2007-01-01

The Role of Information and Communications Technology (ICT) in the Supply Chain

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by RONAN MCDONNELL, EDWARD SWEENEY AND JOHN KENNY, NITL present an overview of the role of IT as an enabling technology in SCM

IT HAS TRANSFORMED THE WAY COMPANIES DO THEIR BUSINESS

The movement of goods along the supply chain is reflected by corresponding movements of information. For example, the moment an item is sold at the supermarket check-out, this information is captured via a bar code reader and can then be read immediately anywhere in the distribution chain. Computers communicate with other computers via local area, national and, in some cases, international networks. However, without properly designed supply chains, and capable people, this will not succeed.

CATEGORIES OF LOGISTICS IT SOLUTIONS

Broadly speaking, there are two types of logistics IT solutions, point solutions and enterprise solutions. Point solutions fulfil a particular function within one of the component parts of the supply chain; buy, make, move or sell. Enterprise solutions, on the other hand integrate elements of the enterprise or the supply chain, linking the output of one action to other related elements.

POINT SOLUTIONS

Buy – There are a variety of purchasing IT solutions which support a range of both operational and strategic decision-making. In addition to managing what and how much to buy, other systems support vendor selection and management (see Table 1), and order processing.

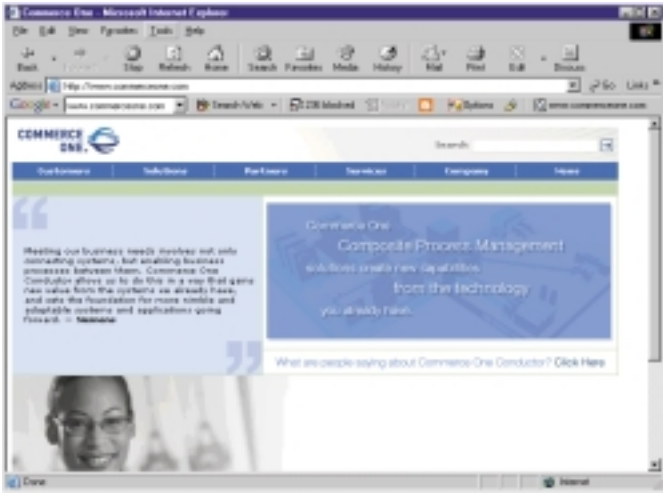


Table 1 - Example of a 'Buy' Solution
(http:// www.commerceone.com)

Fragmented buy-side processes, from sourcing and negotiation to procurement, fulfillment, and payment can be integrated into a single seamless process, reducing time consuming and repetitive manual tasks by implementing Supplier Relationship Management (SRM) applications such as that offered by Commerce One.

Make - Sophisticated planning systems can be configured to model the production facility in great detail, and can be programmed to optimise the production process based on production volumes, product mix, available capacity, and any other constraints that impinge on production planning. Such systems can interface with a stock control system or a warehouse management system to ensure that sufficient materials are, or will be, available. The production planner can also run 'what-if' scenarios to make the best use of resources. Table 2 provides an example of such a system.

Dynalogics is a suite of Expert Systems for Manufacturing. The system uses artificial intelligence to manage all the phases of manufacturing, from Estimating to Shop Floor control, Costing and Scheduling. It holds knowledge of each process, method, material and rate, and the capability and constraint of every item of plant on the shop floor.

Table 2 - Example of a 'Make' Solution
(http://www.dynalogics.com.au/index.html)

Manufacturing execution systems (MES) receive orders and dynamically manage resources on the shop floor from equipment and labour to inventory needed to fill those orders.

Move - The function of a warehouse in the supply chain has been described by Benchmarking Partners (1998) as a 'centre for flexible value added services and information'. Warehouse operations have been made easier through the introduction of Warehouse Management Systems (WMS). The basic functions of a WMS are receiving, put-away, work planning, picking, inventory level control, and shipping. Also important is a WMS system which is able to calculate the exact cost of the warehousing component in an order. Many software companies provide WMS systems, from tailor made packages such as EXE Technologies to off the shelf systems such as Swisslog's WarehouseManager (see Table 3).

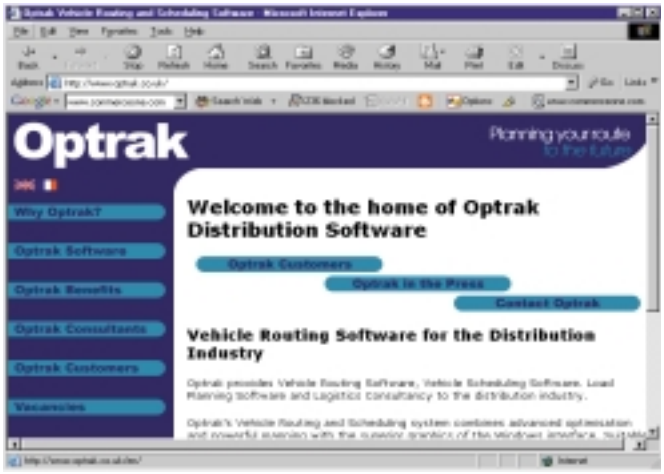
Swisslog's WarehouseManager automates key processes from inbound goods arrival and processing through inventory storage to fulfilling outbound shipping orders. Such a system can offer the improved inventory visibility that allows companys maximum throughput with minimum inventory.

Table 3 - Example of a 'Move' Solution
(http:// www.swisslog.com)

A wide range of Transportation Management Systems (TMS) are available, and include following functionalities:

- ❑ Complete support of transportation order management, transport planning, and fleet management;
- ❑ Communication with other supply chain participants. Most interfaces are supported by EDI, however the use of internet technology has enhanced communication between supply chain participants;
- ❑ Open database for execution and administration of transport activities;
- ❑ Evaluation of transportation performances (KPIs)
- ❑ Distribution modelling and route optimisation

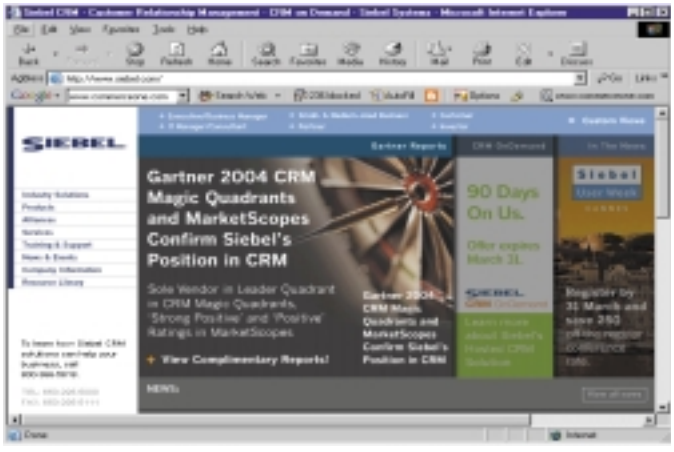
A brief description of an example of a route optimisation tool is shown in Table 4 opposite.



Optrak is a vehicle routing tool that allows the user to quickly build distribution routes which are mileage and volume efficient. The user can customise the system to model their own unique distribution network, incorporating any delivery constraints or special requirements.

Table 4 - Example of a 'Move' Solution
(http://www.optrak.co.uk)

Sell – The use of spreadsheets to monitor key customer's accounts, as well as to track trends in sales evolved into Customer Relationship Management (CRM). CRM applications are designed to collate as much relevant information as possible about each individual customer. But, the ultimate goal of CRM must be to provide the entire supply chain with as much information as possible about what has happened in order to maximise customer satisfaction. This involves understanding the customer well enough so as to be able to anticipate their needs, not just forecasting the future by extrapolating the past. A brief description of an example of a 'sell' solution is shown in Table 5.



By streamlining processes and providing sales, marketing and service personnel with better, more complete customer information, Customer Relationship Management (CRM) such as that provided by Siebel enables organisations to establish and maintain more profitable customer relationships and decrease operating costs.

Table 5 - Example of a 'Sell' Solution
(http://www.siebel.com)

APPLICATION INTEGRATION

The shift from fragmentation, which is a characteristic of many traditional supply chains, to integration is a key objective of supply chain management. A major disadvantage of point solutions is that they can reinforce barriers between functional parts of the business. Enterprise solutions or enterprise resource planning (ERP) represent an attempt to achieve more effective integration across traditional supply chain functions.

ENTERPRISE RESOURCE PLANNING

Enterprise resource planning (ERP) came about in the 1990s because of an organisational shift away from the traditional task-based structures that had been based on Adam Smith's theory that industrial work should be broken down into its simplest and most basic tasks, to process based structures. The phrase ERP was first coined by the Gartner group to describe the change in computer systems from the inventory focused, transition-centric and reactive nature of ERP's predecessors – MRP (Materials Requirements Planning) and MRPII (Manufacturing Resource Planning) – to systems focused on customer service.

ERP attempts to integrate all departments and functions across a company into a single computer system that can serve all those different departments' particular needs. Traditionally, each department from finance to human resource management to the warehouse has had its own computer system, each optimised for the particular ways that the department does its work. But ERP combines them all together into a single, integrated software program that runs off a single database so that the various departments can more easily share information and communicate with each other.

For example, when a customer places an order, that order would typically begin a mostly paper-based journey from in-basket to in-basket around the company, often being keyed and re-keyed into different departments' computer systems along the way. All that time in in-baskets causes delays and lost orders, and all the keying into different computer systems invites errors. Meanwhile, no one in the company truly knows what the status of the order is at any given point because there is no way for the finance department, for example, to get into the warehouse's computer system to see whether the item has been shipped. Well known ERP systems include SAP, J.D Edwards, Oracle and Peoplesoft.

EXTENDED ERP SYSTEMS

Traditional ERP is focused internally and does not easily extend beyond the boundaries of the organisation. The supply chain focus, on the other hand, extends to all supplier and customer linkages both within and outside the organisation. This conflict within ERP systems is now being addressed, on a technology level at least, through what has become known as extended ERP (ERP II according to Gartner Group). Gartner research group director explains ERP II as "The major difference being that ERP II involves collaborative commerce". (www.vnunet.com/NEWS/112618) . Essentially, this refers to the collaborative sharing of information and processes between the partners along the supply chain using the technological underpinnings of ERP. Extended enterprise software suites incorporate functionality that was previously limited to best-of-breed applications such as supply chain management, procurement and customer relationship management.

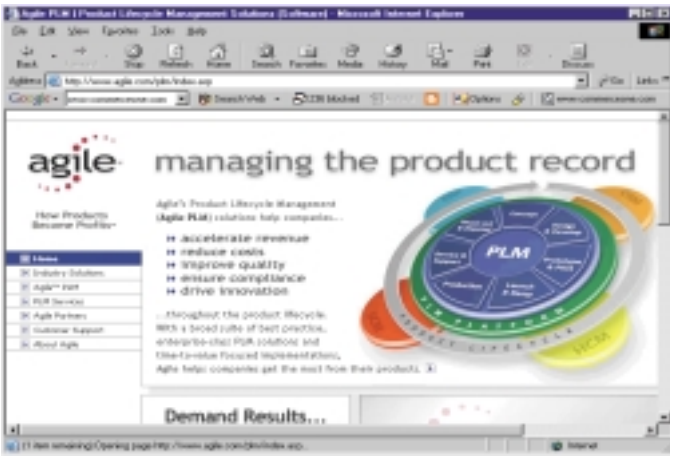
SUPPLY CHAIN SOFTWARE

Indeed, ERP vendors have been evolving and extending their product's capabilities to address areas such as supply chain management, supplier relationship management, customer relationship management, datamining and business intelligence, product lifecycle management, etc. This is evident in the MySap business suite offerings from the leading "traditional" ERP vendor, SAP (www.sap.com below). Roughly speaking, the extended functionality falls into either Supply Chain Planning or Supply Chain Execution categories.

As supply chains become more dynamic and operate in real time, the lines between planning and execution continue to blur. Real time information from execution systems give the capability to feed back into and allow the development of continually adjusting optimal plans. The ultimate realisation is perhaps technologies which lead to the adaptive or self healing supply chain – where a software engine monitors all the numerous events happening supply chain wide, identifies and escalates exceptions, sends notifications and reacts appropriately. See www.riverone.com (left) www.worldchain.com (see next page) www.agile.com (see next page).

WEB-BASED ERP

Internet technology has made it possible for companies to operate their ERP systems in real-time, even across a number of



sites. In this way, up-to-date information is always available on-screen. This information may be made available to the necessary parties through the use of intranets and extranets. Web-based ERP facilitates the sharing of information between companies and their suppliers, customers and other trading partners.

BEST-OF-BREED SOLUTIONS

A study published by the Meta Group in 1999 found that the average implementation time for an ERP solution was 21 months, and that the average total cost of ownership of such a system amounted to $15m. The study also found that it took two and a half years from project initiation to achieve 'any kind of quantifiable benefit from such a system'. Companies very often do not have time to build integrated infrastructures. In addition, in many cases departments within a company may have invested time and money in implementing and developing systems that are robust and ably fit their business processes.

'Middleware' companies have developed data translation that has enabled organisations integrate 'best-of-breed solutions'. Middleware is 'software that connects two otherwise separate applications' (Webopedia, 2001). In some cases applications are built on open standards, making the integration easy because all good middleware incorporates those standards. This technology has been facilitated in recent years by the advent of extensible markup language (XML). XML 'allows designers to create customised tags, and share documents between different platforms and computer languages' (Softworld, 2001).

The trend toward best-of-breed solutions has also decreased the anticipated role of ERP as a central repository of all business data for manufacturers (Berton Latamore, 2000).

ENTERPRISE APPLICATION INTEGRATION

Whichever application platform is chosen, Best-of-Breed or ERP, the need is not diminished for integration with diverse software and hardware platforms within and external to the organisation. This need has come more into focus in recent times with tighter IT budgets and the desire to gain more from existing IT investments. The XML technology along with other established technologies and protocols, has begun to be utilised as a platform for developing the next level of integration tools - Web Services and the broader Service-Oriented Architecture. Web Services detail the necessary technology and protocols to wrap around existing applications and treat them as purely services such as Warehouse Management or Customer Relationship Management or Legacy system. This then allows the service to be plugged into and interoperate with any other service in the enterprise and effectively the concept of plug-and-play for software is nearer to realisation. For examples www.iona.com

NEW LOGISTICAL CHALLENGES

All of the technological potential identified in this article presents opportunities for companies throughout the supply chain. The necessary IT is now available to enable a company to provide finished goods just-in-time for delivery, based on an individual unique order received from anywhere in the world; sourcing the optimum materials for the order, and the identification of the optimum means of shipping it to the customer.

The proliferation of sophisticated information technology solutions has led to IT investment decisions becoming a complex choice between (a) custom or standard solutions, and (b) point or enterprise solutions. Even more challenging is the realisation that most IT solutions are no longer likely to provide strategic advantage, but simply the business basics. The competitive advantage for companies will originate from developing creative information technology strategies and implementing them superbly. LS

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