

22 SMES IN THE VIRTUAL ENTERPRISE – LOGSME ENABLES IT SUPPORT

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Small and Medium Enterprises (SMEs) are moving in the direction of integrated supply chain systems. With the introduction of virtual enterprises, the SME has an opportunity to join forces with stronger and larger partnerships. Technologies are the current enablers, which allow integrated supply chain management between partners in the chain. However, current tools are often inappropriate for SME use. This paper describes the approach taken by the LOGSME¹ project in its development of an integrated toolset for smaller partners in the supply chain operating in a virtual enterprise environment.

INTRODUCTION

As a result of the global marketplace and the convergence of enabling information technology, businesses are been driven to securely create, manage and transfer data between partners in their supply chain. Sharing information between enterprises is leading to collaborative partnerships forming, allowing for design, manufacturing

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and product support services to become accessible over shared global computer networks.

Responding to new market conditions and emerging technologies, the organisational structures of enterprises are becoming increasingly distributed. New information technologies enable and support the management of distributed structures, (Zimmermann, 1997). The new technologies include, distributed database networks, the World Wide Web, object oriented data tools and maturing enterprise planning software. These technologies enable creating, managing, and using integrated information within Virtual Enterprise (VE) partnerships. Success in several industrial sectors stimulates the interest within others.

The aim of this paper is not to explain the characteristics of a VE but it will explain the architecture developed by the LOGSME consortium² in their development of integrated software solutions for small and medium sized organisations, wishing to participate in a VE partnership. SMEs are facing several challenges, see Figure 1. Often, they lack the resources to apply the same software solutions available to their larger partners. Having co-operation between enterprises is giving SMEs access to skills and knowledge. Access to specialised expertise is of great benefit and access to regional and global markets gives the SME a competitive edge. In the virtual enterprise each partner supplies what it can do best - whether it's a product or a service.

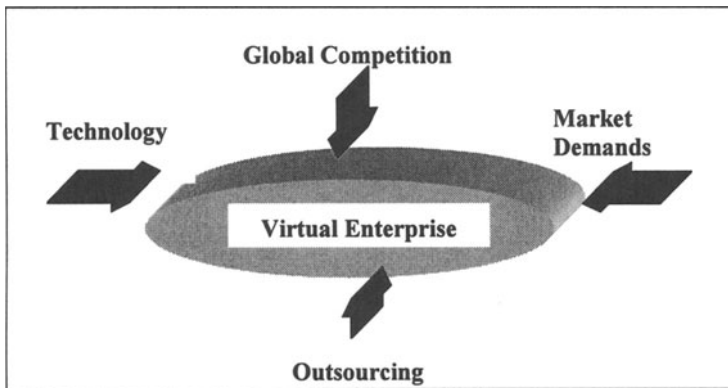


Figure 1- Challenges facing SMEs

LOGSME AND THE VIRTUAL ENTERPRISE

Despite the huge array of research that is going on throughout the world on virtual enterprises, the real challenge facing the business world is not so much the technology available for creating the virtual environments but the challenge in establishing effective business models and architectures for these virtual co-operations. LOGSME is creating an open platform and the appropriate protocols, mechanisms and tools to support virtual enterprise environments in the food supply

² The LOGSME Consortium consists of the Kewill Group, Alfamicro, Grupo Delgado, BSM Ireland Ltd., CIMRU, SIP, TUE, Green Isle Foods, Pleroma Ltd., and Pallas Foods Ltd.

chain. The project is focused on SMEs in order to provide them with easy, reliable and inexpensive means to operate within several food supply chains.

The design of the LOGSME architecture required a clear vision of the virtual enterprise concepts applied to the food supply chain. These include:

- Identification of the relevant business processes and understanding the nature, the semantics and the structure of the business transactions and the supporting message data.
- Identification of the information that needs to be communicated between partners in a virtual enterprise, with a focus on integration, flexibility and evaluation of the SME.
- Identification of adequate harmonisation mechanisms to keep LOGSME messages templates unchanged along the food supply chain.
- The design and development of a software infrastructure to provide an environment for this data and information to be exchanged, shared and managed in the virtual enterprise network, unlike the present integration mechanisms which are typically closed and proprietary, (Technical Annex 1998).
- Provision of a flexible solution able to adapt to varying levels of IT use and integration within participating SMEs.

Wortmann (1998) points out, "The user community for ERP software will expect close co-operation between components from different vendors." Further, he states, "this requirement will also be enforced by co-operation with supply chains or virtual organisations".

LOGSME AND ITS APPROACH

The last three years have brought to Europe very significant changes in the way business is undertaken in the food supply chain: ECR, (Efficient Consumer Response) VMI, (Vendor Management Inventory) CFAR, (Collaborative Forecasting And Replenishment) are today becoming well established business practices which have been adopted by some of the major retail and manufacturing companies. They are already benefitting from reduced costs across the supply chain and increased market growth and market share. However, the SMEs are not benefitting from the potential 40 billion ECUs savings estimated for the European market. In order to demonstrate to SMEs the benefits they can gain from these new business practices and how they can implement them, it is critical to have a deep understanding of the business processes involved and the business changes required to provide effective IT solutions, together with the organisation and the management environment, (Technical Annex, 1998).

This study has been, and still is, a major task undertaken by the LOGSME consortium, one where the consultants and the industrial users work together in different teams (vision, technical, exploitation). Many brainstormings, critical analysis of best practice in European and American reports, extensive field research, conferences, other technical and scientific gatherings have all been fed into the LOGSME project.

The LOGSME consortium has produced a business technical architecture and specification of software and communications tool requirements to provide SMEs with the capability of integration into virtual enterprise solutions.

LOGSME Software Classification

As illustrated in Figure 2 most Enterprise Resource Planning (ERP) vendors have been moving their products from the lower left quadrant to the upper right, or plan to do so soon. LOGSME wishes to make these components affordable and useable for smaller firms. LOGSME has identified the need for an *integrated solution for supply chain and logistics activities* that is quick to implement and affordable to the SME. There is a need for breaking up monolithic applications into more granular components. Figure 2 illustrates the As-is situation and the envisioned To-be situation. According to Tim Harmon, senior programme director at the Meta Group, independent analysts, “The Fortune 500 market is limited and smaller companies can’t afford to spend \$50m on implementation”, (Taylor, 1998). Hence the need for relatively cheap software solutions to suit the needs of the SME. According to Mr. David Duffield founder of PeopleSoft “Software costs are trivial compared to implementation costs”, suggesting that archrival SAP’s software will generate \$7 to \$8 in consulting costs for every \$1 on SAP software. Figures for Peoplesoft applications are around \$3 in consulting costs for every \$1 spent on software, (Wheelwright, G., 1998). With the growing shortage of quality IT personnel to undertake ERP implementation projects, the Gartner Group predicts that the average cost for ERP implementers will rise 30 percent, (Taylor, 1998).

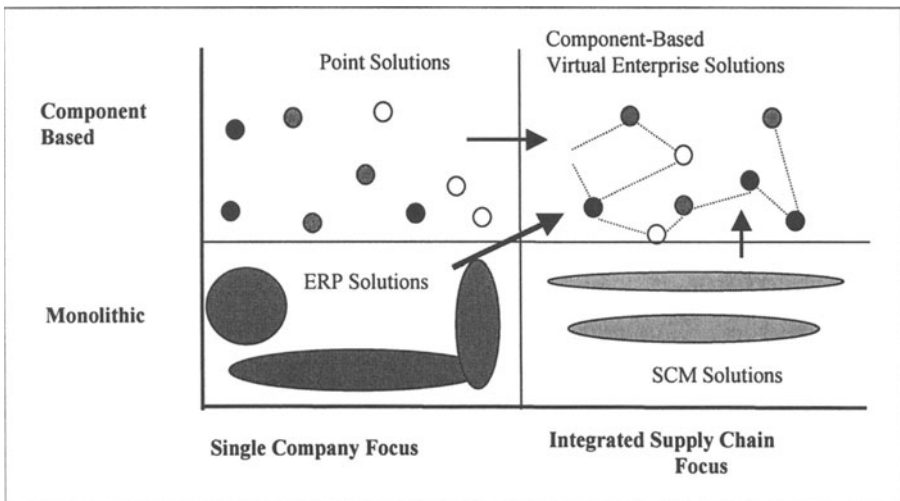


Figure 2 - Classification of ERP software (Internal Baan Company Figure, 1998)

THE LOGSME SOFTWARE MODULES

The LOGSME software modules, see Figure 3, permit standard software modules to cater for the extra information that will be available through use of the LOGSME Architecture.

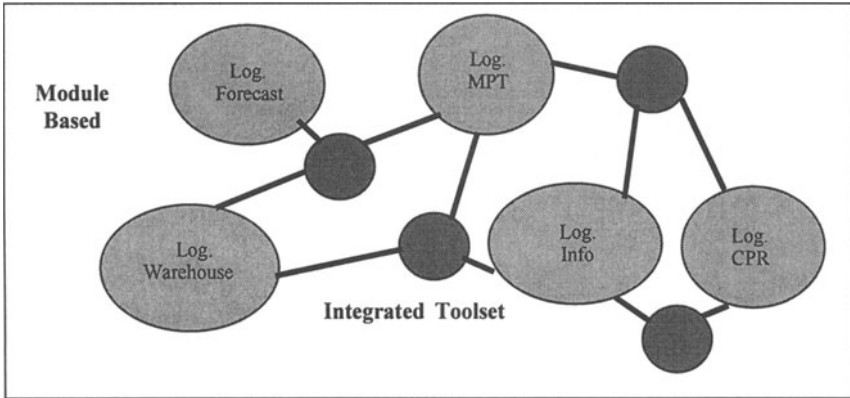


Figure 3 - Architecture of LOGSME Tools

The LOGSME modules are required because low cost standard ERP software which are sold to SMEs have been developed primarily with a manufacturing focus rather than a supply chain focus. This means that even if information from other SMEs in the supply chain could be made available through some form of standard messaging system, such as that described in this document, existing ERP systems would in many cases not be able to make use of it. However with the increasing focus on supply chain management (SCM), ERP vendors are recognising the need to make SCM an important part of their applications

The LOGSME consortium is delivering software modules communicating seamlessly without human intervention. Data is being shared and executed throughout the software modules. Although a uniform user interface is standard for a monolithic ERP system, the LOGSME consortium are not addressing the issues involved by the creation of a uniform user interface, but they are ensuring the availability of information throughout all the modules.

The prototype system used for end user testing, is able to support several possible scenarios within the context of ECR. Independent companies within a supply chain can apply VMI and Continuous Product Replenishment (CPR) in various ways, using different business processes for the different applications of these business concepts. The prototype system is enabling several variants to be used in different companies, each with their respective needs. There are multiple levels of technical integration of independent software modules. One of the main challenges of the LOGSME modules (from a software technical perspective) is the ability to integrate or even inter-operate seamlessly. This implies data harmonisation across the supply chain and the use of a communications tool (LOG.INFO) which provides the required connectivity to achieve the virtual enterprise. The following modules, LOG.CPR, LOG.MPT, LOG.Forecast, LOG. Info and LOG.Warehouse are briefly described below:

LOG.CPR provides visibility of stock levels and replenishment orders at the stocking points of the supplier, distributor and retailer in a supply chain. This allows product to be replenishment with a minimum manual intervention as the replenishment is based on pre-set rules. Information is transferred electronically from one trading partner to another. The information transferred can then be processed automatically. **LOG.MPT** provides the basic functionality for planning

and operations in the food industry, comprising modules to support: Recipes, inventory, billing sales and orders. LOGSME manufacturing planning tools (LOG.MPT) are MICROSS ERP³ (PC Networked based ERP system) modules enhanced to support the virtual enterprise. **LOG.Forecast** has a major aim of allowing SMEs to use advanced forecasting techniques without requiring specialist staff with a knowledge of statistics. LOG.Forecast uses neural nets, which can be trained automatically from existing data. This protects non-specialist staff from forecasting problems associated with market unpredictability and sparse data and enables clarity of interpretation of results. LOG.Forecast allows co-operative forecasting by allowing the results of forecasts by trading partners to be incorporated. **LOG.Warehouse** aims to support two applications, i.e. the actual warehouse application and the virtual warehouse application. The former application will provide transaction support for a logical warehouse. This application is scoped to support the transaction flow that results from physical movements within the warehouse initiated through orders that are generated by other (external) modules. The virtual warehouse application will allow the visibility of on-hand inventory figures of logistic network stocks that do not necessarily belong to the same legal enterprises. Though the applications are to work independently, they will support each other's information requirements. **LOG.INFO** module ensures local and remote interconnectivity between LOGSME modules and legacy systems. The project focuses on the communications between the trading partners in the supply chain. The base functionality is provided by a standard ERP system or other legacy systems.

Another module being developed, as an independent part of the LOGSME toolset is **LOG.Simulator**. This tool will demonstrate the mechanisms by which SMEs can benefit through integration across the supply chain. As such it will be used as a sales or consulting tool prior to the implementation of the LOGSME architecture in a company. The Log.Simulator will act as a training and modelling tool both for students and SMEs. Log.Simulator has led to the development of an Internet based Extended Enterprise Supply Chain Management Simulator (IESS) tool. This provides a simulated environment to support role playing (such as on-line ordering and inventory retrieving), of virtual enterprise chain partners over the Internet.

LOGSME ARCHITECTURE

LOGSME architecture includes an open platform and the adequate IT protocols and mechanisms to support the virtual enterprises in the food supply chain. The architecture is based on new emerging standards such as DCOMM and CORBA, and advanced communication technologies supporting co-operative information management and distributed decision-making. A key feature of the LOGSME Architecture is that SMEs can use a variety of mechanisms including E-mail and the

³ Further information regarding the MICROSS product can be found at http://www.kewill.com/kewill_erp.htm

World Wide Web to share information. LOG.INFO will allow messages to be sent and received using protocols such as FTP (File Transfer), HTTP (Web based communication) and SMTP (E-mail). The LOGSME reference model and the general architecture presented in Figure 4 support the virtual enterprise environment existing in the food supply chain. The architecture takes into account the heterogeneity of the infrastructure existing at each node as well as the levels of local autonomy and privacy, and allows the connection to the legacy systems.

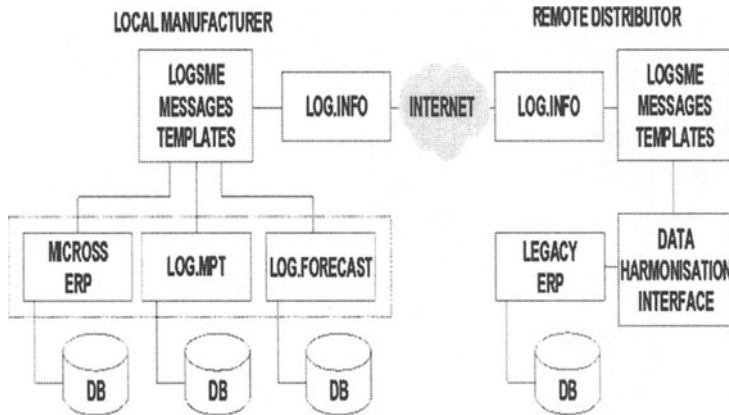


Figure 4 - LOGSME Architecture

LOG.INFO Architecture

The function of the LOG.INFO module is to provide data both internally within an organisation, and externally to virtual enterprise partners. It will be possible for the same data, or subsets of the same data, to be provided in multiple formats enabling it to be used by both humans and other systems software. Figure 5 illustrates an outline of the LOG.INFO architecture and shows how it will function in respect to the rest of the LOGSME toolset and other software systems.

Internal to the organisation, data will be provided in response to data requests, which the system will receive from other applications, primarily LOGSME tools. These requests may be for data from within a local system (e.g. a manufacturing system) or may require requests to be transmitted to external systems to be satisfied. The data collected will then be made available to the applications as a database view such as an ACCESS record set.

External requests will be received via e-mail or as HTTP requests over the INTERNET. Whilst the design of the system will allow expansion to receive requests via other routes, these are the only routes we propose to produce as part of the LOGSME project. Following security checks, the necessary data will be assembled and formatted for return to whomever requested it. The format of the information returned via an external request will be configurable. It will be possible to define different formats depending on the request made, the partner making the request and the return route to be used. **This is key to allowing SMEs to participate in multiple Virtual Enterprise chains.**

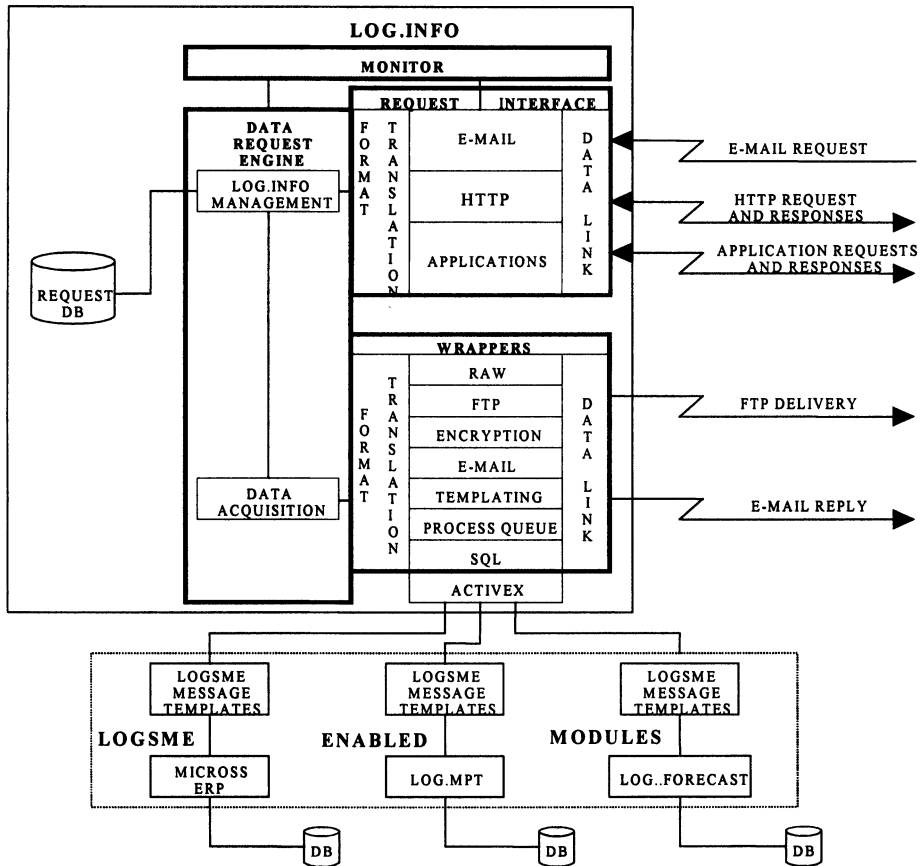


Figure 5 - LOG.INFO Architecture

The return route is also to be configurable allowing the response to be returned via a different route to that by which the request was received. For example, a request for a customer price could be received by an HTTP request. Notification that the request had been accepted could be returned immediately and the actual response could be made via e-mail at some later time.

LOG.INFO will not be one single executable, but it will be a number of executables and Dynamic Link Libraries (DLLs). These units together will provide the LOG.INFO information system on which the other LOGSME tools will rely. In addition to its original aim of making information available to 'Trading Partners', it will provide an installed site with the ability to make suitable parts of its information generally available.

As mentioned earlier it is envisaged that the consumers of information provided to external requests will be both human and other application software. This will allow the tool to be of benefit within the virtual enterprise even when only one member has the LOG.INFO tool installed.

LOGSME TESTING APPROACH

The approach taken to testing the LOGSME software modules within the project is summarised at a high level as follows:

- A dual approach was taken to testing and evaluating the prototype software of the LOGSME toolset. This comprises of product testing of the LOGSME Toolset and process testing, to run concurrently.
- Product testing assessed product functionality and product integration. in line with the user requirements defined earlier in the project.
- Process testing demonstrated the enhanced Supply Chain performance facilitated by the LOGSME Toolset to the SME community for a number of test supply chain scenarios.
- Each scenario is based on real supply chain transactions carried out by the LOGSME end users and each end user used real data.

The testing road map is illustrated in Figure 6, (Deliverable D33, 1998).

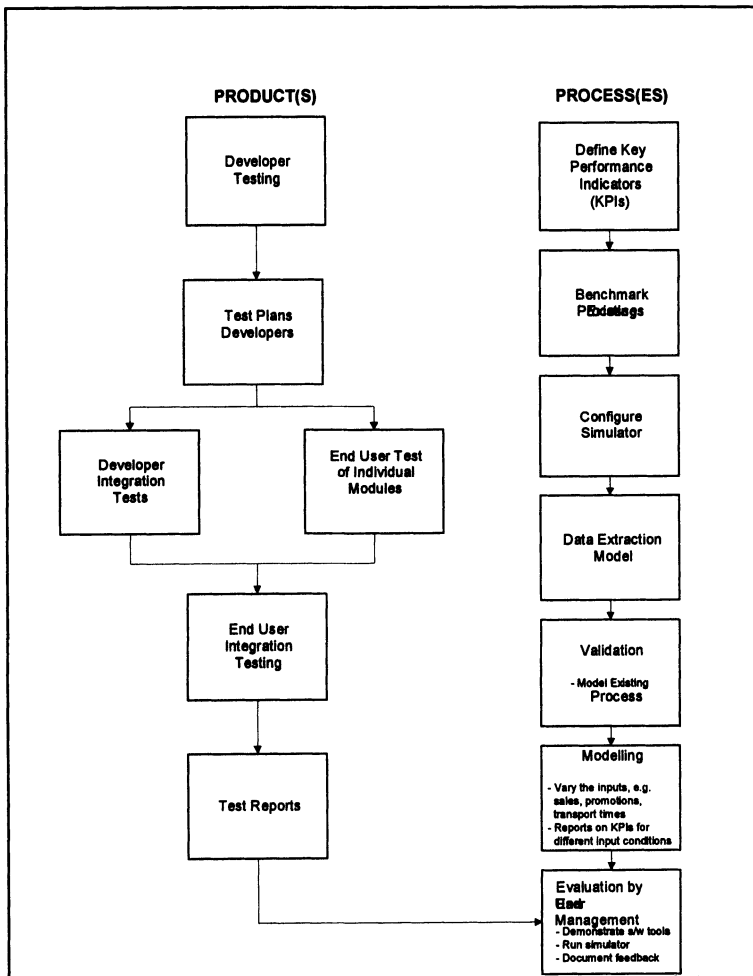


Figure 6 - Testing Road Map

CONCLUSION

During the first industrial revolution social organisations changed dramatically from closely-knit rural communities to a core of structured and independent urban enterprises. Network of enterprises began joining together and formed a united front. Throughout the 1980's and 90's these enterprises became more global and collaborative and this transition has been encouraged by fiercer competition, the rapid introduction of information processing enterprises and the faster pace of the world in general. This transformation leading into the year 2000 is made possible by the numerous information and communication technologies and applications, which are making "virtual" linkages possible across widely, separated organisations.

The infrastructure provided by the Internet, World Wide Web and other high speed digital networks facilitates virtual enterprises. Technology is only an enabler, however. The challenge facing organisations who want to form VE partnerships is not one of building the actual partnership but one of actually using it to its potential. LOGSME through its development work brings the opportunities of such co-operation to smaller enterprises, thus leading to the improvement of supply chain integration. While our focus is the food industry, the results can be applied to many other sectors.

Finally, the approach and benefits of LOGSME will be disseminated throughout the European community.

ACKNOWLEDGEMENTS

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