discussed scenario.

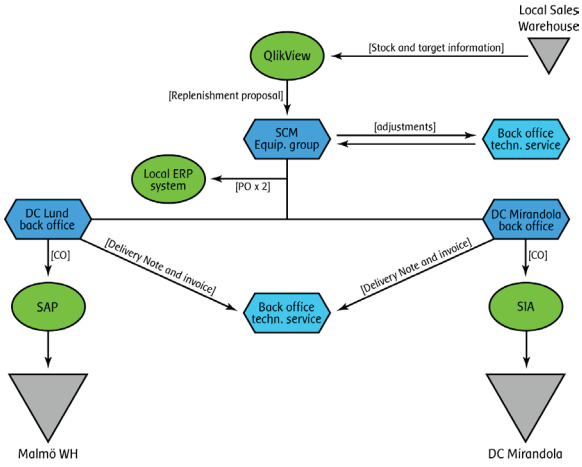

Figure 3 Consumption-based replenishment

The second suggested distribution alternative, the direct delivery distribution, is a solution that, if implemented, will solve many of the issues that are at hand for spare parts. Just as with the consumption-based replenishment solution,

direct delivery of spare parts to customers and service technicians from the DC will result in reduced or eliminated demand peaks. This is simply because of the fact that only real orders, i.e. orders with quantities that are equal to or very close to the real need, will be dealt with at the DC. When direct delivery is implemented, the spare parts that today are kept in the local warehouses can be sent back to the DC and therefore reduce the total inventory levels. Another consequence of these both aspects is a higher availability at the DC level, since the local warehouses will not place consolidated orders to the DCs anymore. Due to the same reason, the administrative work carried out by the back office personnel in the relevant markets will be somewhat reduced as well. Customers and service technicians will also not be affected by this change of distribution. They will still order spare parts in the exact same way as they are doing today.

Figure 4 shows how the flow of information would be handled in a direct delivery setup when a service technician would place a spare part order.

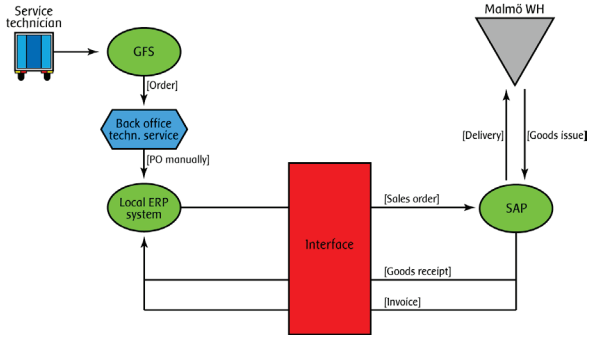

Figure 4 Direct delivery flow of information

Recommendation & conclusions

There is no doubt that high fluctuating demand from the sales subsidiaries cause availability issues at the DC level and as a consequence orders are put on backorder resulting in longer lead times for many customers in other countries. The goodwill damages and upset customers that these availability issues are causing are hard to quantify, but they are most certainly present. It have been shown that these frequent high demand peaks are in most cases a result of certain ordering routines that have been adopted at the sales subsidiaries, which are not reflecting the true demand that is experienced in the local market at the time of ordering. What has also been shown is that the solutions suggested would eliminate these high demand peaks and thus increase the availability at the DC level which in turn would improve customer service levels. From a logistical point of view the results and discussions presented imply that something should definitely be done.

However, since other organizational entities are involved, it is always important to look at things from their point of view as well. In order for service technicians to be able to fully meet the demands of the customer, they need to have access to spare parts, preferably directly available in their car. From a service technician point of view, it is therefore no surprise that much inventory is being kept locally, even though a large part of it has not been moving for quite some time. The same reasoning can be applied for the sales subsidiaries in the concerned countries. They prefer to have big inventories close to their end customers so that they will be able to rapidly supply these with spare parts when needed. Although these facts justify to some extent why high inventory is being kept in the local warehouses and in the service technicians' cars, they do not give good reasons for the ordering of big quantities, which cover several weeks or months of demand, from the DCs in Lund and Mirandola.

As we have seen, these demand peaks can be eliminated or at least dramatically reduced by adopting one of the suggested solutions, without interfering with the availability of spare parts in the local markets in any negative way. Instead, both solutions seem to improve the availability

of spare parts at the DCs substantially and as a consequence improve the availability of spare parts in all local markets. This is a direct effect of the fact that in these scenarios only real demand is supplied from the DCs to the local markets.

I believe that by adopting one or both of the suggested solutions in the thesis, improvements would be noticed both on inventory levels and costs as well as on customer service levels. Usually these two features do not go hand in hand. The conclusion that a simultaneous improvement of these aspects is possible, again stresses the reason why something should be done.

Given that the main purpose of the thesis was to find a solution to the fluctuating demand problem and the secondary purpose was to look into the direct delivery possibilities of spare parts to the non-SAP countries, my recommendation is that Gambro adopts a two-step implementation plan. The two suggested solutions are not necessarily mutually exclusive. Since all cost implications of a direct delivery distribution structure has not yet been fully identified and verified and since that specific solution requires substantial amounts of both time and money it could be a good idea to combine the two suggested solutions:

Phase 1: Local Sales Warehouse Replenishment

Phase 2: Direct Delivery

In the first phase, the consumption-based replenishment of the local sales warehouse would thus be implemented. This solution will most probably solve the issues with high fluctuating demands and in the same run increase availability at the DC. It is also a very straightforward solution which does not require much investment in time or in money. Parallel to this, the work with planning and organizing the work related to a direct delivery implementation could be initiated.

The full effect of reduced demand peaks and higher availability at the DC level will be possible only when a consumption-based replenishment of the local warehouses in all markets have been successfully implemented. Of course Germany, France and Italy are top priority in this sense since they are ordering high quantities compared to other smaller markets. It's important however that other big countries such as the US and Canada are taken into consideration as well. Otherwise, the countries that are replenished in a consumption-based manner will suffer the most if there will still be countries that continue to place big orders which in turn deplete the DC stock. Efforts should therefore be made in order to have all markets supplied with spare parts only when there is a true local demand.

As it has been concluded in the thesis, the direct delivery solution, Phase 2, requires more preparatory work before it can be implemented. Although, according to the IT department in Lund, the technical aspects of the integration are not as complex as one might think, it is time-consuming to have all required steps in the final process completely defined and agreed on with all involved parties. It is therefore important to initiate these discussions as soon as possible. Transportation alternatives should also be decided on and tariffs and discounts should be negotiated with the most suitable package delivery company. A deeper cost analysis than the one carried out in the thesis comprising all relevant markets should also be conducted if deemed necessary.