

NETSTOCK – a web based approach for stock control in a heterogeneous IT world

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Abstract: Logistics managers have to cope with the dilemma to provide an optimum service level towards the client on the one hand and to minimise the total logistics cost on the other hand. This job requires an optimum transparent view along the whole supply chain both on the actual stock and on the demand situation. Several partners are concerned which in case of SMEs moreover work often with heterogeneous ERP environments. Within the NETSTOCK project, this problem is overcome by installing a web based stock control system. A web based Logistics Server is implemented which models the whole production and distribution network on a virtual level. For a given customers demand, both quantities and time are monitored and checked against the customers requirements. This solution allows the partners to increase the internal efficiency and the service level towards the client.

1. Introduction

Logistics managers have to cope with the dilemma to provide an optimum service level towards the client on the one hand and to minimise the total logistics cost on the other hand. This job requires an optimum transparent view along the whole supply chain which is not always easy in the case of several partners: The required quantities from the sales department change often over time, the own production has to be co-ordinated and the supplier stocks are not necessarily transparent for a solid and reliable planning result. In particular, this problem gets more difficult if several partners would like to co-operate but work on different ERP environments. This is the typical case of SMEs which represent some 95% of all European manufacturing companies and where the complex, big and expensive well known systems as BAAN or SAP do not have yet a strong market penetration.

The project NETSTOCK is exactly focussing on this gap. NETSTOCK intends the international hands-on network wide adoption of an existing leading edge graphic orientated web-based Logistic Data Warehouse tool for stock control and service level optimisation. The highlights of such a tool which convince the SME managers with its efficiency are:

- unique self developed ergonomic graphical shell,
- Meta-Repository, multidimensional data views, relational Database,
- User extendable web-based stock analysis and Enterprise Resource Planning (ERP) method pool using the portfolio-technique.

This shows that the functionality of this tool depends strongly on the dynamic integration with the hosting environment (ERP) in a company. In the current situation, it is used only in one company on a local level with interfaces to one proprietary hosting application. This generates benefits for one company only whereas supplementary benefits could be achieved by using the tool in a networked organisation being implemented on a virtual level.

This requires two main technological steps

- (1) Integration of the tool on each companies level with the heterogeneous hosting applications (ERP systems) which are different in particular across the SMEs landscape (requirement of a dynamic standardised interface)
- (2) Linkage of the local applications to a dynamic network (requirement of a network base like WWW and a set of dynamic information exchange and decision rules)

2. Conceptual development of logistics flow optimisation

Looking into the historical development, the classical planning and operational processes inside a company were taking place within the different departments. The first step was to integrate the different data bases of the department into one single data base to which the access was possible from the departments side but which supervises the integrity of the data. Figure with development on time.

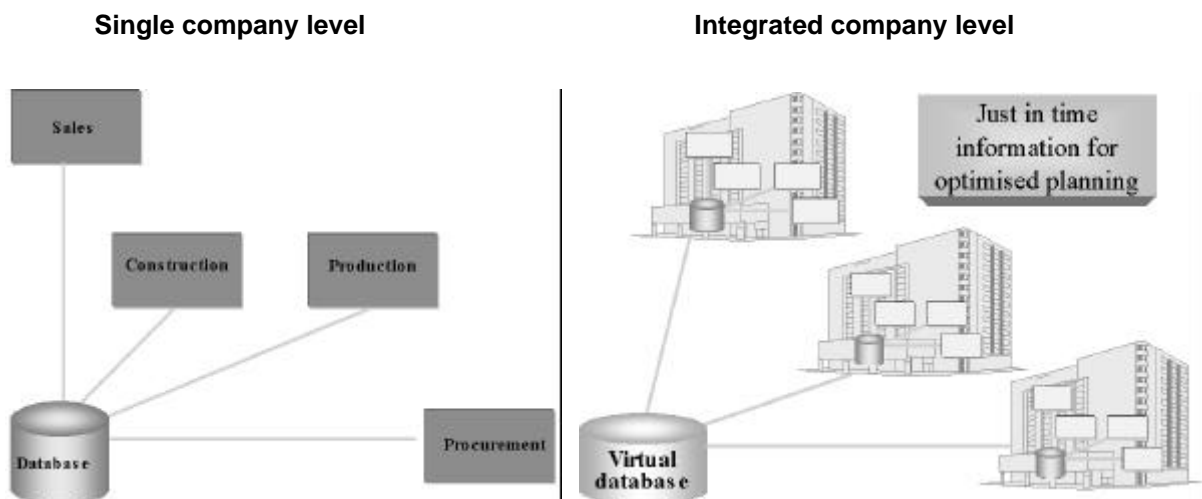


Figure 1: Development of logistics flow optimisation

The modern supply chain management is considering not only the company internal departments but integrates the partners alongside the logistics chain. It is certainly necessary to open the information access to the partners but this situation will open up new potentials for optimisation which were not accessible with independent solutions on each individual company level without any direct connection.

Based on a conjoint co-operative approach it will be possible to reach the following objectives for an increased cost efficiency

- Reduction of stock sold outs
- Reduction of stock level
- Reduction of planning overhead
- Improved service level
- Improved Key Account relationship
- Optimised lot sizes
- Improved controlling instruments

3. Solution by network architecture with bus strategy

Looking into the complexity of the partners information exchange, it is necessary to define an efficient method to link the partners systems together. The conventional Coupling Strategy is the classical way of exchanging data, i.e. via EDI. In particular in automotive industry, a defined set of standard messages is used to exchange data between industry, supplier and logistics service provider: VDA on German level, ODETTE on European level. The connection on system level is done peer-to-peer, with a direct high capacity telecommunication link between the partners. This means for a network of several partners that the number of connections increases as a quadratic function. An alternative solution which was followed up within the NETSTOCK project is the use of a bus strategy where the partners systems are linked via a commonly defined XML interface to a bus system which enables the information transfer to the Logistics Server (see figure 2)

Conventional coupling strategy:

Strategy used in the NETSTOCK project:

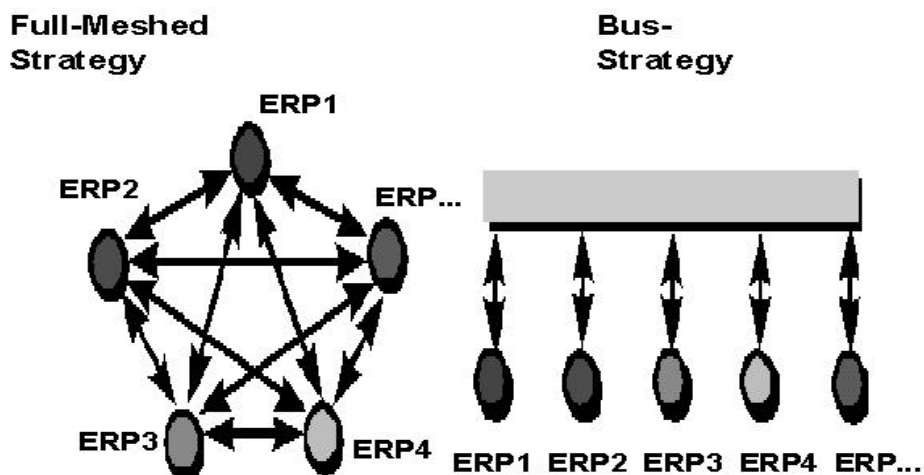


Figure 2: Bus strategy of NETSTOCK for efficient information exchange

This concept allows also to cope with the problem of heterogeneous ERP systems in particular within the segment of SMEs.

4. Logistics flow optimisation

The whole system was designed to optimise the logistics flow alongside the supply chain. The overall system architecture is given within the following picture.

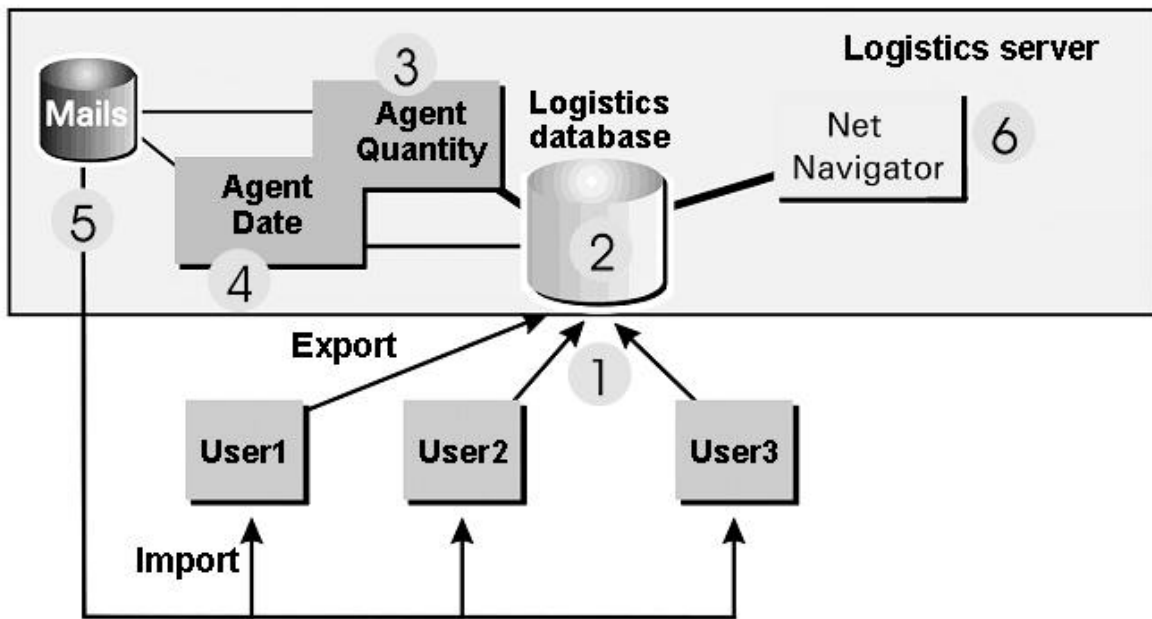


Figure 3: System architecture of NETSTOCK for logistics flow optimisation

Within this system architecture, the following characteristics are realised:

- The *export module* (1) couples the user application systems (called ERP or legacy systems) with the logistics server.
- All data flows of the enterprises involved are stored in the central *Logistics Database* (2).
- The *Agent Quantity* (3) is controlling the fact that the stocks within the network are minimised and that no lack of goods will occur.
- The *Agent Date* (4) monitors the schedules alongside the Supply Chain. It detects urgent orders and announces these to the responsible systems.
- All inconsistencies in relation to dates or quantities are stored in a *mailbox* (5) and are transferred to the attached legacy systems.
- The *Net Navigator* (6) serves as a central user interface for tracing and showing the logistics flow system.

Within the following paragraphs, a detailed example is given in which the data inside the virtual network is processed (see figure 4).

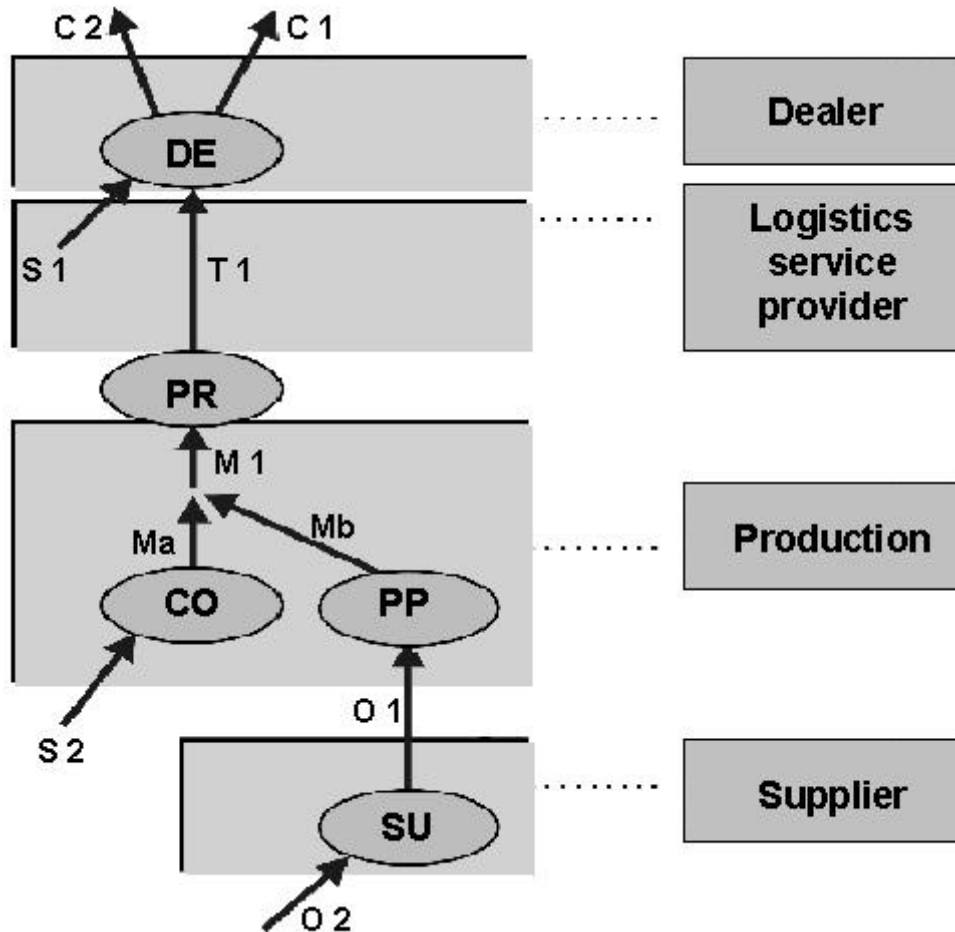


Figure 4: Example for logistics flow optimisation

The clients demand C1 and C2 are requested via the dealer. Linked to the clients demand is a requested time (date) for delivery. The stock level S1 is compared against the demand C1+C2 and induces a transport quantity T1 for the logistics service provider. To fill up the stock again, a material quantity of M1 is deduced which is broken down according to the materials requirements planning into Ma from the stock of components and Mb for parts to be purchased. The quantity Ma is compared to the stock level S2 from the companies stock. Mb which is needed as purchased parts from a supplier; it is transformed to an order O1 by the purchase department. On the first tier supplier level, a further order O2 is needed to be sent to the second tier supplier level.

Scheduling information

For the purpose of integrated control, a *Time Window* for each flow is constructed. Before the earliest date, no handling is possible, since the material is missing. After the latest date no date is allowed to be scheduled, since otherwise the customers requested date would not

be achieved. The real date for the connected legacy system must be positioned between these two dates as shown within figure 5.



Figure 5: Time window for each flow

The Agent Date now reacts in two cases:

- If the earliest date is positioned behind the latest date, an error message is placed within the mailbox.
- If the real date falls outside of the *Time Window*, a warning appears.

The customer orders are checked for availability and feasibility before the confirmation is dispatched. Forecasts and merchandising schemes are checked for bottlenecks before they are fixed, and excessive stocks and capacity lacks become visible, as long as possibilities for their removal exist.

5. Expected impacts – efficiency and transparency

The implementation of the NETSTOCK solution described above is expected to have several advantages compared to expensive and complex modules of large ERP systems:

- Small coupling effort for the heterogeneous systems involved
- Retaining of the optimised legacy systems with which the employees are used to work
- Integrated network planning that achieves smaller stocks and shorter turn-around times
- Retaining of the global date and the quantity consistency within the network
- Network wide graphic controlling of the four logistics targets
- Reduction of material and date buffers in the entire supply network
- Potential for a gentle migration over several years of the legacy systems to progressive IT solutions.

6. Conclusions

The NETSTOCK demonstrates the benefits of an advanced integrated stock control and service level optimisation software for manufacturing and distributing SMEs based on the WWW. These benefits (i.e. reduced capital tied up, reduced assortment, better liquidity and service level, etc.) enhance the competitiveness of the European SME and raises the stock turn over.

The NETSTOCK application will consist of an implementation of a dynamic interface between proprietary hosting environments (ERP systems) and a dynamic networked stock control application for SMEs which deliver and supply each other and which exchange relevant stock data via the World Wide Web. NETSTOCK will introduce a standardised software technology such as Web Technology with high practical impact so that anywhere in the world SME's employees and partners could get information about available stocks at any time. By this way, it will show SMEs the benefits of an optimised customer service level and of an efficient stock reduction by improving the overall Material Requirement Planning (MRP).

The results of these activities will be a set of stock control solutions covering different aspects as well as application areas. These applications will act as a showcase for the European manufacturing and distributing industry (mechanical, electrical, electronic, etc.) and therefore stimulate the wider adoption of innovative software technologies in user sectors. The successful project will not only result in cost reductions for the users inside the project, moreover it will enable them to accelerate the deliveries and displace competitors abroad. Thus making this trial application of strategic importance for the represented industries.