



1403605045



**SWP 3/00 VIRTUAL LOGISTICS:
AN EXPLORATORY CASE STUDY**

Ulrich Franke & Otto Jockel
Centre for Logistics and Transportation
Cranfield School of Management
Cranfield University
Cranfield
Bedfordshire MK43 0AL

Tel: +44 (0)1234 754088
Fax: +44 (0)1234 751806
Email: u.franke@cranfield.ac.uk
o.jockel@cranfield.ac.uk

The Cranfield School of Management Working Papers Series has been running since 1987, with approximately 450 papers so far from the nine academic groups of the School: Economics; Enterprise; Finance and Accounting; Human Resources; Information Systems; Logistics and Transportation; Marketing; Operations Management; and Strategic Management. Since 1992, papers have been reviewed by senior members of faculty before acceptance into the Series. A list since 1992 is included at the back of this paper.

For copies of papers (up to two free, then £5 per copy, cheques to be made payable to the Cranfield University), please contact Wayne Bulbrook, PhD Administrator, at the address on the back of this booklet.

© All Rights Reserved. Cranfield School of Management, Franke & Jockel, 2000

ISBN 1 85905 151 0



Working Paper

‘Virtual Logistics’ An Exploratory Case Study

Author: U.J. Franke
O.M. Jockel

1. INTRODUCTION.....	2
2. AIMS AND OBJECTIVES OF THE RESEARCH.....	3
3. LITERATURE REVIEW ON ‘VIRTUAL LOGISTICS’	3
4. WHAT DOES ‘VIRTUAL’ MEAN?	5
5. THE CONCEPT OF ‘VIRTUAL ORGANISATION’.....	6
6. THE CONCEPT OF ‘LOGISTICS’.	7
7. THE SYMBIOSES OF ‘VIRTUAL’ AND ‘LOGISTICS’.....	8
8. RESEARCH METHODOLOGY	10
9. THE EXPLORATORY CASE STUDY.....	11
9.1. THE CO-OPERATION OF BEARING PARTNERS.....	11
9.2. THE COMPETITIVE ENVIRONMENT.	12
9.3. THE ‘VIRTUAL LOGISTICS CENTRE’ - PROJECT.	14
9.3.1. <i>VLC Order Processing</i>	15
9.3.2. <i>Benefits and Costs of the VLC</i>	17
9.4. FUTURE PROSPECTS OF BEARING PARTNERS.....	20
10. FINDINGS	21
11. FURTHER RESEARCH.....	22
12. CONCLUSION.....	22
BIBLIOGRAPHY	23

1. Introduction

A new buzzword in the world of logistics is born. Of course, 'Supply Chain Management' is still state of the art and only a few companies have been exploiting the full potential of SCM so far. However, in very recent practitioner and academic journals authors try to persuade logistics experts that the Holy Grail lies in 'Virtual Logistics'. The sub-consequent questions are:

- What is Virtual Logistics?
- Is Virtual Logistics something new, or is it just a new label for an already existing logistics management approach?
- Does Virtual Logistics lead to any competitive advantage?

Prof. Ihde (1999) states that one has to consider the main irreversible economical changes in the logistical environment in order to make any predictions about the future trends in logistics management. He considers the following major external trends to determine logistics management in future:

- the opening of markets with increasingly new options for procurement, production, and distribution,
- the development of information and communication technology (ICT), especially in telecommunication with the consequence of massive cost reductions in information, communication, and co-ordination activities (transaction costs) and the development of new forms of trading (E-Commerce),
- the development of transport technologies and transport infrastructure resulting in decreasing transport costs,
- the increasing importance of non or only limited competing, jointly usable resources, such as knowledge, competencies, market power, image, etc. for value adding processes of production, trade, and logistics companies,
- on increasingly more markets a dominance of value exchange relations determined by demand,
- in combination with those changes the increasing transparency of markets, the mobility of production factors, and the acceleration of economic processes (time competition), especially also the knowledge diffusion (Ihde, 1999).

Logistics is not an isolate discipline, in contrary; logistics is may be the most effected discipline of changing environment conditions. Logistics is dynamic, and companies have to be flexible to adjust permanently their management processes to the changing internal and external environmental condition.

Taking the main irreversible economical changes in the logistics environment into consideration, the question is whether the concept of virtual logistics is capable to cope with the logistical challenges in future.

2. Aims and Objectives of the Research

This paper is set out to investigate the concept of 'Virtual Logistics'. The objectives are to briefly review the literature on what has been regarded as virtual logistics so far, clarify what the term 'Virtual' means, and to introduce to the concepts of 'Logistics' and 'Virtual Organisation'. In management research the term 'Virtual' is mainly used as an attribute to describe an organisational structure and the involved management processes. Therefore we determine virtual logistics as a management approach to organise logistics processes in a changing organisational structure. We basically view virtual logistics as a symbioses of the concept of logistics and the concept of virtual organisation. In order to manifest our theoretical construct we conducted an exploratory case study about a group of companies, which has adopted the structure of a virtual organisation and has consequently changed their logistics management processes as a result of it. This paper aims the shed light on the new concept of virtual logistics, it provides evidence of a successful application of this concept, and it identifies benefits of the concept based on the analysis of the case study.

3. Literature Review on 'Virtual Logistics'

Traditional logistics will be replaced by 'virtual logistics', Robert J. Bowman (1996) claims, a new concept which others call 'channel system'. Bowman even foresees that the logistics function in corporations will be replaced by 'process teams', consisting of experts from procurement, manufacturing, marketing, finance, and distribution. The traditional logistics manager will turn into a process manager, more an internal consultant who manage and oversees all business processes. This viewpoint is very radical, and it must be questioned whether this concept is feasible and can be called 'virtual logistics'?

However, in many other recent publications the term 'Virtual Logistics' has been used as a pseudonym for the intensive use of information and communication technology in logistics and the management of logistical processes.

Rayport and Sviokla (1995) wrote in their article 'Exploiting the Virtual Value Chain' that with an integrated information flow, companies can begin to perform value adding activities more efficiently and effectively through and

with information. In other words, these information-based activities mirror steps in the physical value chain. When companies move a number of value adding activities from the market place to the market space, they exploit a virtual value chain. This idea about the virtual value chain comes close to the concept of supply chain management, the physical flow of goods accompanied by the relevant flow of information.

Jane Klobas (1998) tries to explain that the virtual supply chain is the separation of the physical flow and the information flow. If the information is the product, than its flow through the supply chain is virtual. She uses the software industry as an example where the product does not need any physical existence.

Virtual logistics is also frequently described as the effect of E-commerce and the Internet on logistics (Wiegand, 1999).

Another group of authors, such as Van Hoek (1998) and Bell (1998), view virtual logistics from an outsourcing perspective and its integration through the use of IT. Such an integration of dispersed functions is described as information logistics, Szyperski and Klein (1993).

Mike P. Clarke (1998) provides a more narrow view of the concept. With virtual logistics, the physical and information aspects of logistics operations are treated independently from each other. In such operations, ownership and control of resources is effected through Internet (or Intranet) applications rather than direct physical control and resources can, thereby, be owned and utilised remotely.

A different perspective on virtual logistics is provided by another group of researchers. They regard virtual logistics as the operating system of virtual corporations. It is the logistical system of inter-organisational network organisation. Semich (1994) claims that information replaces inventory at virtual corporations. In virtual corporations fixed logistic chains change to dynamic logistic systems or logistic networks (Kloth, 1995). Such logistics chains of virtual corporation need an integrated planning, control, and administration for the flow of goods and information amongst all partners (Faisst, 1995). Schuh (1996) stressed that order processing is the core function of logistics management and the biggest challenge to virtual corporation. In order to manage the logistics of virtual corporations an integrated inter-organisational production planing and control system is needed (Wiendahl, 1996). The common planing of all logistical processes of the involved partner companies targets: a) to reduce inventory, b) to improve production capacity utilisation, c) to shorten the lead-time, d) and to improve the in time deliveries and delivery availability (Kernler, 1996).

4. What does 'Virtual' mean?

The word 'virtual' originates from the Latin word 'virtus' which basically means 'proficiency, manliness' (Scholz 1994), it defines an attribute of a thing, which is not really existing, but would have the possibility to exist (Scholz 1996).

Later in 1997, Scholz provided following overview of virtual objects (Figure 1.) in order to differentiate the different forms from each other. Scholz explicitly distinguishes the virtual organisation into an inter- and intra- organisational perspective. The question is where does the concept of virtual logistics fits into this picture? Assuming that virtual logistics is the next consequent evolutionary logistics stage succeeding 'Supply Chain Management', then virtual logistics is an inter-organisational logistics management approach, which would be according to Scholz virtual object hierarchy as a supportive management process of virtual corporations. However, there is a big question mark behind this assumption.

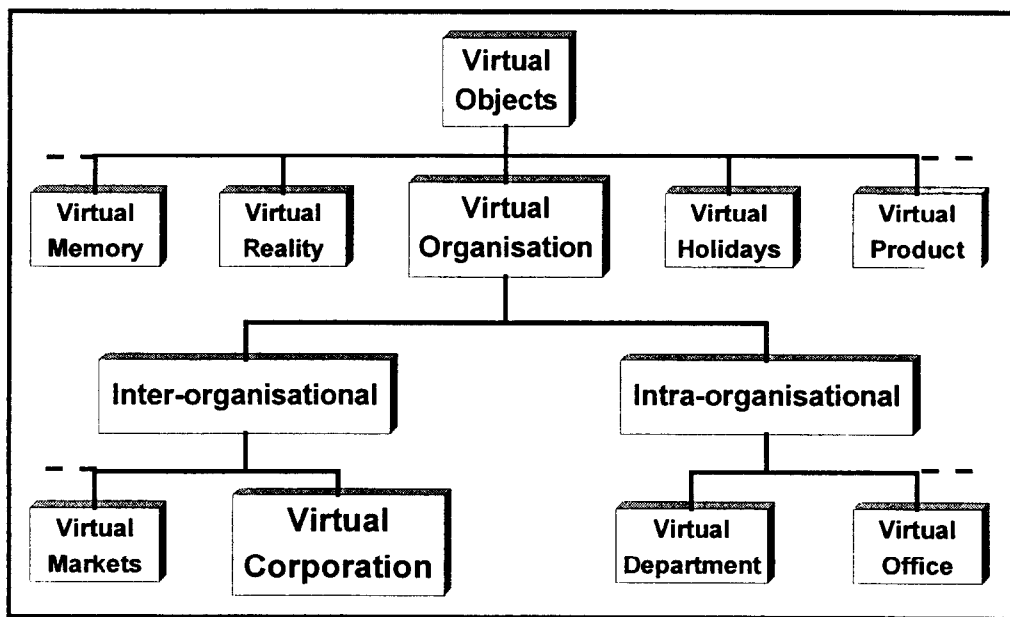


Figure 1: Scholz 1997, Virtual Objects

Bultje and Wijk (1998) tried to bring some more clarity into the discussion about the definition of what a 'Virtual Organisation' is. They noted that the different definitions of 'Virtual Organisation' partly depend on the view the authors have of the concept of 'Virtual'. Basically, one can distinguish four different sub-concepts of 'Virtual' in the context of organisational configurations.

- Virtual means 'unreal, looking real'. 'Virtual Reality' is a good example for this sub-concept of 'Virtual'. It simply means, that a 'Virtual Organisation' has the appearance of a real (traditional) company for externals, but in reality

this company does not exist, it is only a conglomerate of independent network partners.

- Virtual means 'immaterial, supported by information and communication technology (ICT)'. This sub-concept of 'Virtual' means, that something does not physically exist, it is only created by data, i.e. 'Virtual Products' or the 'Virtual Shopping Mall', which does only exist on the Internet.
- Virtual means 'potentially present'. This sub-concept of 'Virtual' means, i.e. resource pools. The resource pool is basically a resource warehouse, as soon as the need for a certain resource configuration is allocated; an operating unit will be formed. This simply means that the resource pool has the potential to be real when it is needed. The 'Virtual Web' is a good example of this sub-concept.
- Virtual means 'existing, but changing'. This sub-concept describes the fluid and dynamic network approach. This kind of organisation reconfigures itself permanently; it is dynamic, progressive and only temporary. 'Virtual Corporations' and 'Virtual Teams' are good examples of this sub-concept.

As an attribute of any organisational structure Venkatraman and Henderson (1996) took a process perspective of virtual organisations. They defined virtualness as is the ability of the organisation to consistently obtain and co-ordinate critical competencies through its design of value-adding business processes and governance mechanisms involving external and internal constituencies to deliver differential, superior value in the market place.

This statement seems to be key to get close to the core of virtual logistics.

5. The Concept of 'Virtual Organisation'.

Since virtual logistics is like any other logistics management approach (i.e. ECR, SCM, or MRP II) embedded into a larger organisational configuration, virtual logistics is part of inter-organisational virtual organisation (virtual corporations) and follows the major organisational characteristics of virtual corporations.

Basically, the 'Virtual Corporation' is a partnership network.

Arnold et al. (1995) provided following very universal definition of 'Virtual Corporation': *A virtual corporation is a co-operative form of legal independent companies, institutions and / or individuals, which deliver a performance, based on a common business understanding. The co-operating units contribute foremost their core competencies to the horizontal and / or vertical co-operation and during its performance it appears externally as a single unit. By*

doing this it almost neglects the institutionalisation of central functions. The necessary co-ordination is realised by suitable information and communication systems. The virtual corporation exists until the business purpose has been achieved or has become obsolete.

Again, this definition emphasises the inter-organisation perspective, the vertical or horizontal co-operation between independent entities, whether they are companies, institutions or individuals. Their co-operation is based on mutual interests, trust and understanding whereby the members contribute only what they regard as their strengths. It is a win-win co-operation, which has an almost lean and non-hierarchical structure. Due to a common corporation or brand name the virtual corporation appears for externals as a single operational unit. Close co-operation of several independent and geographically dispersed entities increases the management complexity. Modern information and communication technology supports the co-ordination of complex operations across organisational boundaries. To optimise and synchronise the resource base of members leads to synergetic benefits for participating parties. The virtual corporation is established on a defined business purpose. It is a voluntary partnership of equal members that last as long as it is beneficial for its members. Since its members stay independent, legal or contractual agreements hardly exist; everybody is free to leave the partnership without any major financial obligations. The attractiveness of such an organisational construct lies in the potential of several dispersed resource bases, its merely unlimited access and its simple co-ordination. This leads to the strategic option for member companies to concentrate on their core competencies and businesses, which improves the competitiveness of the individual members and the virtual corporation as a whole.

In short, the virtual organisation is a system whereby organisations end up with more capabilities and power than they inherently possess (Christie and Levary, 1998).

6. The Concept of 'Logistics'.

The term 'Logistics' has two roots, on the one hand the Greek word 'Logos' or 'Logicos' (calculation, mathematics; logical, reasonable), on the other hand the Franco - German origin 'loger' or 'logis' (accommodation, quarters), (Ihde, 1984).

Today there are many definitions of logistics. One is that logistics is an umbrella term used to identify the management responsibility to design and administer a system to control the flow and strategic storage of material, parts, and finished inventory to the maximum benefit of the enterprise (Wood, 1995).

Christof Schulte (1991) defines logistics as an integrated planning, design, operation and control system of the total material flow and information flow belonging to it from the supplier to the company, within the company as well as from the company to the customer.

The most accepted definition has been provided in 1986 by the Council of Logistics Management (CLM), the leading-edge professional organisation. They define logistics management as: The process of planning, implementing, and controlling the efficient flow and storage of raw materials, in-process inventory, finished goods, and related information flow from the point-of-origin to the point-of-consumption for the purpose of conforming to customer requirements.

However, logistics is not about definitions, it is an operational system which depends on the companies structure and strategies, and the technical possibilities provided to operate an efficient flow of information and material. Therefore logistics has been evolving over the time. The changing environments, organisational structures and strategies and especially the development of sophisticated information and communication technology (ICT) has been changing the approach how logistics management is conducted today and in future. Today, stable supply networks controlled by a core firm, such as in the automobile industry and in retailing, are operated by supply chain management systems. However, there is a clear trend in industry towards more agile and dynamic network structures, and those virtual corporations require a different logistics management approach (Franke, 1999).

7. The Symbioses of 'Virtual' and 'Logistics'

In Porters' value chain (1985), inbound and outbound logistics are identified as primary activities of companies within their defined organisational boundaries. The virtual corporation can be viewed as a network of several value chains (Szyperski and Klein, 1993), which co-ordinate, combine and share their resource bases. Similar to production networks, virtual corporations' pool their logistical resources whether it is the physical infrastructure, inventory, logistical know-how and even purchase power.

Figure 2. illustrates a value chain network pooling the logistical resources.

VIRTUAL CORPORATION

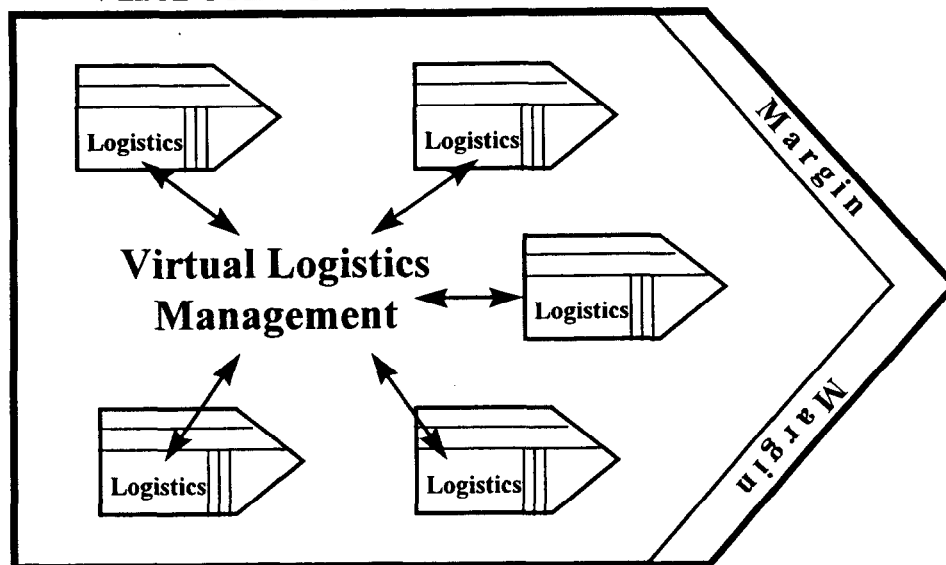


Figure 2: Logistics Management of Virtual Corporations.

Virtual logistics is part of the operational system of virtual corporations; it is a symbioses of the traditional logistics approach and the key attributes of the virtual organisation concept. Logistical virtualness is the management process, which supports the primary activity to operationalise the partnership network.

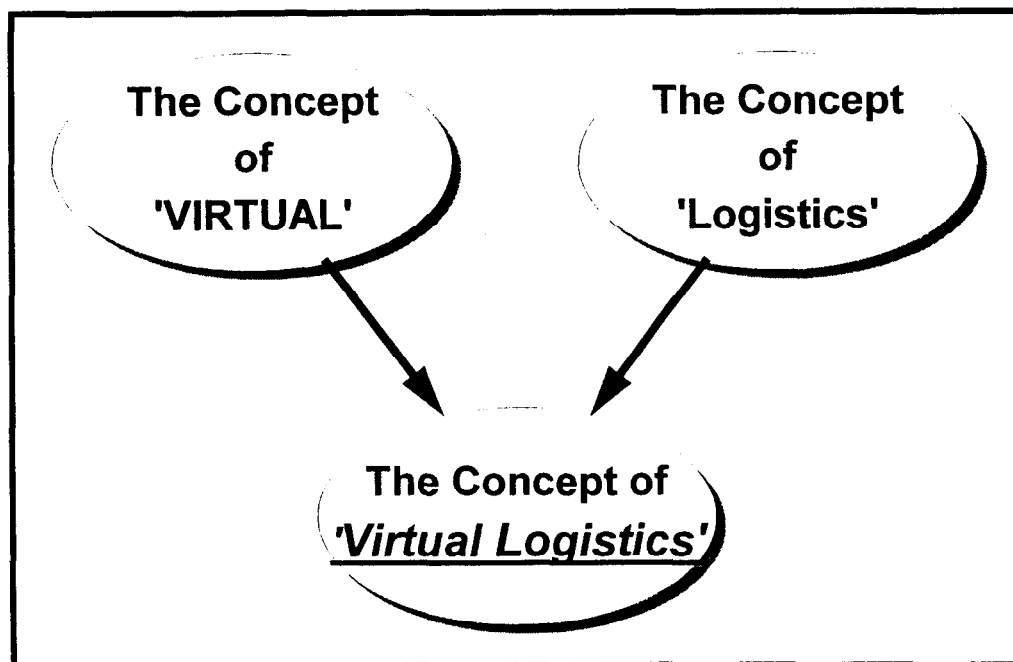


Figure 3: The Concept of 'Virtual Logistics'.

Therefore, 'Virtual Logistics' can be defined as a management process that consistently obtain and co-ordinate critical logistical resources provided primarily by virtual corporation members, but also by externals. The virtual

corporation determines the design of value-adding processes and governance mechanism, the virtual logistic management pools the logistical resources of virtual corporation members and performs a joint planning, implementing, and controlling of an efficient flow and storage of raw materials, in-process inventory, finished goods, and the related information flow from the point-of-origin, through the virtual corporation to the point-of-consumption for the purpose of conforming to customer requirements.

The following case study has been conducted to explore the new emerging field of 'Virtual Logistics Management' in the real world and to demonstrate the practical feasibility of it.

8. Research Methodology

There have recently been several academic publications about virtual logistics. Those papers however were merely theoretical and therefore our intention was to conduct an empirical research of an existing example of virtual logistics. An article about a virtual logistics centre published in a German practitioner logistics magazine drew out attention to Bearing Partners, a virtual corporation in Germany. Despite we had already some basic information about Bearing Partners from the article and the Bearing Partners Web-Side, we decided to conduct an exploratory case study.

Exploratory case studies are supposed to investigate a new emerging social phenomenon. Furthermore, the exploratory case approach is the first step of research in a new field in order to prepare the ground for further research (Yin, 1993).

Our first intention was to conduct several interviews with different members of Bearing Partners, but all of them refused and pointed us in the directions of their spokesman. Therefore, our research was limited to only one interview with the spokesman of Bearing Partners. However, this semi structure interview lasted for several hours and was very fruitful. The second step in our research design was an interview with the software and Internet service provider of Bearing Partners, which aimed to investigate the information technology (IT) and information system (IS) aspects of the virtual logistics centre.

For the analysis and interpretation of the case we used the collected data from the interviews we conducted as well as documents, which the interviewed parties have provided.

We are absolutely aware of the limitations of only analysing one case study with only limited access to data. However, since we decided to conduct an exploratory case study, which can be seen as the first attempt to conduct an

empirical research in the field of virtual logistics. This approach is absolutely legitimate since our intention is to establish the ground from which further research in this area can evolve.

9. The Exploratory Case Study

9.1. The Co-operation of Bearing Partners.

In 1991 the leading manufacturer of roller bearings in Europe, SKF, formed a retailer committee in Germany in order to counter the economic recession. Some years later this committee was abandoned. During this time the participating retailers developed a close relationship to each other. They started to exchange products between them in situations where customer orders could not be satisfied from their own inventory. To enhance their co-operation, in 1997 six members of the former SKF retailer committee formed a partnership, manifested in a formal co-operation agreement and the establishment of GbR (Society of Civil Law) as a common legal entity. Bearing Partners aims are to pool their purchasing volumes from manufacturers increase product availability and reduce inventory at the same time. Today, Bearing Partners has eight member companies with 26 locations in Germany in order to ensure an area wide-wide service to its customers. The total turnover of the partnership is about 320 million-DM, of which 180 million-DM turnover are roller bearings. The partnership has a permanent available stock of around 50 million-DM. All partner companies' together employ about 600 people processes about 90,000 deliveries every month to 50,000 customers.

Bearing Partners is a horizontal co-operation of retailers, which are geographically dispersed all over Germany, and therefore the partners are only in some overlapping area competitors. Figure 4. illustrates the horizontal retailer co-operation of Bearing Partners.

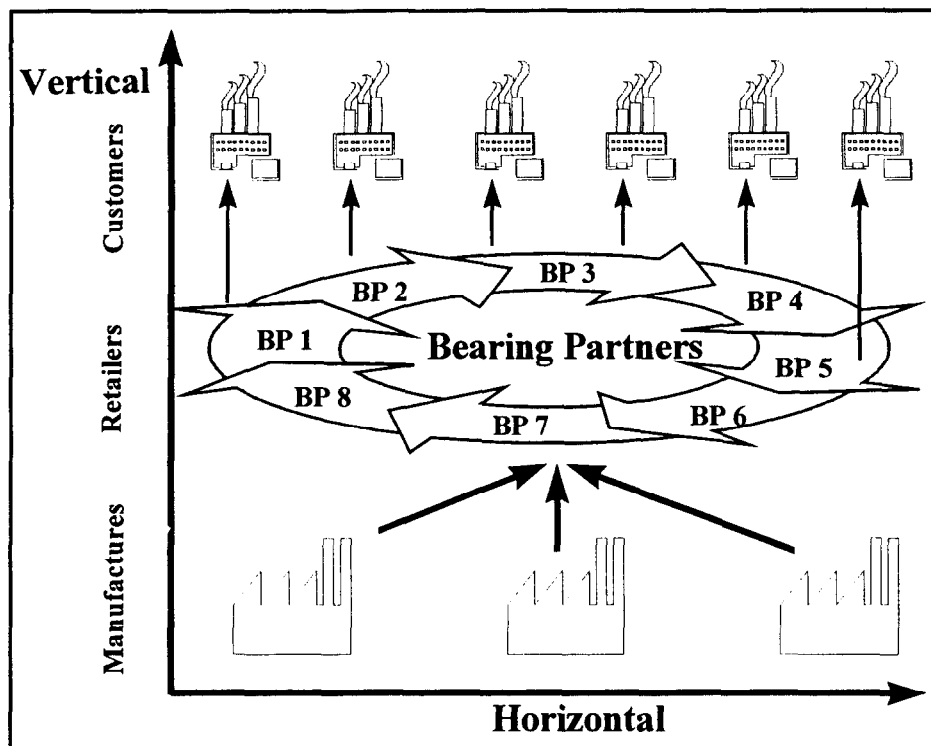


Figure 4: Horizontal Co-operation - Bearing Partners

The partnership is managed by a steering committee (multiple leadership). Bearing Partners has neither a head office nor permanent staff, one of the partners' MD has been appointed as the partnership spokesman. Besides the joint development of the 'Virtual Logistics Centre', the partnership has set up special interest group (SIG), which deal with topic of general interest to member companies. Another important feature of the partnership is the regular face-to-face (f2f) meetings. The MD's of the partner companies meet 4 times a year, and additionally they organised several f2f meetings for their key personnel, which have regularly contact to each other. This is an important to build up personal relationships and trust, which facilitates to daily work between partner companies. Furthermore, the partners do not pay a fixed membership contribution; they share all costs equally.

According to Hr. Werner (spokesman of Bearing Partners), the level of trust between the partners is very high, which is prerequisite to close and successful co-operation.

9.2. The Competitive Environment.

The German roller bearing market is the biggest market in Europe. The main customers of roller bearings are OEMs and manufacturers directly deliver 85%

of their supply. The major European manufacturer (SKF, FAG, and INA) maintain a network of small and medium sized appointed retailers in Germany. Despite their market share on the OEM market reaches only 15%, the OEM market counts for about 50% of their total business. The other half of their business is the after sales market.

On the European level the market structure is different. There are three major large English retailers (BRAMME, WYKO, and BSC), that are in contrast to German retailer multi-brand retailers. Besides their traditional strong position in the after sales market, their market share on the OEM segment is extremely larger compared to German retailers. Due to the higher purchase volume those retailers have a stronger bargain position, which leads consequently to better purchase conditions.

The retailers' part of the OEM segment is likely to increase due to modular manufacturing strategies of Industrial Engineering companies. This has led to a wider geographical dispersion of OEM manufacturers who are increasingly supplied by appointed retailers. In the lucrative after sales segment German retailers have to face increasing competition from other European multi-brand retailers, namely English companies like. These have a traditional strong hold in the after sales market and are not tied to exclusive dealerships, which enables them to purchase from most of the main bearing manufacturers directly.

At the moment, the German roller bearing market faces serious market and competition challenges.

- Internationalisation: Since the German roller bearing market is the biggest in Europe (due to the large German engineering industry), it is very attractive for the larger European competitors to enter the German market.
- Concentration processes within the industry: The increasing competition on the German roller bearing market has led to take-overs of smaller retailers. This concentration process increases the competition again, which results consequently in more mergers and acquisitions.
- Changing customers' requirements: concentration processes also affect The German industry. On the one hand OEMs are also involved in mergers and acquisitions within their industry, and on the other hand there is a trend that larger companies re-centralise their procurement activities. In order to bid for contracts retailers have to offer a wide product range (multi-brands) as well as a wider geographical coverage. Furthermore, the logistical requirements of customers have been changing. Former large deliveries to central warehouses are now split into several smaller deliveries directly to manufacturing plants. This trend is in particular accelerated by outsourcing and modular manufacturing in the engineering industry. Both, the direct OEM market and the after sales market are influenced by those trends.

All these market and competition changes has led a group of roller bearing retailers to join forces and to establish Bearing Partners. The major benefits of the co-operation are the geographical coverage of whole Germany, access to a wider product range, and increased purchase power. Altogether it improves the competitiveness of each individual member company because they are able to offer their customers better services and prices.

9.3. The 'Virtual Logistics Centre' - Project.

The 'Virtual Logistics Centre' (VLC) is the first project of Bearing Partners to improve their competitiveness. The basic idea is to create a virtual stock, a common inventory of all eight partners from which each individual partner can obtain the items it needs to satisfy customer orders. The VLC is supposed to manage geographically dispersed inventory from various organisational locations in real time.

A common business understanding of the partner companies has developed the idea for the VLC. Bearing Partners set following objectives for the VLC:

- to simplify communication amongst the partners and reduce its cost,
- to process stock orders to and from other partner companies electronically,
- to gain total visibility of common stock items to increase customer responsiveness,
- to reduce inventory at each partners warehouse location.

The major problems of programming a common inventory database was that despite four of the partners worked with a similar company software package, each of the other four partners used a different software package. The second major problem was to keep the confidentiality of sensible data. Basically, Bearing Partners searched for a software house that would be able to establish a common inventory database, to program the interfaces to the database, to install firewalls, and to develop user friendly Internet applications. They found this partner in Cybernet AG, Munich, a provider of business solutions for integrated communication and Internet services.

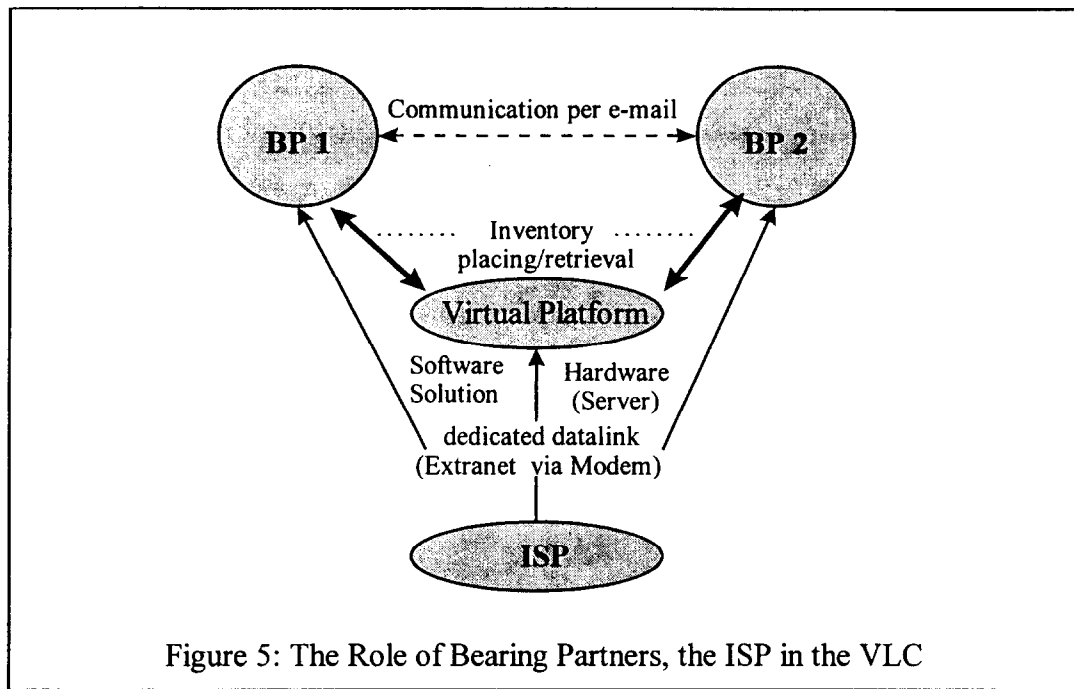


Figure 5: The Role of Bearing Partners, the ISP in the VLC

Figure 5. illustrates the VLC, a virtual platform to which each partner is linked via Internet (Extranet). The VLC features a central database that holds the inventory information of all partners, such as products, item numbers, quantity, locations, and prices. This database is kept on a central server at Cybernet's premises, which can be accessed by each partner through a dial-in/dial-out interface that is firewall protected. Furthermore, Cybernet provides the Internet access to Bearing Partners member companies and acts as system administrator to the VLC database.

The VLC provides visibility and access to the common inventory of the dispersed 26 different warehouse locations of all partners together, which is the virtual stock of Bearing Partners.

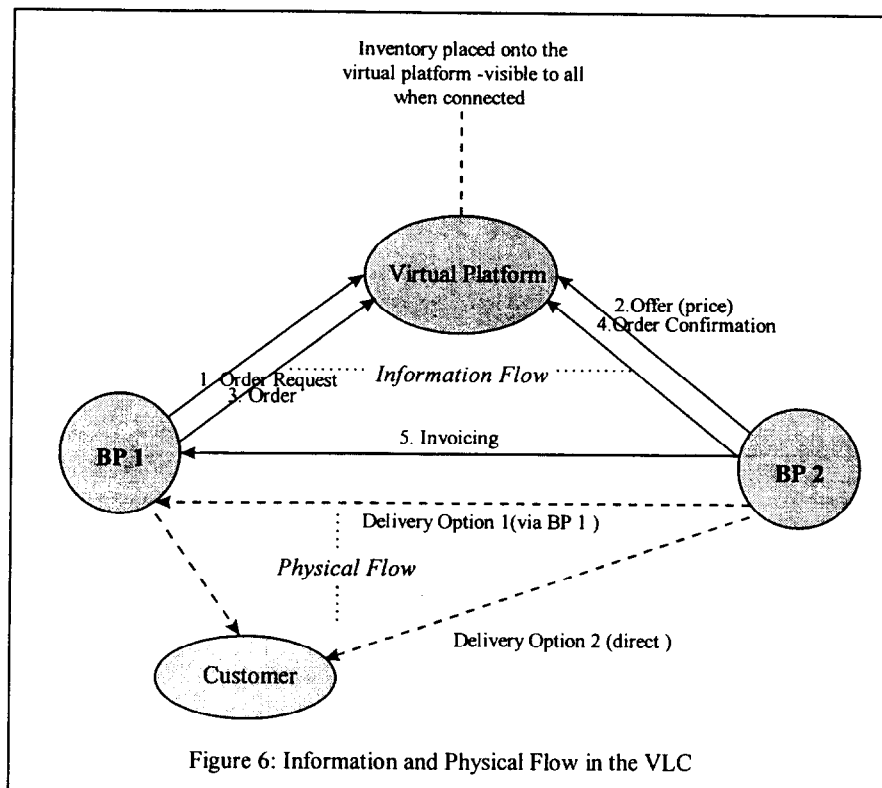
The virtual stock is updated every night through a batch download from the different Bearing Partners' WH management systems to the central database.

9.3.1. VLC Order Processing

The VLC changed the way orders are processed by partner companies. To match a customer order, the retailer first checks its own inventory for the requested items. Any item, which is not available here, is then searched for in the inventory of the other partners, which becomes visible by simply connecting

to the virtual platform via Internet. The database keeps information about location, quantities, and transfer price of about 45,000 articles commonly available. Numerical codes that are unique to each of the partners warehouse management systems are cross-referenced via the virtual platform.

Figure 5. illustrates the information and physical flow caused by order processing via the VLC. This process involves four information and two physical option flow sub-processes. If a partner company (BP1) has allocated a needed item at another partners' warehouse (BP2), it issues an order request to the VLC, which is transferred to BP2 who hold inventory on the requested items. BP2 either confirms the internal order or amend it stating the available quantity and applicable transfer price. Amendments might be caused by current fluctuations on the market for roller bearings or an already changed inventory since the virtual stock is based on data of the previous day. Upon the received offer the BP1 issues an order to BP2 by accepting the offer. BP2 confirm the reception of the order and prepares the items for shipping. Those four sub-processes might seem complex at first glance, but the processing of an order through the VLC is mere matter of minutes. The delivery of the internal ordered products offers two options. However, most of the products that are purchased from other partners are shipped to the buying partner (BP1), where they are consolidated with other parts of the original order and then delivered to the final customer. Only in cases of emergency, orders are directly delivered to final customers. The final sub-process is invoicing BP1 for the delivered items. The partners have agreed to charge each other only the acquisition costs plus a fixed percentage for warehouse handling. BP2 bears the transport costs to its warehouse or to the final customer.



9.3.2. Benefits and Costs of the VLC

BENEFITS

- **Customer Service Improvements**: The VLC has improved the customer service of each individual member of Bearing Partners. Due to the access to a wider range of products, such as products from different manufacturers or slow moving product, which are normally not stored, provides customers with a broaden product range to choose from. The second major improvement in customer service is that items, which are not on stock for a variety of reasons, are now available over night.
- **Order Processing**: Bearing Partners exchanged already products before they started their partnership. However, it was a difficult and time-consuming process to search for items that were urgently needed. Since this process was not standardised it involved many phone calls and long lasting negotiations about transfer prices. Therefore, one of the main objectives of the VCL is to simplify the co-operation between the partners. Due to the common database and the standardised order process, the exchange of data (i.e. inventory, availability, internal transfer prices, etc.) is accelerated, and the costs of communication (employee's time and telephone/telefax costs) are reduced.
- **Stock Reduction**: The inventory that is kept at regional warehouses can be reduced to those items that are most commonly sold in this region. Since the

customer base (in terms of industry) differs significantly amongst the partners, items that feature a fast turn of inventory (A items) for one partner are items of medium (B items) or slow (C items) turning frequency for other partners. The transparency of inventories at one another partners and its accessibility enables all partners to reduce their inventory. The synergy effects are:

- depending on the area and industries partners serve, B and C items of some partners are A items for others, such items can be centrally stored at one warehouse location,
- due to the access to partners inventory, all partners are able to reduce their minimum (safety) stock,
- partners are able to get rid of slow moving items, items they already keep for ages in their warehouses; this leads to lean stock.

All this leads to the synergy that the number of items each partner keeps in stock can be reduced, whereby the volume of each item the individual partner keeps increases. However, the total stock of all eight partners together, decreases.

- Increased Purchase Power: Besides significant stock reductions, Bearing Partners benefit from a changing procurement strategy. Figure 7. illustrates the gradual change in Bearing Partners procurement strategy:

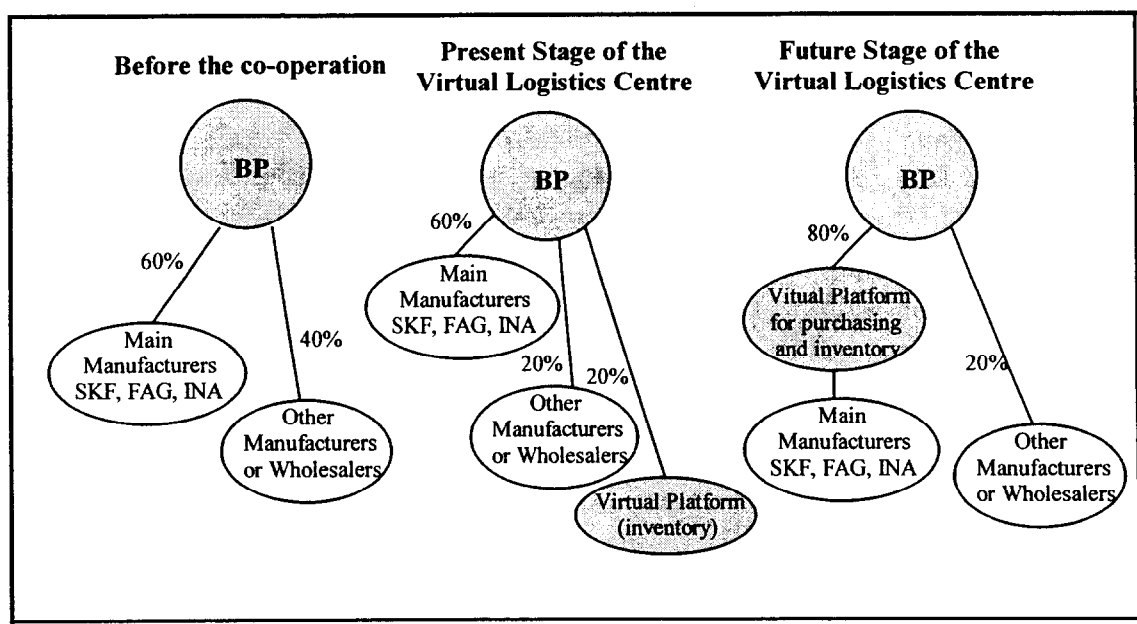


Figure 7: Changing Procurement Strategy of Bearing Partners.

- Before the partnership was established, the each retailer purchased 60% of bearings from different or the same major manufacturers.

Everyone used to have different purchase agreement with the manufacturers mainly based on different order volumes. The other 40% of bearings were bought from other wholesalers and East European or Asian manufacturers.

- At the present stage of the project 20% of the purchase volume is acquired via the VLC. The partnership already benefits from the different purchase agreements of partners with their supplier. For example, a certain item, which is a C-product for one partner (BP1), it might be an A-product for another partner (BP2). Therefore, BP2 obtains better purchase prices from the manufacturer and is able to supply BP1 with this item for a better price than BP1 would be able to obtain placing only a small volume order with the manufacturer.
- At the final stage of the VLC - project, Bearing Partners expect to source about 80% of their demand via the virtual platform. The major savings are achieved by pooling their purchase power. To consolidate the supply demand of eight SME roller bearing retailers puts Bearing Partners in a much stronger negotiation position, which leads to better purchase conditions. Bearing Partners has already become the biggest customer for INA in Germany, and the second or third most important customer of the market leader (SKF) in Germany. Being a major customer of manufacturer improves the final customer service again, since orders with manufacturers are handled with priority.

COSTS

- Organisational Change: The introduction of the VLC had three major implications for the individual member organisations. On the one hand employees had to accept and to learn to work with new media's such as the Internet and Emails. The second organisational change was the changing order process for the inter-partnership product exchanges. By far more difficult was the cultural change. Employees had to learn to co-operate with former competitors. Therefore, Bearing Partners organised also several meetings where key personnel of partners met f2f.
- Software: Cybernet AG, Munich did the programming of the VLC database, interfaces to the different management systems and necessary firewalls, as well as the item cross reference program. Bearing Partners expected a return on investment (ROI) for this initial project of about six months. The investment costs were split equally amongst the partners.
- Operational Costs: To run the VLC, the Internet Service Provider (ISP) provides the central server, administers the VLC software, provides lines

and Internet accesses. For these services the ISP charge a fixed amount every months to each partner separately.

- Additional Handling and Transport Costs: All partners will maintain their decentralised warehouses in order to ensure customer responsiveness and short transport distance. Increasing inter-partner product exchange leads to double warehouse handling and commissioning. It also increases the number of transport between the different warehouse locations. However, the additional handling and transport can partly be counterbalanced by an increased number of items per shipment, which will be handled and transported at the same time. Additionally, if the eight partners pool their transport volume they will be able to negotiate lower transport prices for all their shipments.

9.4. Future Prospects of Bearing Partners

Bearing Partners is just at the beginning of their co-operation. The virtual corporation they have established offers them with a variety of future prospects, which will intensify their co-operation and strengthens their competitiveness as a collaborating group and as individual independent SME retailers. The following list is just a few future prospects of Bearing Partners:

- A) They will be able to bid for large contracts as a group, assuring customers geographical proximity, large geographical coverage combined with an extensive product range.
- B) Another option would be to widen the virtual platform to entire product portfolio of the partner companies. That also would have implications on the marketing and sales functions of the partners.
- C) To improve customer services the integration of OEM customers into a future information infrastructure (SCM), which could be based on the virtual platform.
- D) The partners could consider to extend their partnership on European level and to integrate new partners. However, Bearing Partners should keep their philosophy and should only consider SME retailers as possible candidates.
- E) Finally, may be in the long run, Bearing Partners might consider to pool/consolidate out sales activities as well.

However, despite those future prospects, Bearing Partners philosophy is that all partners stay independent and keep their geographical proximity as well as the personal contacts to customers. It will be the strength of Bearing Partners to combine the flexibility and proximity to customers of SME with the purchase

power and the sharing of resources of a larger group, which will provide them with a competitive advantage.

10. Findings

If the world around logistics changes, the way logistics is managed has to change as well. If companies pool their resources and form virtual corporations, logistics management has to adopt and to follow the virtual organisational principals.

Bearing Partners is a virtual corporation, a partnership network of equal members. In many cases virtual corporations are regarded as vertically integrated value chains. Interestingly, Bearing Partners is a horizontal co-operation of retailers targeting the same market. However, rivalry is limited due to geographical dispersal and only a few sales areas of partners are overlapping. The partners have agreed to pool their resources and to share their inventory with the other partners. All partners stay independent, but they make use of their joint purchase power, their SME strengths, their geographical proximity to their customers, and they join forces to bid for larger contracts.

The members of Bearing Partners have realised that this partnership is the only strategic option to stay independent and in business in an increasingly competitive environment. It is the external pressure that brings them internally close together.

The VLC is the first common project of Bearing Partners to join forces. It is an excellent example of how equal partnership makes it possible to replace physical inventory by information. However, the case study has also demonstrated that it is not enough just to implement a software system and a common database. Besides the change of logistical processes, the organisational culture towards a more co-operative approach has to change as well. Virtual logistics has to be embedded in a larger virtual organisational structure. Only in a virtual co-operational context, the full potential of virtual logistics can unfold. Bearing Partners do not only use the VLC to reduce inventory; it enables them to improve customer service, to speed up order processing, and to join their purchase power. The virtual management approach offers Bearing Partners a variety of future prospects; such as to bid for larger contract or to integrate their suppliers and customers via Internet into a vertical supply chain.

Certainly, the formation of a virtual corporation and the implementation of the VLC involve costs, but compared to the benefits it is a minor investment. The key to run a virtual corporation and virtual logistics successfully is mutual trust and a common co-operative culture. Since the world around us is changing,

mistrust and opportunism make a win-win collaboration impossible and leads to self-destruction in the long run.

For many SMEs, whether retailers, manufacturers, or service companies, it might be the only strategic option to join forces with other equal partners to stay in business and to keep indecency. Virtual logistics becomes key to operate such inter-organisational partnerships; virtual logistics offers a huge potential of synergies which lead ultimately to competitive advantage.

11. Further Research

We are just at the beginning of a new era of new organisational forms, such as the virtual corporation. Our research and this case study are the first attempt to bring empirical data into the new field of virtual logistics. The concept of virtual logistics is still infant and further research is needed to understand and to apply the virtual logistics management approach. So far, there is hardly any research done on the theory behind this new concept. Resource Based Theory, Transaction Cost Theory and Co-ordination Theory seems to be the theoretical backing of virtual logistics, but their applicability has to be studied in more depth. Besides the questions of how to implement and to operate virtual logistics, a fundamental research area would to investigate the potentials virtual logistics can provide to its participating companies.

12. Conclusion

Today's strategic challenge of doing more with less has lead firms to look outward as well as inward for solutions to improve their ability to compete without adding internal resources. Kanter (1989) proposed three strategic options for firms to cope with increasingly competitive markets. Firms can either pool their resources with others, form alliances to exploit market opportunities, or link their organisational systems in partnerships.

Bearing Partners has done it. The changing market environment; international competition, concentration processes of German retailers, and changing customer needs; has made the small and medium bearing retailers aware of that their survival in an increasing competitive market leis in the co-operation with others facing the same threats. The fear not to survive in the future bonds the partner companies together, it enables a close, fair and trustworthy partnership of equal independent companies. The 'Virtual Logistics Centre' is the first step in the right direction. It is about sharing resources, information, and knowledge, which leads to cost reduction for everybody. To reduce costs is one factor to

improve competitiveness, but the 'Virtual Logistics Centre' provides more to its partners.

Bearing Partners implemented an organisational system whereby each partner ends up with more capabilities and power than it inherently possesses. This enables each partner individually to keep their independence and to improve their competitiveness.

Virtual logistics is embedded in virtual corporations. Virtual logistics is more than the flow of information and material across organisational boundaries. Moreover, it enables the real time visualisation and simulation of possible combinations of logistical resources using modern information and communication technology. Virtual logistics is the real time management of logistical processes by sharing resources and capabilities that can be organisationally and geographically dispersed. It enables a high degree of process agility in the supply chain through total transparency of available resources and capabilities in a network of independent organisations.

Bibliography

Arnold O., Faisst W., Hartling M., Sieber P. 1995, Virtuelle Unternehmen als Unternehmenstyp der Zukunft?, in: Handbuch der modernen Datenverarbeitung, Vol. 32, Heft 185, 8-23

Bell S. 1998, Ready, Set, Go Virtual, CIO, Vol. 12, No. 2, 86-90.

Bowman R.j. 1996, The case of the vanishing job title (logisticians), Distribution, Vol. 95, No. 1, 32-34.

Bultje R., van Wijk J. 1998, Taxonomy of Virtual Organisations, based on definitions, characteristics and typology, VoNet: The Netwsletter @ <http://www.virtual-organization.net>, Vol. 2, No. 3, 7-20.

Christie P.M.J., Levary R.R. 1998, Virtual Corporations: Recipe for Success, Industrial Mangement, Vol. 40, No. 4, 7-11.

Clarek M.P. 1998, Virtual logistics: An introduction and overview of the concepts, International Journal of Physical Distribution & Logistics Management, Vol. 28, No. 7, 486-507.

Faisst W. 1995, Welches IV-System sollte ein Virtuelles Unternehmen haben? Arbeitspapier der Reihe 'Informations- und Kommunikationssysteme als Gestaltungselement Virtueller Unternehmen, Institut für Wirtschaftsinformatik der Universität Bern / Institut für Wirtschaftsinformatik der Universität Leipzig, Bereich Wirtschaftsinformatik I der Universität Erlangen-Nürnberg, Nr. 1.

Franke U.J. / b 1998, The Evolution from a static virtual corporation to a virtual web - what implications does this evolution have on supply chain management, VoNet: The Netwsletter @ <http://www.virtual-organization.net>, Vol. 2, No. 2, 59-65.

van Hoek, R.I. 1998, Logistics and virtual integration, International Journal of Physical Distribution & Logistics Management, Vol. 28, No. 7, 508-523.

Ihde G.B. 1984, Transport, Verkehr, Logistik, Verlag Vahlen, München.

Ihde G.B. 1999, Logistiktrends: Reise in die Zukunft, Logistik Heute, Vol. 21, No. 7/8, 20-22.

Kanter R.M. 1989, Becoming PALs: Pooling, Allying, and Linking across companies, The Academy of Management Executive, Vol. 3, No. 3, 179-193.

Kernler H. 1996, Materialwirtschaft im virtuellen Unternehmen, Industrie Management, No. 1, 18-21.

Klobas J. 1998, The virtual supply chain: a view of information flow, business structures and business opportunities, Business Information Review, Vol. 15, No. 3, 185-192.

Kloth M. 1995, Arbeit im virtuellen Unternehmen, Logistik + Arbeit, No. 6, 34-43.

Porter M.E. 1985, Competitive Advantage, Free Press, New York.

Rayport J.F., Sviokla J.J. 1995, Exploiting the Virtual Value Chain, Harvard Business Review, Vol. 73, No. 6, 75-85.

Scholz C. 1994, Die virtuelle Organisation als Strukturkonzept der Zukunft, Arbeitspapier Nr. 30, Lehrstuhl für Betriebswirtschaft, Universität des Saarlandes, Saarbrücken.

Scholz C. 1996, Virtuelle Organisationen: Konzeption und Realisation, zfo, No. 4, 204-210.

Scholz C. 1997, Das virtuelle Unternehmen - Schlagwort oder echte Vision?, Bilanz Manager, No. 1, 12-19.

Schuh G. (1996), Logistikmanagement: strategische Wettbewerbsvorteile durch Logistik, Schäffer-Poeschel Verlag für Wirtschaft, Recht, Steuern GmbH, Stuttgart.

Schulte C. (1991), Logistik, Verlag Vahlen, München.

Semich W.J. 1994, Information Replaces Inventory at the Virtual Corp., Datamation, 15 July.

Szyperki N., Klein S. 1993, informationslogistik und virtuelle Organisationen, Die Betriebswirtschaft, Vol. 53, No. 2., 187-208.

Venkatraman N., Henderson C. 1996, The architecture of virtual organizing: leveraging three independent vectors, Discussion Paper, Systems Research Center, Boston University, School of Management.

Wiegand A. 1999, Auswirkungen von E-Commerce im Internet auf die Logistik, in: Logistik Jahrbuch 1999, Fachverlag Handelblatt, 34-40.

Wiendahl H.-P., Fastabend H., Helms K., Jäger M. 1996, Zukünftige PPS-Systeme müssen Logistik-Netzwerkebeherrschen, Industrie Management, No. 1, 6-11.

Wood D. (1995), International Logistics, Chapman & Hall.

Yin R.K. 1993, Applications of Case Study Research, Sage Publication, Inc., Newbury Park.

**CRANFIELD WORKING PAPERS
List No 9, 1995**

- SWP 1/95 Andy Bytheway
"Information in the Supply Chain: Measuring Supply Chain Performance"
- SWP 2/95 ~~John Ward & Joe Peppard~~
~~"Reconciling the IT/Business Relationship: A Troubled Marriage in Need of Guidance"~~
- SWP 3/95 Kevin Daniels, Gerry Johnson, & Leslie de Chernatony
"Collective Frames of Reference, Recognition, and Managers' Mental Models of Competition: A Test of Two Industries"
- SWP 4/95 Alison Rieple
"Staffing as a Lever of Strategic Change - The Influence of Managerial Experience, Behaviour and Values"
- SWP 5/95 Grafton Whyte & Andy Bytheway
"Factors Affecting Information Systems Success"
- SWP 6/95 Andy Bailey & Gerry Johnson
"The Processes of Strategy Development"
- SWP 7/95 Valerie Bence
"The Changing Market for Distribution: Implications for Exel Logistics"
- SWP 8/95 Valerie Bence
"The Evolution of a Distribution Brand: The Case of Exel Logistics"
- SWP 9/95 Andy Bytheway
"A Review of EDI Research"
- SWP 10/95 Andy Bytheway
"A Review of Current Logistics Practice"
- SWP 11/95 Joe Peppard
"Broadening Visions of BPR: The Imperative of Strategic Integration"
- SWP 12/95 Simon Knox & David Walker
"Empirical Developments in the Measurement of Involvement, Brand Loyalty and their Structural Relationships in Grocery Markets"
- SWP 13/95 Ashley Braganza & Andrew Myers
"Issues and Dilemmas Facing Public and Private Sector Organisations in the Effective Implementation of BPR"
- SWP 14/95 John Mapes
"Compatibility and Trade-Off Between Performance: An Alternative View"

SWP 15/95 Mike Sweeney & Marek Szwajczewski
"Manufacturing Standards of Performance for Success"

SWP 16/95 Keith Thompson, Nicholas Thompson & Roy Hill
"The Role of Attitudinal, Normative and Control Beliefs in Drink Choice Behaviour"

SWP 17/95 Andy Bytheway
"Information Modelling for Management"

SWP 18/95 Mike Sweeney & Marek Szwajczewski
"Manufacturing Strategy and Performance: A Study of the UK Engineering Industry"

SWP 19/95 Valerie Bence
"St.James's Hospital and Lucas Engineering Systems Ltd - A Public/Private Sector Collaboration in BPR Project A - Elective Admissions"

SWP 20/95 Valerie Bence
"St.James's Hospital and Lucas Engineering Systems Ltd - A Public/Private Sector Collaboration in BPR Project B - The Re-Organisation of Purchasing and Supplies"

SWP 21/95 Simon Knox & David Walker
"New Empirical Perspectives on Brand Loyalty: Implications for Segmentation Strategy and Equity"

**CRANFIELD WORKING PAPERS
List No 10, 1996**

SWP 1/96 Andy Bailey & Gerry Johnson
"Patterns of Strategy Development"

SWP 2/96 Simon Knox & David Walker
"Understanding Consumer Decision Making in Grocery Markets: New Evidence from the Fishbein Model"

SWP 3/96 Kim James, Michael Jarrett & Donna Lucas
"Psychological Dynamics and Organisational Learning: from the Dysfunctional Organisation to the Healthy Organisation"

SWP 4/96 Mike Sweeney & Marek Szwajczewski
"The Search for Generic Manufacturing Strategies in the UK Engineering Industry"

SWP 5/96 John Baker
"Agility and Flexibility: What's the Difference"

SWP 6/96 Stephen Adamson, Noeleen Doherty & Claire Viney
"30 Years On - What Have We Learned About Careers?"

SWP 7/96 Keith Goffin, Marek Szwajczewski & Colin New
"Supplier Base Management: An Empirical Investigation"

SWP 8/96 Keith Goffin
"Operations Management Teaching on European MBA Programmes"

SWP 9/96 Janet Price, Ashley Braganza & Oscar Weiss
"The Change Initiative Diamond: A Framework to Balance Business Process Redesign with other Change Initiatives"

CRANFIELD WORKING PAPERS List No 11, 1997

SWP 1/97 Helen Peck
"Towards A Framework of Relationship Marketing: A Research Methodology"

SWP 2/97 Helen Peck
"Towards A Framework of Relationship Marketing: An Initial Case Study"

SWP 3/97 Chris Edwards & Joe Peppard
"A Critical Issue in Business Process Re-Engineering: Focusing the Initiative"

SWP 4/97 Joe Peppard and Don Fitzgerald
"The Transfer of Culturally-Grounded Management Techniques: The Case of Business Re-Engineering in Germany"

SWP 5/97 Claire Viney & Shaun Tyson
"Aligning HRM with Service Delivery"

SWP 6/97 Andy Bailey & Gerry Johnson
"Logical or Processual? Defining Incrementalism"

SWP 7/97 Keith Goffin
"Evaluating Customer Support Requirements at the Product Design Stage"

SWP 8/97 Keith Goffin, Colin New & Marek Szwajczewski
"How Innovative are UK Manufacturing Companies?"

SWP 9/97 Kim James
"Beyond Individual Stress Management Programmes: Towards an Organisational System Approach"

SWP 10/97 Mark Hambly & Richard Reeves
"The Application of Foresight in UK Research and Development"

SWP 11/97 Leslie Falkingham & Richard Reeves
"Context Analysis - A Technique For Analysing Research in a Field, Applied to Literature on The Management of R&D at the Section Level"

SWP 12/97 Ali Jawad & Richard Reeves
"Successful Acquisition of IT Systems"

~~SWP 13/97 Richard Reeves~~
~~"Managing Research and Development"~~

SWP 14/97 Leslie Falkingham & Richard Reeves
"The Four Schools of Thought in Research and Development Management and the Relationship of the Literature to Practitioners' Needs"

SWP 15/97 Val Singh
"A Qualitative Study of the Relationship between Gender and Managerial Perceptions of Engineers' Commitment: Cases from the UK and Sweden"

SWP 16/97 John Fielding
"Dividend Yields, Business Optimism and the Predictability of Long Horizon Returns in the UK"

SWP 17/97 Brenda Porter
"Audit Committees in Private and Public Sector Corporates in New Zealand: An Empirical Investigation"

SWP 18/97 Brenda Porter
"Securing Quality Audit(or)s: Attempts at Finding a Solution in the United States, United Kingdom, Canada and New Zealand"

SWP 19/97 Kim James & Michael Jarrett
"Group Regression and Team Development: Implications for the Top Team Consultant"

CRANFIELD WORKING PAPERS List No 12, 1998

SWP 1/98 Zhang Lihong & Keith Goffin
"Joint Venture Manufacturing in China - Key Opportunities for Operations Management Research"

SWP 2/98 Francis Buttle
"I Heard it Through the Grapevine: Issues in Referral Marketing"

SWP 3/98 Helen Peck
"The Development and Implementation of Co-Managed Inventory Agreements in the UK Brewing Industry"

SWP 4/98 Val Singh
"Gender and Managerial Meanings of Commitment in High Tech Engineering in the UK and Sweden"

SWP 5/98 Joe Peppard
"IT in Organisations: A Framework for Analysis"

SWP 6/98 Kusum Sahdev & Susan Vinnicombe
"Downsizing and Survivor Syndrome: A Study of HR's Perception of Survivors' Responses"

SWP 7/98 Mark Jenkins & Steven Floyd
"Spinning your Wheels or Winning the Race: Knowledge, Resources and Advantage in Formula One Racing"

SWP 8/98 Francis Buttle & A. Adlaigan
"Customer Attachment: A Conceptual Model of Customer-Organisation Linkage"

SWP 9/98 Joe Peppard
"IS/IT Management in the Global Enterprise: A Framework for Strategic Alignment"

SWP 10/98 Keith Goffin & Colin New
"Customer Support and Product Innovation: Three Exploratory Case Studies"

SWP 11/98 Joe Peppard & Patrick Butler
"Consumer Purchasing on the Internet: Processes and Prospects"

SWP 12/98 Haider Ali & Sue Birley
"The Role of Trust in the Marketing Activities of Entrepreneurs Establishing New Ventures"

SWP 13/98 Joe Peppard & John Ward
"Mind the Gap': Diagnosing the Relationship between the IT Organisation and the Rest of the Business":

SWP 14/98 Cliff Bowman & Véronique Ambrosini
"Value Creation versus Value Capture: Towards a Coherent Definition of Value in Strategy - An Exploratory Study"

SWP 15/98 Alan Harrison
"Enablers and Inhibitors to Manufacturing Strategy"

SWP 16/98 Joe Peppard & Rob Lambert
"Whose Job is it Anyway?: Organisational IS/IT Competencies for Value Creation"

SWP 17/98 Haider Ali & Petronila Anselmo
"Women's Perceptions of their Role Portrayals in Print Adverts: A Qualitative Study"

SWP 18/98 David Partington
"Building Grounded Theories of Managerial Behaviour from Interview Data"

SWP 19/98 Keith Thompson & Yat Ling Chen
"Personal Values Underlying Women's Perceptions of Fashion Store Images"

SWP 20/98 Keith Goffin
"Customer Support Distribution Channels: Five Exploratory Case Studies"

CRANFIELD WORKING PAPERS List No 13, 1999

SWP 1/99 Haider Ali & Sue Birley
"Integrating Deductive and Inductive Approaches in a Study of New Ventures and Customer Perceived Risk"

SWP 2/99 Haider Ali & Yalçin Göl
"Brand Attitude and Image Congruence Amongst Teenagers"

SWP 3/99 Ulrich Franke
"Logistics Networks: The Future Trend in Logistics Management"

SWP 4/99 Keith Thompson, David Palmer-Barnes & Nicholas Thompson
"Personal Values and Food Choice: An Application of Means-End Analysis"

SWP 5/99 Joe Peppard
"Bridging the Gap between the IT Organisation and the Rest of the Business: Plotting a Route"

SWP 6/99 Brenda Porter
"Survey of In-House Tax Departments in United Kingdom Corporates"

SWP 7/99 Adam Lindgreen & Ian Crawford
"A Multiple, Embedded Case Study of Contemporary Practices of Relationship Marketing in the Danish-British and New Zealand-British Food Supply Chains: A Research Methodology"

SWP 8/99 Caroline Roberts
"A Review of Decision Analysis Methods for Application to Risk Based Management of Structural Assets"

SWP 9/99 Joe Peppard, Chris Edwards & Rob Lambert
"A Governance Framework for Information
Management in the Global Enterprise"

SWP 10/99 Sue Holt
"Relationship Marketing and Relationship
Managers: A Customer Value Perspective"

SWP 11/99 Adrian Payne & Sue Holt
"Diagnosing Customer Value: A Review of the
Literature and a Framework for Relationship
Value Management"

SWP 12/99 Jos van Ommeren & Chris Brewster
"The Determinants of the Number of HR Staff
in Organisations: Theory and Empirical
Evidence"

SWP 13/99 Adam Lindgreen & Ian Crawford
"A Multiple, Embedded Case Study of
Contemporary Practices of Relationship
Marketing in the Danish-British and New
Zealand-British Food Supply Chains:
Preliminary Findings from the Danish-British
Food Supply Chain"

CRANFIELD WORKING PAPERS
List No 14, 2000

SWP 1/00 Fred Lemke, Keith Goffin, Marek
Szwejczewski, Colin New, Rolf Pfeiffer &
Bertram Lohmüller
"Supplier Base Management: The Contrast
between Germany and the UK"

SWP 2/00 Jennifer Abley
"Decision Making and Stated Preference
Techniques: New Challenges to Old
Assumptions"

SWP 3/00 Ulrich franke & Otto Jockel
"Virtual Logistics: An Exploratory Case Study"