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SUPPLY CHAIN MANAGEMENT
SOFTWARE PROVIDERS

Independent Study Project

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Advisor: Prof. Wil Mitchell

This is an excellent study. Eugenia has prepared a thoughtful overview of the emerging market for supply chain management software, along with a careful analysis of the strengths and weaknesses of the key competitors. The discussion of critical success factors, especially the need for organizational change in support of the SW systems, is particularly apt.

Grade: Excellent
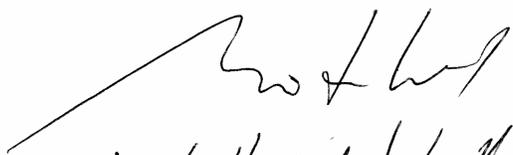
Will Mitchell
Associate Professor of Corporate Strategy & International Business   May 2, 1996

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Abstract

This study contains the methodology, analysis, and findings of Eugenia Copeland, MBAII independent study of the supply chain management software industry. I have research the supply chain management software industry utilizing four major software providers an a sampling - Manugistics Inc., Numetrix., I2 Technologies and American Software. My methodology includes an industry analysis and case analyses. My findings are supported with data, scholarly research and doctrines from industry researchers and analysts. My findings include:

- Supply chain management software industry is a thriving industry. Many of the products that used to be complementary are now competitive; Numetrix, originally known as a scheduling vendor, is moving up the supply chain to provide planning capabilities, and Manugistics has augmented its planning tools with scheduling modules.

- The industry move toward integration is a direct response to customers' integrated environments.

- Supply chain management software market still in early adopter stage were readiness to adopt completely integrated solutions vary.

- Success of supply chain management system depends on an organization's people, polices, and practices

These finding has lead to the identification of opportunities and threats facing the supply chain software providers:

- Market exist for inexpensive integrate solutions for the smaller organization

- Internet/Intranet may emerge as the inexpensive technological alternative

- Potential emergence of off-the-self integrated solutions

I. Industry Overview

Competition is intensifying, complexity is increasing and companies are operating at very low margins -- typically ranging from 2-10%. These pressures are driving the demand for supply chain management and planning solutions in these highly logistical industries. Supply chain management entails complex interactions to ensure the flow of products from the raw material stage through manufacturing and distribution channels to delivery to customers as finished good.

By the year 2000 it will be essentially impossible, at least in certain industries, to compete at any level as an isolated entity. A more likely scenario will be a constellation of companies - for example, a network of kitchen appliance suppliers, distributors, retailers, manufactures and a variety of other support providers all tightly aligned and tightly coordinated - competing against another network of companies by focusing their collective energy on satisfying customers. In this new world of competition the battle is now supply chain versus supply chain. At the same time, some levels of supply will be common across their competing supply chains. And, perhaps most complicated of all, some companies will supply competing customers. This practice is now becoming common is the automotive industry.

The early adopters of EDI technology developed proprietary systems and protocols in an effort to meet their specific needs and ensure security. It is becoming clear that the imposition of proprietary technologies in a world of shifting alliances and rapidly forming and dissolving relationships requires universal standards and open architectures. Supply

chain information requirements have transcended the capabilities of traditional EDI. Managers need actionable information to make crucial time-sensitive decisions. Supply chain management software providers are recognizing this business organizational and technological transformation.

As a result, there is a rapid deployment of integrated supply chain management software packages from providers such as, Manugistics, Numetrix, American Software and I2 Technologies, to complement the new client-server enterprise management applications. Leading companies are attempting to measure the cash cycle time through the entire supply chain and this requires a clear understanding of the value chain. Many companies that have achieved this understanding are reengineering for efficient growth and service, as opposed to cutting costs and capability.

These companies derives revenues from licensing its software and providing product support and related services including implementation, education, training, systems consulting, business operations consulting, product modification, business process reengineering, and change management consulting. Most customers are also large companies, paying license fees of between $250,000 and $900,000.

II. Industry Analysis

Industry Growth

Supply Chain Management is a huge industry. In 1994 U.S. companies spent $ 670 billion to store, sort and transport goods.[1] Most analysts place the market for supply chain software at more than $ 1 billion while others put the potential at about $ 4 billion. Yet, for now, the market remains largely fragmented. There is no such thing as a single integrated supply chain management system.

A key driving factor associated with the growth in the supply chain market is the reality of shrinking cycle times, which makes forecast accuracy more critical. Manufacturers are taking on the role that wholesale distributors used to play and they are hasty putting together strategies and programs to satisfy that. Additionally, inventory which was once the pride of the manufacturer, is now an evil. Business reengineering methodologies and, most recently, supply-chain management software tools, has arisen to correct inventory leveling issues. Inventory management is often key as businesses reengineer their process today.

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[1] According to The Yankee Group, an manufacturing research firm in Boston.

Diversity of Competitors

Table 1.   **Competitive industries**

	Pharmaceutical	Health Care	Chemical	High-Tech	Consumer goods	Automotive
American	S	D			S	
I2		N	S	D	N	N
Manugistics	N		N	N	D	S
Numetrix			N		S	S

* as of December, 1995

D - Dominant Player; N - New Entry; S - Strong Competitor

American Software, was a maker of supply chain management software for IBM mainframe and midrange computers since 1987. In 1994 American launched its first client/server Supply Chain Management application for business users. American experienced a decline in service fee revenues and a slow product development cycle that has hurt sales and earnings over the past 2 years. American Software reported an $6.7 million dollar loss in 1995 on revenues of $79.5 million compared to an $6.6 million dollar loss in 1994. By 1995, American also reduced its workforce from 853 to 606 employees. The company has also reported a shift in U.S. vs. non-U.S. revenue, with a 22% increase in sales outside the U.S. and a 14% decrease in domestic sales.

I2 Technologies, is dedicated to providing its customers with the highest level of business value at the lowest possible cost. Founded in 1988, I2 is the leading provider of intelligent planning and scheduling software for global supply chain management with more than 200 site installations at more than 60 client corporations. Its software provides support for planning and scheduling functions across both inter-enterprise and intra-enterprise supply chains. The firm is headquarters in Irving, Texas, and maintains offices in Atlanta, Boston,

Chicago, Philadelphia, Pittsburgh, Rochelle Park, NJ, San Francisco, Toronto, Mexico City, Brussels, Copenhagen, London, Munich, Melbourne, Singapore, and Tokyo

Numetrix, solutions provide a full range of software modules specifically designed to support the strategic, tactical, master and detail planning levels of the supply chain, from demand management and distribution, to manufacturing and sourcing. In 1994 Numetrix had 200 employees and was operating at $29 million in sales. Numetrix was founder in 1977 and now has offices in Toronto, Chicago, Atlanta, Santa Clara, Norwalk, Brussels, Manchester, Wiesbaden, Utrecht and Paris.

Manugistics Group, Inc., ten years old, is the leading provider of software and services for supply chain management with a 40% market share. Manugistics got a jump on most of its competitors by being a early convert to client-server computing. In 1995, revenues grew by 30% to $49.4 million, of which 84% came from supply chain management and net income was $3.2 million, an increase of 50% over 1994. Client/server revenues grew 129% and accounted for over 58% of Manugistics' revenue. At the end of fiscal year 1995 Manugistics has less than 400 staff and direct operations in only four countries the US, UK, Germany and France. Manugistics is currently the only provider of a set of business operations planning software products that addresses all four key areas of supply chain management: demand planning, distribution planning, manufacturing planning and transportation planning.

Product Difference

Client-server software is one of the fastest-growing segments of the industry. Client-server networks, which are displacing mainframes and minicomputers at many companies, divide computing tasks between desktop personal computer - called the "client" - and one or more network "servers," which act as data repositories. The four top supply change management software providers featured all operate in a client-server environment. Manugistics early conversion to the client-server environment positioned them as the industry innovator. To the same extent, American's late client-server conversion from the mini-computer environment was of significant cost to the company. This technological transformation to a client-server architecture provided companies with a more economical platform, was a key factor in creating an attractive market for supply chain software.

Supply chain software is often confused with distribution or manufacturing software, which are transactional programs. Unlike supply chain software, transactional programs only track data without providing analysis tools that look at the whole supply process and help users make forecast. Each of the providers featured in this study offer supply chain software that can operate as stand-alone modules.

American Software has a suite of modules that competes principally in areas of forecasting and inventory management, purchasing and materials control and order processing and receivable control; additionally Americans' product provides decision-making support in areas such as demand forecasting, inventory management, procurement, manufacturing and financial management. American Software reported that Supply Chain

Planning represented its top revenue-producing product in 1994. 45% of Americans' revenue is from services compared to 26% related to license fees.

I2 Technologies' Rhythm is a tool that encompasses the complete demand fulfillment cycle, from sourcing and procurement of materials through manufacturing, transportation, and distribution to customers. By considering all constraints in the supply chain, Rhythms' Forecast Planner will generate an accurate forecast that is feasible for manufacturing, distribution, and transportation. It will also alert planners if more material, capacity, or transportation resources are available than the forecast allocates, and indicates the level of sales needed to achieve full resource utilization.

Manugistics' Manugistics4 is a comprehensive suite of solutions for demand, supply, manufacturing and transportation planning, which represents Manugistics' significant investment in new functionality for supply chain management. Constrained Production Planning (CPP) is a key product of Manugistics4. CPP considers factors such as manufacturing capacity, forecast product demand, production calendars, and inventory carrying cost designed to tighten the integration between manufacturing and distribution decision making. With the flexibility and proactive decision-making that CPP provides, clients will have the ability to optimize their use of manufacturing resources, lower overall production cost, and increase customer service by responding quickly to changes in demand. Manugistics' Software business generates 39% of revenues compare to 45% for their supply chain management services.

Switching Cost

Considering there is no one that supplies a complete package, competing supply chain management software is generally compatible with one another. Most users piece together complete systems from several vendors' products. Fortunately, most larger vendors will assemble a system for them. However a significant amount of a products total cost is the cost of implementation, consultant and training.

Threat of Entry

Constraint based analysis programs require very sophisticated and complex mathematical operations. The supply chain software providers find their biggest threat is posed by the traditional suppliers of business management software. All are now keen to augment their offerings with supply chain management. However, few of these companies are building products themselves and a number of key players are opting to partner with a supply chain software provider. Consultant firms are also a well positioned group to make transitions into providing software solutions, however due to the complexity of these systems, the time to develop comparable software is 2 to 4 years. As a result, consultant firms are partnering with the software providers on the systems implementation.

III. Recent Trends

Alliances and Acquisition

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┌─────────────┐   ┌─────────────┐   ┌─────────────┐                      P
│ Front-end   │   │ Enterprise  │   │ Integrated  │ ⇐                     r
│ GUI         │   │ applications│   │ Supply      │   Consulting          o
│ applications│   │ vendors     │   │ Chain       │   Firms               c
│ & report    │   │             │   │ Software    │                       e
│ generators  │   │ (SAP,       │   │             │                       s
│             │   │ Oracle, etc)│   │             │ ⇐                     s
│             │   │             │   │             │   Software            R
│             │   │             │   │             │   Providers           e
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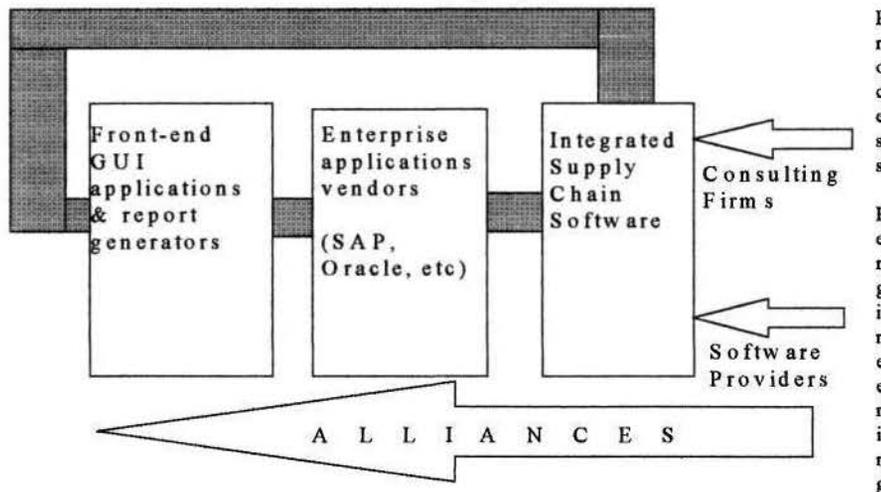
As companies increasingly recognize the importance of reengineering their supply chains, they want the best applications and technology available to support that process. Recognizing that there is no all-in-one solution, a definite trend in the software industry is to design products that interoperate more easily with other supply chain applications. Interoperability and expanded openness increases flexibility and secures customers' investments over time. Integration of products by these companies will provide clients with more complete enterprise-wide planning, decision support, and execution capabilities, enabling users to match demand and distribution requirements to available resources throughout the supply chain.

This is the strategy of Manugistics, who claims to have became the leader in supply chain management software and services by listening to its customers and providing flexible and comprehensive solutions through alliances and acquisitions.

Since supply chain management revenues continue to lead the growth of businesses competing in this industry many providers find themselves faced with the challenge of keep up with demand, Manugistics' supply chain management business increased more than 51% over the same period last year. To further position themselves to take advantage of the rapidly growing market for these products, companies are continuing to expand our internal resources and build alliances with leading consulting firms and complementary software providers. Manugistics' solution is to emulate the highly successful strategy of SAP. The company is looking to build closer ties with the big consultancy groups (relationships already exist with Price Waterhouse, Ernst & Young and Andersen Consulting) and to push more of the implementation and service burden out to third-parties. Manugistics considers itself a product company, as such, it sees its future in software not in services. Manugistics is intending for the various consultancies to take on a substantial part of the implementation process. Considering that Manugistics' service revenues are 45% of their supply chain revenue, this strategy will means service revenues will drop off but the company believes "the shortfall will more than be recouped through increased software sales."[2]

Supply chain vendors also are teaming up with enterprise applications vendors to give users ready-made links between manufacturing systems such as SAP AG's R/3 and supply chain products. SAP sought out an alliance with Numetrix for two very important

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[2] Mary Lou Fox, senior vice president of professional services, Manugistics.

reasons: their large number of mutual clients and Numetrix's advanced optimizing functionality, which SAP did not have in their production application.

Further, alliances are being forged as a distribution strategy. Baan's Alliances with Hewlett-Packard helped Baan gain access to the U.S. market, Manugistics established distribution alliances in other countries to expand its reach.

These alliance offers a total business solution for a major strategic challenge facing business today -- identifying and communicating critical information to the right people in time to make the right decisions. Customers are the clear winners, because the process of integrating the supply chain is simplified. However, an essential skill that companies need is the ability to enter and exit alliances that meet the needs of the market and provide high value, but that are also capable of realigning for the next generation of products.

Note: See Exhibit A for most recent alliance and acquisition with the four featured supply chain software providers.

Internet (Intranet)

American Software has integrated the capabilities of its supply chain management solutions with the Internet to enable companies to easily and cost effectively manage their supply chain environments. Using the American Software approach, companies can quickly and easily link department, customers and suppliers to create interactive information sharing to reduce cycle time and synchronize production to demand.

The Internet - and intranet- enable solution permits the simultaneous sharing of supply chain information. Data can be incorporated from the field, distributors and other resources using the Internet in real-time. The information can then be automatically assimilated into comprehensive, accurate forecasts. The final results can be viewed and adjusted by all levels of the supply chain via the Internet before the data is integrated with manufacturing or purchasing systems.

The benefits of such a solution include the ability for organizations to integrate as virtual organizations, regardless of differing technology architectures. Sophisticated software may also be inexpensively deployed without concerns about version control or high network costs.

IV. Supplier Chain Value Proposition

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Forecasting   Warehouse Management   Manufacturing   Transportation
              Transportation          Scheduling      Customer Delivery

Demand   >    Supplier  >  Warehousing >  Manufacturing >  Distribution >  Customer >
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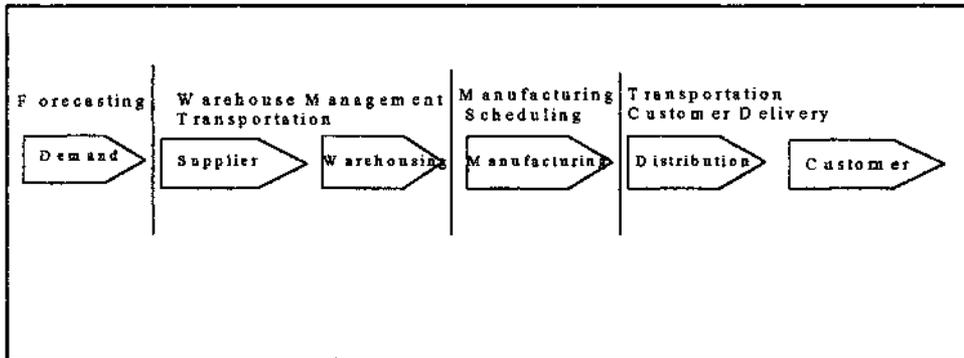
Demand Forecasting

The strategic role of inventory is to buffer production processes against the uncertainty of demand. But companies can no longer afford that luxury. The pressures of time-based competition, product proliferation, dynamically changing markets and escalating service requirements have raised the stakes. Today the cost of inventory obsolescence is pushing companies to work together to remove inventory from the supply chain.

Companies are now recognizing that their suppliers are part of integrated supply chains that allow their products to compete effectively, and that they must work closely with their suppliers to lower inventories and streamline the overall process. American Software forecasting module has the main advantages of reducing forecast errors at the stage of assessing supply and demand for products and a lower investment in inventory as a result of more accurate forecasting capabilities.

Demand forecasting software is catching on with suppliers of groceries, drugs, electronics and other consumer goods. The impetus can be traced to retailers like Wal-Mart Stores

Inc., which are demanding that manufacturers deliver the right amount of goods just when it's needed. Manugistics' Demand Planning Extended Edition, gives users a new level of accuracy in forecasting customer demand to make the right decisions at the start of the supply chain, in order to shorten product lifecycles, reduce inventories and save money. For example, BMW AG in Germany has realized millions of dollars in cost savings and improved their forecast accuracy by as much as 30 percent in predicting consumer demand for as many as 120,000 variable options in its automobiles.

Manufacturing Scheduling

A greatest need for integrated supply chain management solutions has been identified as in the manufacturing scheduling market. Manufacturing Scheduling allow for material release and scheduling decisions that will minize the impact on resource constraints (material, capacity of machines, manpower, tool, etc.). Manufacturing Scheduling has a direct effect on cost, inventory, resource utilization and delivery performance.

Warehouse Management

The warehouse is another one of the operational areas in which distributors can achieve significant cost savings through computerization and automation. Software marketers say they can reduce distributors' warehousing costs from 10 to 40 percent depending on the industry. The features and capabilities of these systems are diverse, but inventory control seems to be the linchpin in each of them. Most warehouse management system marketers claim their product offers from 99 to 100 percent inventory accuracy.

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Transportation

Transportation management systems are the hottest focus in the marketplace because of the large amount of money spent on transportation, It has been estimated that 40% to 50% of the cost of distribution is transportation[3]. Through better carrier selection, better rating and routing, there are tremendous savings. Because of the plethora of different modes one might use and the various carriers, increasing the possible different solutions. It's not uncommon to see a 10% to 30% savings in annual transportation management costs.[4]

In a survey conducted by a management consultant firm specializing in supply chain management revealed that warehouse management was the most important aspect of computers in logistics, closely followed by demand-sales forecasting and order management. However, sales of software does not appear to match this opinion. The most dominant trend is the move toward fully integrated systems. Nevertheless, in tomorrow's world, functionality will not be the differentiator. The differentiator will be acceptance and ease of use. When I buy a car, I can drive it immediately. When I buy software, it shouldn't take me years before I can use it.

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[3] Larry Ferrere, director of industry marketing for JD Edwards, providers of integrated supply chain software
[4] Larry Ferrere, director of industry marketing for JD Edwards

V. Critical Success Factors

In order for supply chain mangers to claim that the supply chain functions as a strategic force, they must have tangible, quantitative ways of relating its performance to that of the larger organization it servers. The following factors have been identified as being critical for the complete utilization of supply chain management software.

- Partnerships between buyers and suppliers. Suppliers are no longer just people you negotiate prices with, according to executives at the Supply Chain Management colloquium. They are becoming company extensions -- people with whom you plan the future and share information and technology

- Relating internal supply chain performance measures to one another and linking them to corporate objective and competitive advantage. Manufacturers and distributors must find ways to constantly add value to the customers' operations through cycle time reduction, inventory improvements, product innovations, and enhancements to the overall procurement process.

- Evaluating the performance of the supply chain and those within the chain some measurement (metrics). Supply chains require metrics to measure the economic endurance of the chain. Managers must understand what their chain's customers require. Good metrics ensure that decisions are made locally to improve local performance actually improve the overall performance of the supply chain from the customer's perspective.

- Integration of changes in processes, structure and people behavior. As the supply chains become both simpler - in terms of numbers of competing suppliers - and more

VI. Tradeoff Considerations

In general, supply chain managers must determine the most effective material stocking levels for all buffers, the capacity levels for each factory, the utilization level for each machine/resource and the most appropriate customer service levels. The supply chain managers must determine the uncertainty in the chain and its effect. The most effective supply chain software must address the competitive issues faced by the organization, and the decision making issues faced by the supply chain managers.

VII. Measurable Benefits

According to analysts, the real potential of supply chain software won't be unlocked until companies rethink the way they are structured. A supply chain philosophy is a paradigm shift on how people actually work within a company. Streamlining a company may force staff and equipment to be moved around. Supply chain software can gives companies the data that will tell them which links in a supply chain are inefficient. It may help them see that certain links aren't even needed.

As an example, Day-Timers Inc., used to take days to produce a packing slip after receiving an order. With supply chain management software, an order can be sent at once from the sales office to the warehouse via computer, and the packing slip can be produced automatically. Significantly reducing the order fulfillment cycle time while simultaneously increasing customer service.

Most all supply chain demand software provides management with the necessary information to make forecasting solutions that will result in increased productivity, reduced costs, and better inventory management. However to optimize the benefit, an integrated supply chain solution is necessary.

The drawbacks of coupling manufacturing to other information systems is that it increases the number of people who can make an impact of the manufacturing operation. With separate systems, fewer decisions are necessary since there isn't the flexibility to adjust manufacturing at many stages. However, the real benefit is the information that would otherwise never get communicated. As such, the question become, do you have the management talent to use of abuse a completely integrated supply chain system.

VIII. Evaluation of Software Congruency to Supply Chain Measurables

Table 2 outlines some of the ways to reduce or avoid uncertainty in the supply chain. Changes to products and process will stimulate reductions in the uncertainties present in each link of the supply chain. The bolded/italicized items on the improved supply chain performance check list represent the scope of supply chain management software currently on the market.

Table 2.

Actions to Improve Supply Chain Performance[5]		
	Product	**Process**
Supplier Performance	• Use common components and subassemblies in many product • Follow industry standards to increase part availability • *Share information with strategic partners*	• Reward good performance • *Measure transportation performance separately* • Subcontract inbound freight handling • Source locally to shorten lead times • *Review stocks more frequently*
Manufacturing	• Lower tolerances • Pool engineering change orders • *Use standard process* • Produce a generic product	• *Remove bottlenecks* • *Size buffers appropriately* • Reduce setups • *Shorten cycle time* • *Introduce self-managed work teams* • Install buffer capacity
Customer Demand	• Reduce product offerings and options • Design for localization • *Customize products in software, not hardware* • *Manage delivery expectations*	• *Adjust safety stocks* • *Change transportation mode* • *Implement better data systems* • *Introduce improved forecasting techniques* • Subcontract distribution operations • Build near customer

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[5] Effective Supply Chain Management, Tom Davis, 1993.

IX. Conclusions

Supply chain management (SCM) software is becoming increasingly more crucial. As companies become more global, doing business in different countries may require that a product be packaged in many different ways to reflect different languages, currencies and business codes. Keeping track of supplies of these distinct products and where they're needed can be a management challenge. Without the right software, most companies couldn't compete with local brands.

The SCM software industry still appears to be in the early adopter stage. Organizations vary in their readiness to adopt fully integrated SCM solutions. Recognizing that the majority of SCM customers are larger companies, the hesitation may be predicated by complex organizational structures. Smaller organization with less complex organizational structures appear more eager to adopt but the average cost of a typical solution is $500,000 suggesting a untapped market for inexpensive fully solutions. An internet/intranet approach may be the answer. However some firms are discussing an off-the-shelf product to cater to smaller companies.