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Zhongxian Wang

Ruiliang Yan

Kimberly Hollister

Ruben Xing

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A Relative Comparison of Leading Supply Chain Management Software Packages

Zhongxian Wang, Montclair State University, USA

Ruiliang Yan, Virginia State University, USA

Kimberly Hollister, Montclair State University, USA

Ruben Xing, Montclair State University, USA

ABSTRACT

Supply Chain Management (SCM) has proven to be an effective tool that aids companies in the development of competitive advantages. SCM Systems are relied on to manage warehouses, transportation, trade logistics and various other issues concerning the coordinated movement of products and services from suppliers to customers. Although in today's fast paced business environment, numerous supply chain solution tools are readily available to companies, choosing the right SCM software is not an easy task. The complexity of SCM systems creates a multifaceted issue when selecting the right software, particularly in light of the speed at which technology evolves. In this paper, we use the approach of Analytic Hierarchy Process (AHP) to determine which SCM software best meets the needs of a company. The AHP approach outlined in this paper can be easily transferred to the comparison of other SCM software packages.

Keywords: analytical hierarchy process; expert choice; multiple objective decision making; supply chain management software

INTRODUCTION

A supply chain represents the veins of a business; it is a network of facilities and distribution options that perform the functions of material procurement, the transformation of materials into intermediate and finished products, and finally the distribution of finished products to customers. Supply chains are not specific

to any one industry; they are inherent in both manufacturing and service based organizations. Supply chains do however vary in complexity from industry to industry and even firm to firm. The process of managing supply chains is a multi-billion dollar software industry; the worldwide market for SCM software topped an estimated \$6 billion in 2006 and is expected to

reach \$10 billion by 2010 (a compound annual growth rate of 8.6%) (Trebilcock, 2007).

Supply chains are evolving to meet the changing requirements of the companies trying to manage them. A few years ago simply having full visibility of your own supply chain was seen as extraordinary. Now that visibility is no longer enough; companies need to be agile in respect to their supply chain (Croom, Romano, & Giannakis, 2000; Bartels, 2006). Companies need to make educated business decisions based upon the information captured in their information systems.

SCM systems are used to coordinate the movement of products and services from suppliers to customers (including manufacturers, wholesalers, and retailers). The system's main objective is to manage warehouses, transportation, trade logistics and various other issues concerning facilities and the movement and transformation of materials en-route to customers.

The components of SCM include (but are not limited to) supply chain event management and optimization, warehouse management, radio frequency identification (RFID), transportation management, demand management, supplier relationship management, and service parts planning. Beyond the traditional elements, SCM software has also incorporated modules for international management; this is the direct result of the growing need for businesses to manage supply chains that include a mix of global suppliers, manufacturers, and company owned plants. In fact, the bursting demand for global SCM has led the upsurge in the worldwide market for SCM systems (Aksoy & Derbez, 2003; Das & Buddress, 2007; Hill, 2007).

Why Compare?

Research has found that the typical U.S. manufacturer is managing an average of more than 30 contract relationships (Trebilcock, 2007). Wholesalers are distributing to worldwide retailers and jobbers for resale; and retailers now staff virtual storefronts that service customers globally. The growing supply chain requires a

management system that is efficient and caters to the needs of each enterprise. The benefits of implementing an appropriate SCM system include: Increased top-line profit growth through supplier teamwork; Reduced inventory carrying costs and stock-outs; Increased customer service; Supply chain visibility; Optimization of the value chain respective to cost reduction and bottom-line improvement; Reduced corporate-wide operating costs; Increased competitiveness; and Quick adaptation to changing markets without detriment to customers.

However, since SCM system implementation is typically not a small scale operation, there are inherent managerial risks. For example, within businesses with several facilities, partners, and departments etc., a legacy or manual SCM system can lead to bottlenecks. There are cases where the appropriate SCM application is chosen but it does not sufficiently integrate with the rest of the enterprise software applications. In some cases, the wrong SCM application is chosen (perhaps to cut costs or due to poor information); the result is that the whole business from sourcing to distribution is negatively affected. Efficient SCM provides immense benefits; a well-run value chain should positively impact an organization's profitability and success.

SUPPLY CHAIN MANAGEMENT SOFTWARE

While there are a number of SCM software providers, the major players have maintained their top positions. For example, in 2005 the top 5 ranked providers were Manhattan, RedPraire, SSA Global, Swisslog, and SAP AG (O'Neill, 2005); in 2007 the top 5 spots were manned by Manhattan, RedPraire, SAP, Oracle and Infor (who swallowed up SSA) (Trebilcock, 2007). In selecting SCM software vendors to compare for this study, the following criteria were utilized:

- Limited to those providers offering worldwide solutions

- Limited to vendors whose SCM systems include the following minimum components: Warehouse Management Systems (WMS), Transportation Management Systems (TMS) and Warehouse Control Systems (WCS),
- Limited to 7 software vendors in the study (use of Expert Choice limited us to 7 alternatives).

Based on criteria outlined above we have elected to compare the following 7 software vendors:

- Aldata – Aldata SCM
- HighJump - HighJump SCM
- Infor – Infor SCM
- Manhattan Associates – Integrated Logistics Solutions
- Oracle – Oracle E-Business Suite Supply Chain Management - R12
- RedPrairie – E2e
- SAP – SAP SCM

Decision Tool

To aid in the comparison of our selected SCM systems, we have relied on Expert Choice 11.5 (EC11.5). The key functions of EC11.5 are: to structure by identifying objectives and criteria for evaluating the decision at hand and the potential alternatives; to evaluate the objectives and alternatives; to synthesize by combining hard numbers and intuitive judgments (math and psychology) to value the alternatives via sensitivity analyses and exploring “what if” scenarios (Expert Choice Inc., 2007). By relying on EC11.5 we can understand the trade-off of weighing certain choice criteria differently.

It is possible to yield the best alternative via EC11.5 using the Analytical Hierarchical Process (AHP). AHP is based on mathematics and human psychology; the process deals with complex decision making by providing a framework for arranging the criteria, quantifying them, and relating the elements to the overall goal. The AHP method breaks down the decision into a hierarchy of more clearly

stated sub-issues (where each issue is treated independently); once the hierarchy is built, the numerous alternatives are reduced to a series of pair-wise comparisons for synthesis. Those judgments are converted to numerical values that are processed, evaluated and compared over the whole scope of the issue. Because a numerical priority (weight between 0 and 1) is assigned to each element, AHP allows non-comparative elements to be compared in a consistent way. Finally, AHP produces numerical priorities and the choice of the best alternative simply becomes ranking the software packages in order of preference (Saaty & Vargas, 2006; Saaty, 1980; 1996; 2001; 2005).

In the following section, we briefly discuss features offered in each of our seven chosen software alternatives. Based upon this information, each alternative software package will be scored with respect to our evaluation criteria; these scores form the basis for pair-wise comparisons used in the AHP.

Aldata (Aldata SCM)

Aldata is one of the global leaders in supply chain software for retail, wholesale and logistics companies. The company's comprehensive range of SCM and In-Store solutions enable more than 300 customers across 50 countries to enhance productivity, profitability, performance and competitiveness. The majority of Aldata's customers are located in Western Europe; they primarily service small and medium size supermarket chains but also provide service to larger companies including Bosch and Merck. Aldata has won the IT Europa's European IT excellence award (General Business News, 2008).

Aldata invests heavily in research and development within the SCM unit. The G.O.L.D. product family is being further developed and the current version six of the software will remain the core platform for the coming years. Major launches were the new G.O.L.D. Track modules, a federation module for providing integrated traceability across business networks, and G.O.L.D. Mobile, a module providing mobility in the retail store and enabling store

operations such as stocktaking, receiving and price control using PDAs or radio frequency terminals (IHL Group, 2006). The company does not provide any other enterprise management solutions.

HighJump (HighJump SCM)

HighJump, a 3M Company, offers standard functionality but leverages best practices in order to meet the clients' immediate operational disciplines while increasing efficiencies. HighJump software highlights its vertical-specific adaptability which enables solutions to fit a variety of customer requirements in industries that include aerospace, automotive, consumer goods, direct store delivery (DSD), discrete manufacturing, food and beverage, wholesale distribution/industrial production, document management, and publishing.

HighJump implants a best-practice advantage implementation methodology which focuses on budgeting and aligning clients' interests. HighJump offers in-depth training courses aimed at preparing clients to administer their software solutions and 24/7 staffed customer support. Furthermore, HighJump organizes an annual user conference where HighJump industry analysts, employees, partners and customers meet to brainstorm the latest trends in execution; customers get the opportunity to learn how to leverage SCM solutions to achieve increased efficiencies and maintain competitive advantage.

The software architecture and hardware platforms include the following: Main Languages: C++; .net; C-sharp; DMBS; SQL Server; Oracle; and a 4GL: HighJump adaptability tool set. The software pricing ranges from \$100,000 to \$250,000 and is dependent on the number of concurrent users. The target market for HighJump includes logistics/distribution, batch, repetitive, job shop, discrete, process, continuous flow, and project manufacturing which translates to industries that include health care, pharmaceuticals, automotive, grocery, food, apparel, 3PL, and audio.

HighJump integrates source-to-consumption solutions that contain four critical elements including rapid return on investment, a global execution platform that allows all applicants to work together seamlessly, ease of configuration to empower strategic competitive advantage, and best practices based functionality to solve core logistic challenges

Infor (Infor SCM)

Infor is a large size software developer that provides very strong management resource solutions. The company offers its products as separate modules for various enterprise functions, including: Manufacturing, Supply Chain Management, Financials, Project Management (PM), Human Resources, and Customer Relationship Management. Infor also offers an all-inclusive Enterprise Resource Planning Suite (ERP). Their products are implemented worldwide.

Built on Open SOA (service-oriented architecture), Infor's logistics software provides advanced customization, which is not limited to any specific platform.

Due to high levels of customization, there are high setup costs in switching to the Infor's software. Due to high setup costs, Infor has historically targeted medium and large size businesses with sales in excess of \$50,000,000. Recently, Infor announced a new ERP solution targeting small to medium size distributors (ERP FACTS). In targeting smaller firms, Infor has developed numerous industry specific basic modules that do not need costly customization; this has put them in a very cost advantage position when compared with their industry competition. Infor's SCM solutions range from \$2,000 to \$100,000+; solutions at the higher end of the price range tend to be solutions that have been extensively customized.

Manhattan Associates (Integrated Logistics Solutions)

Manhattan Associates is a leading supply chain solutions provider. The company's supply chain

planning, supply chain execution, business intelligence, and business process platform capabilities enable its more than 1200 customers worldwide to enhance profitability, performance and competitive advantage. Unlike some of the other companies that provide SCM tools in addition to other non-SCM solutions, Manhattan Associates is engaged almost exclusively in the SCM solutions field. Much of their operational results company acquisitions.

Manhattan Associates targets companies in the retail, distribution, transportation, and manufacturing industries; their modules include warehouse, transportation, trading partner, distributed order, and reverse logistics management applications. Manhattan also offers performance management and radio-frequency identification tools designed to enhance the functionality of its other products. Manhattan's "Atlanta facility lets customers evaluate technology and equipment before adding RFID to supply-chain operations" (Malykhina, 2005, P.1). The company sells third-party hardware, including bar code scanners and printers, and also provides professional services. Manhattan Associates has been expanding their operations through new product offerings. According to Trebilcock (2007), "In 2001 Manhattan was the No.1 provider of warehouse management systems, with just more than \$100 million in revenue. Today, Manhattan is a nearly \$300 million company, offering transportation management, supplier collaboration and supply chain planning" (P. 47). Manhattan offers customer service on a 24 hour /7 days a week basis.

Oracle (Oracle E-Business Suite Supply Chain Management - R12)

With Oracle SCM (OSCM), companies can build and operate world class value-chains for profitable growth. The Oracle E-Business Suite Supply Chain Management (R12) family of applications integrates and automates all key supply chain processes, from design, planning and procurement to manufacturing and fulfillment, providing a complete solution set to enable companies to power information-

driven value chains. Companies can anticipate market requirements and risks, adapt and innovate to respond to volatile market conditions, and align operations across global networks. A unified data model provides a single, accurate view of your entire supply chain. Companies can implement lean, demand driven principles and manage their increasingly complex, global supply chains.

OSCM consists of a variety of separate applications which are categorized by supply chain segments. Depending on a company's needs, a wide variety of applications are available. Some of the basic benefits of OSCM include real time supply chain measurements as a result of a direct connection with suppliers and customers, expense management for all categories of goods and services, analytical support to monitor the performance of a company's supply and the ability to make adjustments.

Oracle has been rapidly expanding its SCM software business, primarily through the acquisition of smaller, more specialized businesses. Oracle has adopted an acquisition strategy in order to accelerate its software innovations. Previous acquisitions include People Soft and Demantra. As a result of the acquisitions, Oracle is focusing its next generation of products on integration and the ability for these programs to communicate and share information with each other.

RedPrairie (E2e TM Suite)

E2e offers customers supply chain execution, store management, logistics, and warehouse management software that can assist or manage all facets of their business. E2e allows for monitoring and control from inbound logistics and inventory management to order fulfillment and transportation. Collaboration tools are included to assist in a company's daily efforts to collaborate or interact with trading partners.

Every industry is being challenged with increasingly complex multi-channel demands, especially from the end consumer of their products. The ability to respond to create perfect, customized, and timely orders is a critical com-

petitive advantage to meet consumer expectations, reduce inventory and storage costs, and streamline operations (Report, 2006).

RedPrairie considers themselves unique in the SCM software industry in their effort to incorporate change management, learning management, interactive training, comprehensive online help, and customized learning and reference materials into their offerings. Companies implementing their suite of tools can leverage real ROI, minimize downtime due to obstacles, and move toward near 100% efficiency which increases companies core advantage. RedPrairie's support centers are located globally and offer full language capabilities in addition to leading-edge call tracking capabilities for reliability.

RedPrairie's ability to configure their software suites into practical groupings and components allows them to offer build-to-order manufacturing solutions that include sophisticated in-line sequencing which can lead to reduced cost and increased efficiency. The result is that all component levels can be tracked, revised and/or updated keeping all elements in synchronization. This capability is enhanced when used in conjunction with RedPrairie's warehouse management system (WMS).

SAP (SAP SCM)

SAP is the world's largest business software company and the world's third – largest independent software vendor. By building the strongest technology, services and development resources, SAP is positioned to deliver a superior business platform that can access valuable information resources, while improving overall process efficiencies and strong customer relationships including end users, suppliers and vendors. SAP's integrated packages allow customers' needs to be identified quickly and precisely while comprehensive and personal solutions are developed and rolled out.

SAP's services assists companies in maximizing their success through a combination of SAP experts, methodologies, tools, and certified partners. Users of SAP SCM can benefit with

the following: Faster response to changes in supply and demand that will give customers the chance to quickly capitalize on new opportunity; Increased customer satisfaction- SAP SCM enables clients to better adapt to changes and meet customer demand; Compliance with regulatory requirements; Improved cash flow; and Higher margins- SAP SCM helps companies lower operational expenses with more timely planning for procurement, manufacturing and transportation. Using SAP SCM companies can also improve their overall performance and quality through better order, product, and execution synchronization.

SAP SCM delivers a complete set of futures and functions for building adaptive supply chain networks. SAP SCM includes features and functions to support collaborative supply chain planning processes, including strategic, tactical, and operational planning as well as service parts planning. By using SAP SCM, a company can optimize a full range of planning activities including: demand planning, safety stock planning, supply network planning, distribution planning, and supply network collaboration. The company can also handle service parts planning activities, which includes: parts demand planning, parts inventory planning, parts supply planning, parts distribution planning, parts monitoring. With SAP SCM the company can manage order fulfillment activities, support end-to-end procurement, manage key transportation processes, manage warehouse activities, support all production processes including engineer-to-order, make-to-order, and make-to-stock manufacturing. SAP SCM also supports supply chain visibility design and analytics with features and functions that enable supply chain design and analytics processes. Planners and key decision makers can perform strategic and tactical business planning.

RELATIVE COMPARISON

Criteria Revisited

In order to conduct our analysis we will use selected quality criteria to assess software characteristics. With the help of Expert Choice software, we will first compare the relative importance of each of the criteria against each other.

- Ease of Integration: the ability to integrate with any third party software platforms (vendors, government clearance computers, ocean carriers, etc.) and any other proprietary software or legacy systems.
- Reliability and Stability: any warranties provided by the vendor in addition to the degree of completeness, accuracy, and consistency of the package. The availability of any templates or custom models available for specific aspects of the supply chain.
- Efficiency: the level of accessibility and efficiency; how well the software functions are aligned with the general business objectives as well as the number of tools available.
- Customization and Expansion potential: the degree to which the product supports the specific business goal assumptions and the tools available for SCM respective to the specific needs of the client company. Also, the degree of augmentation ability and the ability to evolve over time and expand as well as any expert options or limitations.
- Service and Support: the availability of support services coupled with the time it takes to have a technician to be available on site or on the network. The availability of technicians that are specialized in the particular industry the SCM is being utilized (transportation versus warehouse management, retail versus wholesale etc.). Any extra prerequisites such as annual conferences.
- Mobility and Portability: is a measure of platform independence; the number of support platforms and supported architecture as

well as any software requirements needed to run the software.

- Ease of Interface: shows how well the software communicates with the outside world, the quality of human machine interface, and how results are displayed.
- Pricing: the base price of the product, and/or range of the price for "basic" packaging respective to the SCM applications.

Evaluation Model

Our evaluation criteria, as entered in Expert Choice, are as follows:

- Ease of Integration – evaluated in terms of:
 - Time
 - Number of platforms supported
 - Support for open source developers
- Reliability and Stability – evaluated in terms of:
 - What classes of models does the application support?
 - If the application allows custom model creation, templates or both.
 - The reputation of the vendor supplying the tool
- Efficiency – measured in relation to:
 - How well the software supports the general business objectives?
 - Data processing capacity and speed.
- Customization – evaluated in terms of:
 - How well the product supports the general business goal assumption?
 - Specific tools available respective to the specific needs of the client company.
- Expansion – evaluated in terms of:
 - The degree of augment ability
 - The ability to evolve over time and expand (i.e. available upgrades)
 - Any expert options or limitations

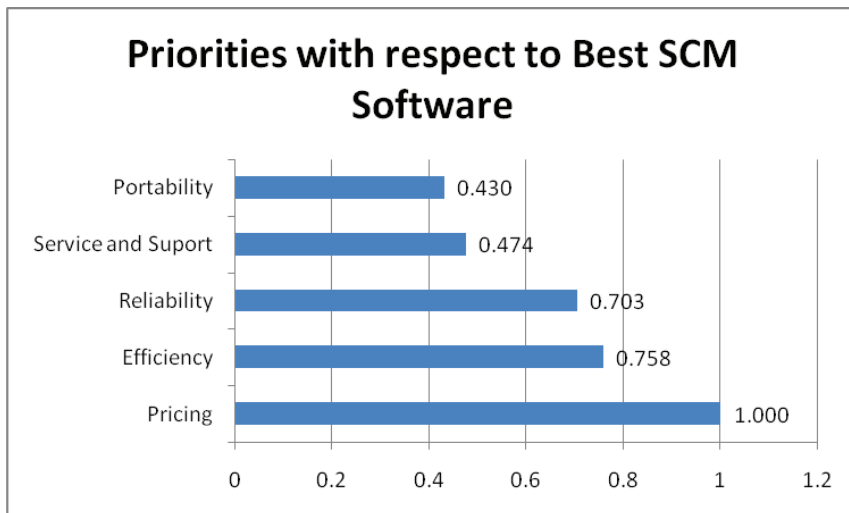
- Service and Support – evaluated in terms of:
 - Any available demos
 - Turnaround time for on site or network tech availability
 - Specialization of the techs in the respective industry
 - Any additional perks (i.e. annual conferences, 24/7 service etc.)
- Mobility and Portability – evaluated in terms of:
 - Hardware platform
 - Software architecture
 - Software requirements
- Ease of Interface – evaluated in terms of:
 - Simplicity of human machine interface
 - Result displays
 - Graphical layout
- Price (where available) – evaluated in terms of:
 - The price range provided – the lower of the range and the mean served as the rating criteria.

PROCEDURE OF EXPERT CHOICE: SHORT EXAMPLE

Providing an example of Expert Choice on a small scale helps to describe the method behind pair-wising and making the best decision regarding which SCM Software to choose contingent on our criteria. To provide a small scale example we implemented five criteria against our objective and compared three SCM software applications.

The pair-wise weights were assigned to the criteria initially chosen; the decisions were based on available information and which criteria outweighed their pair. The result is the prioritized listing of criteria respective to the objective – in this case selecting the best SCM software. Expert Choice allows for normalization in order to better understand the weighting scheme – in other words these small scale results recommend that Pricing is more than twofold the importance of Portability. In addition, the inconsistency is very low at only 2%; the logic behind assigning weights (importance) to each criterion remained consistent within each pair-wise comparison.

Figure 1. Presents the prioritized criteria after the initial weight assignments



We chose three alternative SCM Software packages (Infor, SAP & Oracle) for the short example to exhibit the functions of AHP relied on by Expert Choice. We proceeded to perform a pair-wise comparison of all our software solution alternatives based on each established criteria. Based on strengths and weaknesses determined about each software; we analyzed the components of each criterion on a case by case basis. The detailed level of analysis allowed us to obtain informative results about each software solution tool. The logic provided a prioritized listing of the software packages according to the criteria which held the highest weight. As an example, Figure 2 displays results obtained from Expert Choice when analyzing Pricing criteria.

However, this is minimal information when making a decision – sensitivity analysis provides a technique for determining the outcome of a decision if a key prediction turns out to be wrong. The analysis is a tool for analyzing the impact of key criteria; sensitivity blocks are used to generate tables and/or plots of simulation results as functions of feed stream, block input, or other input variables. Since there are various criteria, the following charts demonstrate the outcome of

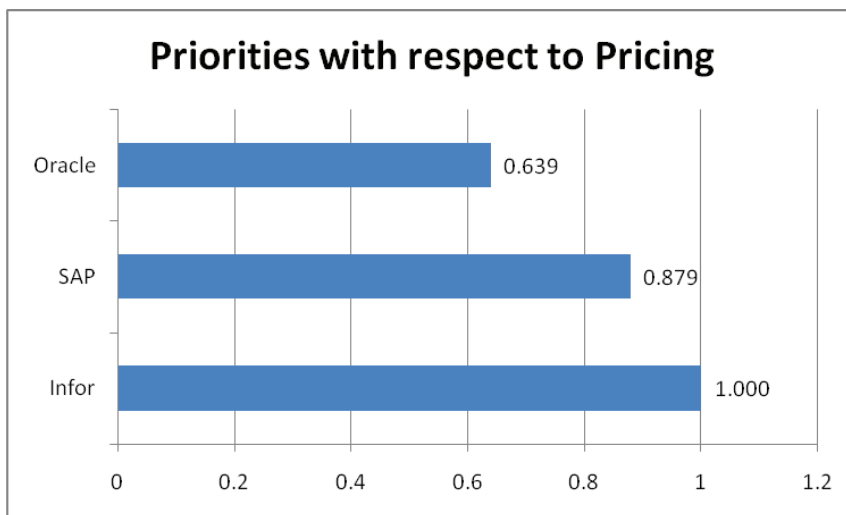
each SCM package against the chosen criteria. Expert Choice offers a variety of alternatives which facilitates the decision making process and offers alternatives for assessing the outcomes according to user preference.

We found that the dynamic sensitivity analysis tool can prove to be very useful when trying to estimate overall impact of each criterion on the final decision. The program allows users to graphically manipulate the relative weight of each criterion against one another by simply clicking and dragging. Furthermore, the program would simultaneously change the graphically presented outcome. Thus, if for the purposes of presentation, we assigned an unrealistically high weight to the price criterion in the example above the overall outcome would change from SAP being the best option to Infor software as the ultimate solution.

SCENARIO ANALYSIS

In this section, we compare the seven chosen SCM applications based on the seven criteria previously defined. The decision of optimal software choice involves multiple-objectives

Figure 2. Presents the introduction of alternative SCM software packages analyzing pricing



and will vary among customers based upon individual needs. It is not often that one SCM application suits the expectations of every industry, institution, or customer; therefore the integration of scenarios is an important tool of the decision making process.

In order to make the simulation realistic, various scenarios were examined that altered the size, needs, and global presence (amongst other aspects) of potential customers for the available SCM applications. We proceed with the hypothetical situations and demonstrate techniques and procedures to establish the best available alternative based on our set of defined criteria. In examining the importance of various criteria, size stood out as a decision making factor. In order to emphasize the importance of size as a decision making factor, we went further to implement three specific scenarios that visit opposite ends of the spectrum; large global presence versus small regional existence. Note, however, that when the size was manipulated, only certain criteria proved to be dependent on that factor, therefore the results below exhibit how other criteria were weighted similarly, despite the variations in size.

The number of SCM applications compared coupled with the number of evaluation criteria results in a significant number of pair-wise comparisons used in the AHP process. The following table summarizes the relative weights of each criterion in addition to the direct relationship between the synthesized weights in each column with their respective criterion. The higher the synthesized weight, the more a particular sized company (Large vs. Small) views that particular SCM software alternative.

When comparing above scenarios, the notable changes were the relative weights of each criterion when the size of the company is accounted for in the scenario. It is important to take into consideration that a real business environment comprises many different industries, as well as an array of different company types with different needs, goals and business objectives; all of which would impact relative weights and the ultimate SCM software decision.

The selection of the best software for a specific company should be based on the individual needs of the organization making the choice. The same software package will not be the best choice for every buyer. Different SCM solutions will provide the best fit depending on the applicable situation or scenario. Creating different hypothetical scenarios can be useful in the selection process.

To illustrate this point, we have created different scenarios which demonstrate the relevance of the individual organization's environment and objectives in the selection process. In addition to size, the best SCM software package for an organization can differ based on characteristics like industry or sector, geographic diversity of operations and vertical or horizontal integration of the supply chain. We found that sector can be a crucial factor in the decision making process; we believe that an organization's sector will drive the decision for an optimal SCM software package.

In addition to a total of 144 basic pair-wise comparisons in order to compare all alternatives with respect to all of the criteria, each scenario also requires an additional 21 pair-wise comparisons. Once all pair-wise comparisons are made, Expert Choice is used to synthesize the weights of all the criteria with the weights of all the alternatives to determine the best solution for each scenario. In illustrating the impact of each scenario of the final decision, we have chosen different sets of SCM software packages for a more complete comparison.

Table 2 lists the weights of the pair-wise comparisons for government versus business entities. There is a direct relationship between the individual criterion and the weights displayed in each column. The higher the number displayed, the greater the weight placed on the criterion for that type of organization.

Based on the results of the weighted criteria calculations done by Expert Choice, the top three alternatives for a business entity would be Oracle, Manhattan Associates and i2 Solutions. This was in line with our expectations. We had expected Oracle and Manhattan Associates to be prime solutions for business

Table 1. Synthesized weights with respect to criteria or goal

Synthesized Weights with Respect to Criteria	Pricing		Service & Support		Reliability & Stability	
	Large	Small	Large	Small	Large	Small
Manhattan Associates	0.138	0.162	0.140	0.090	0.143	0.143
RedPrairie	0.165	0.103	0.159	0.186	0.119	0.119
SAP	0.140	0.103	0.161	0.163	0.209	0.209
Oracle	0.143	0.228	0.161	0.156	0.211	0.211
Infor	0.089	0.078	0.105	0.119	0.146	0.146
Aldata	0.114	0.051	0.090	0.065	0.071	0.071
HighJump	0.212	0.275	0.183	0.221	0.100	0.100

Customization & Expansion		Easiness of Interface		Mobility & Portability		Easiness of Integration	
Large	Small	Large	Small	Large	Small	Large	Small
0.181	0.173	0.223	0.223	0.205	0.205	0.215	0.215
0.114	0.123	0.139	0.139	0.145	0.145	0.137	0.137
0.198	0.204	0.141	0.141	0.205	0.205	0.143	0.143
0.199	0.202	0.165	0.165	0.212	0.212	0.171	0.171
0.143	0.151	0.167	0.167	0.073	0.073	0.166	0.166
0.097	0.086	0.122	0.122	0.043	0.043	0.124	0.124
0.068	0.062	0.042	0.042	0.116	0.116	0.044	0.044

Overall Synthesized Weights with Respect to Goal		
	Large	Small
Manhattan Associates	0.179	0.156
RedPrairie	0.135	0.133
SAP	0.176	0.169
Oracle	0.186	0.199
Infor	0.135	0.122
Aldata	0.094	0.070
HighJump	0.096	0.152

Table 2. Weights assigned to alternatives for both business and government use

Synthesized Weights - with respect to criteria	Portability		Reliability		Efficiency		User Friendliness	
	Business	Gov't	Business	Gov't	Business	Gov't	Business	Gov't
i2 Solutions	0.149	0.147	0.167	0.167	0.154	0.154	0.159	0.153
Logility	0.138	0.134	0.149	0.149	0.140	0.140	0.135	0.141
SYSPRO 6.0	0.114	0.116	0.085	0.085	0.112	0.112	0.138	0.138
Picasso	0.069	0.073	0.081	0.081	0.064	0.064	0.103	0.102
Manhattan Assoc	0.215	0.207	0.177	0.177	0.209	0.209	0.162	0.172
Oracle	0.238	0.182	0.201	0.201	0.251	0.251	0.154	0.131
ILOG	0.077	0.141	0.141	0.141	0.071	0.071	0.150	0.163

Synthesized Weights - Continued	Report Interpretation Simplicity		Customization Flexibility		Training & Support	
	Business	Gov't	Business	Gov't	Business	Gov't
i2 Solutions	0.164	0.164	0.153	0.153	0.143	0.143
Logility	0.117	0.117	0.165	0.167	0.153	0.153
SYSPRO 6.0	0.124	0.124	0.124	0.123	0.142	0.142
Picasso	0.097	0.097	0.105	0.098	0.118	0.118
Manhattan Assoc	0.215	0.215	0.150	0.150	0.206	0.206
Oracle	0.175	0.175	0.197	0.200	0.133	0.133
ILOG	0.107	0.107	0.106	0.110	0.105	0.105

and government operations, since they were the software solution tools that excelled in the areas of Efficiency and Reliability.

Table 3 summarizes the overall results obtained through Expert Choice for our case scenario. We previously placed emphasis on efficiency and reliability for which the weights obtained were very close to each other when comparing the three top alternatives. However, when the rest of the criteria are considered, the weights obtained under each business entity change influencing the type of software solution that best suit each type of organization. For example: under a business entity Oracle obtained the highest weight of .202 overall, as opposed to .180 under a government entity. Picasso on the other hand, although obtained the lowest weight for both type of entities, it

obtained a better rating from the government sector with a weight of .092 as opposed to .086 from the business sector.

As demonstrated by the tables previously shown above, different entities have different preferences and priorities which leads to differences in optimal software selection. The following scenarios will further support this conclusion.

Scenario 1: A&D Wholesale Distributors, Inc

Let us assume this is a mid-size distribution company that operates throughout the United States, with 550 employees and operations in 20 different states. A&D is looking for SCM

Table 3. Summary of synthesized results for government vs. business entities

Synthesized Weights -- with respect to goal	Business	Government
i2 Solutions	0.157	0.156
Logility	0.145	0.144
SYSPRO 6.0	0.113	0.117
Picaso	0.086	0.092
Manhattan Associates	0.189	0.189
Oracle	0.202	0.180
ILOG	0.109	0.121
Overall inconsistency ratio	0.03	0.05

Scenario 1

Criteria	Weights
Efficiency	0.232
Customization Flexibility	0.228
Reliability	0.138
Report Interpretation Ease	0.126
User Friendliness	0.117
Training and Support	0.091
Portability	0.069

Alternative	Ranking
Logility	0.192
i2 Solutions	0.186
Manhattan Associates	0.156
Oracle	0.156
Syspro 6.0	0.115
ILOG	0.102
Picaso	0.093

software that will support a distribution intensive type of business and assist them in reducing transportation and inventory retention costs leading to increased revenue and customer satisfaction. Based on this company's goals and objectives, we decided that the criteria they would focus on would be: Customization Flexibility, they need a software solution tool that would be able to customize to support their specific needs and Efficiency, their main objectives are to reduce transportation costs and inventory retention time.

Scenario 2: Start Up Online Company

Let us assume this is a small retail oriented start up internet company with 10 partners, no fixed location, no fixed relationship with outside parties and limited knowledge on the

industry. This is a company that would need a software solution alternative that would offer them a high level of support with relation to hardware platform and software architecture, and one that would be able to provide a high level of training and support, since they are new in the industry and have a flexible SCM structure. Based on this company's needs, we decided that the criteria they would focus on would be: Portability, because they need a software solution that would support their internet based business, across different platforms and operating systems and Training and Support, because they need a software solution that will provide them with intensive training about the software as well as with aids to gain a better understanding of their flexible supply chain structure and demands.

In the following tables, results for a number of additional scenarios are presented.

Scenario 2

Criteria	Weights
Portability	0.239
Training and Support	0.183
Customization Flexibility	0.176
Efficiency	0.138
Reliability	0.103
Report Interpretation Ease	0.094
User Friendliness	0.067

Alternative	Ranking
Manhattan Assoc	0.195
Oracle	0.191
I2 Solutions	0.166
Logility	0.159
Syspro 6.0	0.109
ILOG	0.095
Picaso	0.085

Table 4. Summary of a large scale retailer

Alternative	Total	Pricing (L:0.49)	Service/ Support (L:0.131)	Reliability/ Stability (L:0.203)	Customization/ Exapansion (L: 0.183)	Ease of Interface (L: 0.107)	Mobility/ Portability (L: 0.110)	Ease of Integration
Manhattan	0.866	0.650	0.762	0.679	0.906	1.000	0.965	1.000
RedPrairie	0.661	0.781	0.868	0.564	0.571	0.624	0.685	0.637
SAP	0.848	0.659	0.878	0.991	0.991	0.635	0.968	0.663
Oracle	0.897	0.674	0.880	1.000	1.000	0.742	1.000	0.797
Infor	0.653	0.422	0.575	0.692	0.717	0.750	0.343	0.771
Aldata	0.454	0.537	0.492	0.335	0.487	0.548	0.204	0.578
HighJump	0.463	1.000	1.000	0.473	0.343	0.188	0.548	0.204

Table 5. Summary of a regional grocery chain

Alternative	Total	Pricing (L:0.267)	Service/ Support (L:0.177)	Reliability/ Stability (L:0.238)	Customization/ Exapansion (L: 0.060)	Ease of Interface (L: 0.108)	Mobility/ Portability (L: 0.092)	Ease of Integration (0.059)
Manhattan	0.687	0.589	0.406	0.679	0.849	1.000	0.965	0.835
RedPrairie	0.585	0.374	0.842	0.564	0.605	0.624	0.685	0.607
SAP	0.743	0.376	0.738	0.991	1.000	0.635	0.968	1.000
Oracle	0.874	0.831	0.706	1.000	0.991	0.742	1.000	0.996
Infor	0.537	0.286	0.537	0.692	0.739	0.750	0.343	0.756
Aldata	0.309	0.186	0.296	0.335	0.424	0.548	0.204	0.401
HighJump	0.668	1.000	1.000	0.473	0.305	0.188	0.548	0.391

CONCLUSION

The SCM software industry is gaining an increasing amount of attention as companies try to maximize return on investment and gain a competitive edge in their markets. The increasing focus on the industry is resulting in greater

investment in SCM software and fueling innovation. In order to choose the best alternative among all of the choices available, potential users must clearly identify and prioritize their needs and preferences.

ExpertChoice's technology, which utilizes AHP analysis, allowed us to compare seven

Table 6. Summary of an auto part distributor

Alternative	Total	Pricing (L:0.092)	Service/ Support (L:0.031)	Reliability/ Stability (L:0.271)	Customization/ Expansion (L: 0.241)	Ease of Interface (L: 0.162)	Mobility/ Portability (L: 0.168)	Ease of Integration (0.034)
Manhattan	0.845	0.650	0.762	0.679	0.906	1.000	0.965	1.000
RedPrairie	0.628	0.781	0.868	0.564	0.571	0.624	0.685	0.637
SAP	0.884	0.659	0.878	0.991	0.991	0.635	0.968	0.663
Oracle	0.917	0.674	0.880	1.000	1.000	0.742	1.000	0.797
Infor	0.623	0.422	0.575	0.692	0.717	0.750	0.343	0.771
Aldata	0.416	0.537	0.492	0.335	0.487	0.548	0.204	0.578
HighJump	0.464	1.000	1.000	0.473	0.343	0.188	0.548	0.204

SCM software alternatives according to seven select criteria in order to determine which software best meets the needs of each scenario. All of the potential factors involved in the selection process must be determined by the organization making a decision on an individual basis. We expect continuous improvements and competition from the companies we have examined as well as new entrants into the marketplace looking to fill niches. The natural caveat to all this software is from the human side; the software is only as good as the users who truly understand how to properly use the application. Most logistics professionals and senior level management lack the knowledge or training to fully exploit the potential of their systems (Hannon, 2005). This ties in to a recent emphasis in moving away from pure planning and focusing on the execution aspects of managing a supply chain (Parker, 2007).

Since problems, criteria, needs, alternatives and other variables will vary from one entity to the next, there is no universal solution. In order to support an optimal choice, all of the key factors in the decision process must be identified and quantified. The methods and processes relied on in our research transfer easily to the comparison of other SCM software packages. The future for SCM software solutions is endless.

REFERENCES

- Adata Optimises its G.O.L.D. Supply Chain Management (SCM) Software. (2006, September 30). IT Toolbox .
- Aksoy, Y., & Derbez, A. (2003). Supply chain management: despite persistent implementation problems, SCM remains a top priority for companies eager to optimize operations (2003 Software Survey). *OR/MS Today*, 30(3), 30-31.
- Bartels, N. (2006). Agile more important than lean. *Manufacturing Business Technology*, May 1, 46-48.
- Croom S., Romano P., & Giannakis, M. (2000). Supply chain management: an analytical framework for critical literature review. *European Journal of Purchasing & Supply Management*, 6(1), 67-83.
- Das, A., & Buddress, L. (2007). Evaluating prospective e-providers: an empirical study. *The Journal of Supply Chain Management*, 43(4), 31-46.
- Expert Choice Inc. (2007). Expert Choice 11.5. Retrieved July 1, 2008, from <http://www.expertchoice.com/products/ec11.html>
- General Business News. (2008). Aldata wins at European IT excellence awards. *Manufacturing & Logistics IT*, March 7.
- Hill Jr., S. (2007). The new rules for global supply chain management. *Manufacturing Business Technology*, April 1, 2007, 22.
- IHL Group. (2006, June 15). Hard data, smart decisions. *The Eye on Retail Information Systems*, 11 (11), 1.

- Malykhina, E. (2005). Minimize supply-chain risk. *Information Week*, February 28, 72.
- O'Neill, J. (2005). Top 20 SCE suppliers. *Modern Materials Handling (Warehousing Management Edition)*, 60(6), 32.
- Parker, K. (2007). Current trends in supply chain management. *Manufacturing Business Technology*, September 1, 2.
- Report. (2006). RedPrairie Corporation announces a supply chain revolution. *Manufacturing & Logistics IT*, May 16, 1.
- Saaty, T.L. (1980). *Multicriteria decision making: the Analytic Hierarchy Process*, RWS Publications.
- Saaty, T.L. (1996). *Decision making with dependence and feedback: the Analytic Network Process*, RWS Publications.
- Saaty, T.L. (2001). *The Analytic Network Process*, 2e, RWS Publications, 4922 Ellsworth Ave., Pittsburgh, PA 15213.
- Saaty, T.L. (2005). *Theory and applications of the Analytic Network Process*, RWS Publications, 4922 Ellsworth Ave., Pittsburgh, PA 15213.
- Saaty, T.L., & Vargas, L.G. (2006). *Decision making with the analytic network process: economic, political, social and technological applications with benefits, opportunities, costs and risks*. New York: Springer.
- Trebilcock, B. (2007). Top 20 supply chain management software providers. *Modern Materials Handling (Warehousing Management Edition)*, 62(5), 47.

Zhongxian Wang is a professor at Montclair State University, New Jersey, USA. Professor Wang teaches operations analysis, production/operations management, decision support & expert systems, business statistics, operations research, and management sciences. He is a member of Institute for Operations Research and the Management Sciences (INFORMS), Information Resources Management Association (IRMA), The Decision Sciences Institute (DSI), The Production and Operations Management Society (POMS).

Ruiliang Yan is an assistant professor of marketing at the School of Business, Virginia State University. He received his PhD degree in marketing from the University of Wisconsin, Milwaukee, MS degree from Sichuan University, China and bachelor's degree from Southwest Agricultural University, China. He specializes in marketing modeling, retailing and supply chain management.

Kimberly Killmer Hollister, PhD is an associate professor in the department of management & information systems at Montclair State University, Upper Montclair, New Jersey. Hollister's research falls into two main categories: applied operations management and educational program assessment of management information systems and operations management curriculums. Hollister's research has been published in many peer-reviewed journals including: European Journal of Operational Research, Journal of Informatics and Education Research, Journal of Accountancy, Journal of Business & Economic Studies. Hollister is actively engaged in sharing her work with the greater academic community at regional, national, and international conferences.

Ruben Xing received his PhD in 1992, MS in 1989, and MA in 1987 from Columbia University, New York. Having worked for more than 15 years in the IT industry, Dr. Xing has held senior IT management positions at several large financial conglomerates like Merrill Lynch, Citigroup, First-Boston/Credit Suisse in metropolitan New York. His current research interests include broadband and wireless communications, the Internet security, disaster recover/business continuity planning, and supply chain management.