Artificial Intelligence (AI):

Is it Real?

AI & Supply Chain Management

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Proceedings

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Executive Summary

On November 13, 2001, the Silicon Valley World Internet Center convened a Think Tank Session, gathering participants, all active practitioners in the field, to discuss and debate what the real opportunities are for Artificial Intelligence (AI) driven implementations in Supply Chain Management (SCM) systems. Given that the exact definition of AI is subject to ongoing debate, and in order to provide a common ground for this session, AI was defined as software that automates tasks that require human intelligence, specifically, for the area of supply chain management. SCM encompasses the organization of, and supervision over the flow of materials, information and finances as they move along the chain from the supplier to the manufacturer and on to the distributor and customer or end-user. SCM includes the coordination and integration of such flows both within the company and among business partners.

Think Tank participants discussed ongoing implementations of AI that are being leveraged to automate and increase efficiencies in eCommerce. Based mostly on personal, first-hand experience, participants agreed that current efforts are focused more on demand, buy-side types of applications rather than on supply-side implementations that require more intensive and costly back-end integration. The proliferation of SCM systems has created an abundance of data, with some experts going as far as to say that there is more data available to industry at this point in time than could be effectively used as knowledge. Not much is being accomplished with the data available, because, as one participant commented, there is "too much data, not enough information." To leverage available data, intelligent agents must be deployed – however, effective deployment depends on the adoption of universally accepted standards. Participants cautioned that standards are not a panacea.

Challenges to SCM were discussed at length. Challenges were found to encompass four main areas – technology, organization, operations and finance. Technological challenges include issues that pertain to data, integration and standards, dynamics, complexity, security and privacy, and the relative immaturity of artificial intelligence as a discipline. Organizational challenges include change management, misalignment in objectives and incentives across functions and divisions, and internal user resistance. Operational challenges stem from the massive planning and scheduling effort required to deploy a SCM system. Finally, economic and financial concerns center around the need to establish clear ROI, especially in the current recessionary environment.

Turning to predict the future, our panel of experts considered the opportunities inherent in leveraging AI to develop more efficient SCM systems and applications. Within 12 to 18 months, participants predicted that opportunities would revolve around data and process integration, collaboration and integration tools, and facilitation of "human" activities. However, significantly more opportunity was seen in the 18 to 36 month time frame, including applications that would facilitate decision support, business rules, inventory management and the leverage of data, improvements in man-machine interfaces, and further facilitation of human activities. The real revolution would come five to ten years from now, when semantic Web technologies will be employed to dramatically increase supplier to manufacturer efficiencies.

Our panel concluded that while implementations of AI in SCM are not about to replace humans, nor will they likely do so in the foreseeable future, significant strides have already been made in leveraging AI-driven technologies to increase efficiencies across the enterprise supply chain. Future progress will occur incrementally as intelligent agents proliferate and universal standards take hold, enabling both up-stream and down-stream collaboration and interoperability.

Introduction

Over the past several years artificial intelligence (AI) has become an inseparable part of both business and consumer applications. We all now use AI-driven applications on a daily basis. But is AI being utilized to automate and increase efficiencies in eCommerce? Are there valid models for the integration of AI in supply chain management (SCM) today? And – what will be the highest ROI (Return on Investment) SCM applications in the short-term (12 to 18 months), medium-term (18 to 36 months), and long-term (36 to 60 months)? What opportunities would you pursue right now if you could? On November 13, 2001, the Silicon Valley World Internet Center convened a Think Tank Session to elucidate what the real opportunities are for AI-driven implementations in Supply Chain Management (SCM) systems. The center gathered participants, all active practitioners in the field, to offer, discuss and debate potential answers to the above questions. The paper in front of you now summarizes the proceedings of this session, providing a concise view on how experts in the fields of AI and SCM see the interface between these two important disciplines evolving over the next 12 to 60 months.

Think Tank Session participating companies included: Coopetition, Inc., Dejima, Frictionless Commerce, Inc., Hewlett-Packard, iSpheres, Lake Forest Venture Management, Open Run, Oracle Corporation, Radical Data Designs, Rod Heisterberg Associates, SAP, SRI International, Stanford University, Technology & Strategy, United Parcel Service, VerticalNet, and Zesati.

Artificial Intelligence

Artificial intelligence is all around us – yet many will tell you it is nowhere to be found. An ongoing conflict rages over coming to terms with a definition of artificial intelligence that is acceptable to a majority of practitioners and academics. The industry adage seems to be that if it is practical, it cannot possibly be AI. However, AI now permeates such a variety of applications, both consumer-oriented and of a business-to-business character, that it is difficult to avoid. Artificial intelligence is embedded in the voice recognition engines that help us navigate previously incomprehensible and frustrating menu trees on customer service calls. It is integrated into the search engines we use to navigate the World Wide Web, as well as into heuristic search processes such as at MapQuest – a Web service hardly associated with AI in one's mind. It is a critical element in the success of Optical Character Recognition (OCR) systems. And, in the context of Supply Chain Management, AI has been put to extensive use - for example, within the context of scheduling and optimization applications at ILOG, for product configuration at Trilogy, and in order to create speech interfaces to enterprise data at Dejima.

> A large factor in today's economic downturn has been an excess of manufacturing inventory due to unreasonable long-term demand forecasts. Inventory is expensive -- 20% to 40% of unit value when annualized.

What, then, is artificial intelligence? Clearly there is no one set and well-accepted definition. Artificial intelligence is commonly thought of as the simulation of human intelligence processes by computer systems. An artificially intelligent system should be able to learn and reason. A common test for artificial intelligence is the Turing Test, named for Alan Turing, a British computer scientist. The Turing Test stipulates that in order for a machine to be considered intelligent it must be able to deceive a human being into believing that the machine is

[1] More information about Big Blue and the rivalry between Kasparov and the machine is available at http://www.research.ibm.com/deepblue/home/html/b.html.

human. Aside from Gary Kasparov's remarks about Big Blue being intelligent following his narrow 1997 loss to the machine [1], no computer as yet has passed the Turing test.

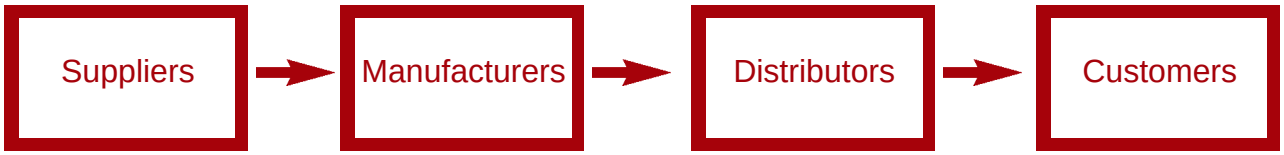
As Adam Cheyer, vice president of engineering for enterprise products at VerticalNet remarked in the introduction to his presentation at the World Internet Center Session, artificial intelligence has moved away from pursuing general intelligence as a goal, to pursuing relevant and preferably applied uses. This trend has precipitated the widespread adoption of useful applications that, while they may not enable a computer to pass the Turing Test, are driving efficiencies across the enterprise. In keeping with this trend – and for the purpose of the World Internet Center Think Tank Session – a common working definition of artificial intelligence was presented: "Artificial intelligence is software that automates tasks that require human intelligence, specifically, for the area of supply chain management."

Cheyer also remarked that it might be too early for further introduction of AI-derived technologies into the enterprise, adding that even though some applications may already be practical, they are beyond the constraints of current paradigms. It is critical to remember that technology is only part of the story, and that human and business factors must be accounted for when planning major change by way of new software implementations. Such implementations may require organizational and structural adjustments in the company. In addition, people need to be prepared for the change adequately and early on in the process. Finally, commitment and leadership must be secured to ensure that enough momentum will be generated in order that the project is completed effectively and efficiently.

Supply Chain Management

Supply chain management (SCM) encompasses the organization of, and supervision over the flow of materials, information and finances as they move along the chain from the supplier to the manufacturer, and on to the distributor and customer or end-user. SCM includes the coordination and integration of such flows both within the company and among business partners. The advent of Web-based SCM systems has allowed the automation of collaborative commerce – commerce among business partners – to an extent never before imagined, enabling such partners to share information both "upstream" – with suppliers – as well as "downstream" – with customers. By sharing data and processes in an automated, electronic and collaborative fashion, companies can realize significant gains in efficiencies, improve time-to-market, and reduce production and distribution costs.

Diagram I -- Supply Chain Structure



Robert Noakes, an independent consultant who facilitated the Think Tank Session, provided a simple, yet powerful, abstraction of the supply chain, presented as diagram I below.

Participants at the Center's Think Tank session discussed ongoing projects in which they are currently involved, projects that are utilizing artificial intelligence in the context of SCM applications. There was widespread agreement that current efforts are focused more on demand, buy-side types of applications rather than on supply-side implementations that require more intensive and costly back-end integration. David Brooks, vice pres-

ident and general manager of enterprise business at Dejima, spoke of the company's ongoing development efforts in the field of natural language recognition to support and facilitate communications across a broad range of applications such as mobility, email and Short Messaging Services (SMS). Rod Heisterberg, managing partner of Rod Heisterberg Associates, has been involved in projects that are utilizing AI in the fields of defense logistics for collaborative product commerce (CPC) and collaborative planning, forecasting and replenishment. CPC applications facilitate mass customization scenarios via demand chain integration while CPFR applications facilitate mass production scenarios via supply chain integration. Most such applications focus on developing integration architectures for business collaboration, and providing total asset and value chain visibility. Manugistics has introduced artificial intelligence into Request for Price (RFP) and Request for Quote (RFQ) processes, allowing for what they are calling "frictionless commerce" and enabling customers to optimize allocations across multiple line-item contracts submitted by multiple vendors. In addition, Manugistics is leveraging artificial intelligence in decision process automation, to gain a handle on expenses as well as to analyze supplier relationships and identify the most strategic partners.

Participants agreed that the proliferation of SCM systems – whether AI-driven or not – has created an abundance of data, with some experts going as far as to say that there is more data available to industry at this point in time than could be effectively used as knowledge. Not much is being accomplished with the data available, because, as one participant commented, there is "too much data, not enough information." When every Enterprise Resource Planning (ERP) system defines a different, proprietary identifier for the same product, companies collect a tremendous amount of data that cannot be correlated in any meaningful way without either intensive manual labor or artificial intelligence. In the short term, then, artificial intelligence can help in sifting through and analyzing available data, creating information that could then be leveraged for decision support, eventually assisting management and employees to make better decisions on the job.

Standards and Supply Chain Management

Another common approach that allows companies to easily leverage data into information involves the use of standards. Overall, participants thought standards would help reduce the complexity of the problem but agreed that standards are not a panacea. Few thought that a single standard would ever emerge, agreeing that in the most likely scenario several standards will coexist, making interoperability and mappings among standards extremely important. Cheyer commented that, "For the big picture, there won't be a de facto standard…" In order to make a semantic Web work, therefore, intelligent agent technology must come into play. Such agent technology can have a huge impact on interoperability, but participants cautioned that, in order for intelligent agents to function effectively, they must be created with the user's perspective in mind and not as an academic exercise. After all, if the user does not utilize the agents intelligently, the system fails regardless of the level of intelligence built into the agents. And, at the end of the day, standards will be needed to enable communication among intelligent agents, as well as to create a basis for a shared data environment.

Challenges in Supply Chain Management

In order to understand what problems are yet to be solved, it was essential to first come to know the pain points associated with SCM early in the 21st century. Think Tank Session participants cited over three-dozen challenges to supply chain management implementations. These challenges encompassed four main areas – technology, organization, operations and finance.

Technological challenges include issues that pertain to data, integration and standards, dynamics, complexity, security and privacy, and the relative immaturity of artificial intelligence as a discipline. On the subject of data, participants commented that it is essential that data be clean and accurate. Systems need to be capable of working with a multiplicity of variables across many dimensions, encompassing not just price but also such parameters as quality, delivery and payment terms. Systems must also be capable of capturing the preferences required to actually make decisions on their inherent idiosyncrasies. The lack of standards continues to be a major issue, driving the need for integration across multiple existing products and architectures while catering to a variety of different technologies. But barriers to integration persist. Primarily, while it is generally expected that most everything has already been automated, in practice approximately 80 percent of data and processes are still unautomated, and it is absolutely impossible to integrate computerized systems with paper and manual labor. A lack of widely accepted standards prevents optimization across the entire supply chain, unless a company is totally vertically integrated, allowing internal access to all such systems.

Still on the issue of technology, a dynamic reality, fraught with constant change, requires constant adaptation and scaling as systems continue to evolve. This situation provides for a challenging and expensive environment in which to implement anything. As a side effect, rules do not always function consistently or as expected, and systems need to be capable of adjusting and responding in a timely manner. However, resulting systems are complex and difficult to maintain, use and install. Security and privacy are also major concerns. Participants emphasized the need to allow for filtering and to ensure encryption and authentication at appropriate levels. Finally, artificial intelligence is a maturing discipline, with many issues remaining to be worked out. For example, collaboration in development and implementation of solutions is complicated by a lack of a standard global understanding of what an agent is. The industry must identify a common language if it is to continue to make progress into the new century.

Organizational challenges begin with the need to manage change carefully and incrementally. People are naturally resistant to change and must be adequately prepared for and coached through the implementation of new supply chain management systems. This is especially true where such systems are complex and substantially different from what had been previously in use. Employees are also naturally reluctant to use systems that are too complex for them to understand. A priori work needs to take place to ensure new systems cater to user needs and demands and provide for adequate usability. Sometimes, systems are simply less efficient than the physical operations they come to replace. For example, when a part is needed in production or a trade needs to be made, human contact may be faster and yelling across the room more efficient than firing up a software-based system.

At the organizational level, participants expected to find organizational resistance, stemming from a misalignment of objectives and incentives across functions and divisions. It was stressed that, following an acquisition or merger, internal competition between divisions becomes especially fierce. Such misalignments can be particularly troubling. The timing for introduction of technological changes should be managed to avoid such periods of increased animosity. Further, to ensure participation by all relevant parties, participants stressed the importance of economically aligning incentives.

More organizational challenges are driven by internal users' resistance to share their intellectual capital where they perceive automation may threaten their very livelihood. A common example is sales. Without the salesperson's knowledge of the process – as well as his data and knowledge of his relationships – the artificial system will never function as well as a human being. Knowledge

is money, and sales people will be reluctant to upload their knowledge into an automated system that can replace them. Further, the group observed that such individuals typically prefer to paste a quote into an email message rather than learn how to use, and then work within, the constraints of a complex system that they may not completely understand. Salespeople will not share information nor adopt a new system unless significant value-add can be demonstrated early on and with minimal investment of time and effort on their part.

In many industries, the elimination of relationships from the business equation, brought about by automation, changes the quality of a company's product or service to the extent that it can negatively impact sales and reputation. The "humanity" of the process, therefore, may need to be maintained whereby a human network is an essential element of the trade process. Often, an "economy of favors" develops, one that simply cannot be replicated by artificial intelligence of any kind. The network of relationships, deals and obligations that makes business tick must not only be maintained, it must be nurtured. Finally, from an organizational perspective one must also consider the challenges posed by external players. For example, the role of distributors in the process needs to be taken into consideration; as we have seen over the course of the last couple of years with the evolution of B2B marketplaces, reintermediation has been a successful approach, but disintermediation typically will bring the entire automation effort down.

From an operational perspective, SCM deployments entail a massive planning and scheduling effort. Especially given the large investments in systems over the last few years, digestion by enterprises of past software acquisitions will typically precede new projects. And, while technology is dynamic and ever-changing, the value chain is no longer standing still either. Its own organic dynamics compound the operational challenges brought about by constantly evolving systems. Additional operational challenges abound. Coordination of integration efforts, for example, typically exceeds expectations, as the need for such work is far greater than first anticipated due to the lack of automation still prevalent across most systems and environments. Participants in the World Internet Center's Think Tank Session expressed concern over how disruptions in the supply chain are handled within the context of SCM systems. For example, participants discussed the way in which such systems deal with shortages, or with returns, which are a reversal of sorts of the normal course of the supply chain.

Finally, our panel of experts raised some economic and financial concerns. In the face of a recession, widespread layoffs, budget cuts left and right, and declining margins, who wants to spend money on the procurement of cutting edge technologies for supply chain management? Only by demonstrating very clearly that large, positive returns on investment loom on the not-too-far horizon will organizations even begin to consider such outlays at this point in time.

Leveraging AI for SCM – Opportunities

Think Tank Session participants considered the opportunities inherent in leveraging artificial intelligence technology to develop more efficient supply chain management systems and applications. Consideration of such opportunities was done in the context of three distinct time frames: the short-term, defined as 12 to 18 months out; medium-term, from 18 to 36 months out; and long-term, from 36 to 60 months out. Discussion of opportunities began with a brainstorm session held with the entire group present; the results of this session are presented as Appendix I and are ranked from most to least popular based on the number of votes each suggestion received during the session. None of the opportunities thus ranked was classified as belonging to the long-term time frame. Following this brainstorm, participants broke out into four groups; each group's mandate was to return with their killer-AI-application for SCM.

Four alternative future product scenarios were thus generated, with the only constraint being that this appli-

cation focus on one of the following three alternatives, which were the most popular groupings derived from the brainstorming exercise held earlier:

1) Data
2) Human interface and/or human factors
3) Business rules driving decision systems

Independent P2P Agents, 6-18 Months

The first of these applications focused on the development of data-driven decision-support software that would allow suppliers to access and interact with any other suppliers, either within or outside their specific markets, and to hedge their production factor decisions. Essentially, B2B failed due to the commoditization of the supplier base. An agent-based system that allows suppliers to protect their margins by hedging their decisions across the entire market offers protection against such commoditization in the future. To succeed, agents must represent the seller in real-time, emulating the human network of relationships common to trading relationships through analysis and prediction of interaction patterns. The implementation of such agents is through the use of peer-to-peer (P2P) processing which enables low barriers to entry that allow even the smallest of "mom-and-pop" type shops to participate. Suppliers adopt such technology due to its low cost, speed of implementation and the application's ability to immediately impact the supplier's business. Such technology, dubbed Independent P2P Agents, provides for predictability, integration and hedging, and the time frame forecast for implementation is within 6 to 18 months.

Independent Network Agents, 24-36 Months

In today's business world, business processes are forced on the executive who needs to make budgetary and spending decisions. Independent Network Agents closely emulate the real world, collecting and analyzing actual data in the system, finding correlations between quantifiable variables and developing algorithms that allow the executive to easily simulate the effect of even minute changes in purchasing behavior on financial outcomes. The executive, using such an Independent Network Agent, should be able to forecast changes in factory output based on a change in the lunch menu or the type of toilet paper used in the restrooms. The concept is similar to applications currently under development by the likes of Cognos and Hyperion; such applications are typically called executive dashboards. Challenges include the difficulties inherent in collecting the data – especially early on, as well as the complexity of the statistical correlation models that need to be developed. Also, participants expressed concerns that, given the current environment where an estimated 80 percent to 90 percent of processes are barely documented and generally lacking in any kind of proper analysis, rule extraction will be a real challenge.

Data Agents, 12-48 Months

Data Agents' focus is to make sense of disparate data. As an example, consider the process of managing returns in a retail environment. In essence, this precipitates a reversal of the normal supply chain. For every such process, a tremendous quantity of data is available, however, typically it is not captured in any kind of structured form, preventing any significant degree of analysis. What is needed is technology that will allow managers to make sense of such data, enabling the kind of organizational learning that can be leveraged to drive down process costs. In other words, such Data Agents as proposed here will turn data into information that can be used to make positive-ROI decisions, with the end-goal being

process automation. Time frame for implementation of Data Agents is incremental – data needs to be aggregated in the system for quite some time in order to enable the agents to begin their learning process. The group estimated that within 12 months such a system could be up and running, and that Data Agents would be fully operational within about 48 months.

Decision Support Video Game, 12 - 48 Months

This application focused on leveraging a human-computer interface to support optimal decision-making. The group identified the problem to be solved as the abundance of data, leading to unclear and conflicting processes and goals. The Decision Support Video Game application would manage disparate sources of information and lead executives through a learning process with the end goal being optimal decision making. Somewhat similar to a video game, the application's design would incorporate video-game-like elements. For example, status quo and crisis would be displayed through situational representation, while progress would be determined through a relevant value function dependent on variables such as price and quality. The application would be capable of calculating and displaying trade-offs as well as managing competing goals in the context of well-defined constraints. Options would include rewards, risks, downstream impact, etc. Implementation of such a system will require a knowledge base, case-based reasoning algorithms, the ability to create ontologies dynamically and the use of inference engines. The application should be able to simulate scenarios such as catastrophic recovery, impact, trade-offs and knowledge sharing. As with the previous application, the necessity to gather data and build a knowledge base requires early operation, possibly within 12 months, but the application will likely not be fully operational within less than 48 months.

Conclusion

Think Tank Session participants concluded that while implementations of AI in SCM are not about to replace humans, nor will they likely do so in the foreseeable future, significant strides have already been made in leveraging AI-driven technologies to increase efficiencies across the supply chain. Intelligent agents will proliferate as universal standards take hold, enabling both up- and and down-stream collaboration and interoperability. Yet, no one should expect such standards to be a panacea. Significant challenges continue to exist along technological, organizational, operational and financial dimensions, and human intervention will be an integral part of supply chain management for yet a long time to come.

Suggestions for Future Think Tank Sessions

Participants requested future Think Tank Sessions to focus on the following subjects:

- Web services and integration in the real world
- Information extraction and normalization with quality control
- Knowledge management and machine/human learning interfaces
- Human/machine interfaces
- Human/computer interfaces
- Collaborative mass customization processes and strategies
- Wearable computing
- Asset and people management
- P2P technologies and services
- Very high-scalable integration (grid computing)
- Internet V.2 – standards
- CRM and intelligent agents
- What's the next wave?
- High ROI
- Machine learning applications beyond data mining
- HMI for ubiquitous computation
- Beta semantic Web problems

Appendix I – Results of Group Brainstorm, Opportunities

Short-term Opportunities: 12-18 Months Timeframe

Data

- Data and process integration and management (e.g. EAI, BPM, Web services)
- Better tools for collaborative, iterative standards development to help move forward the data problem which underlies everything else
- Enabling true integration through
  - Access to data
  - Turning data into information
- Content integration in SCM

Human

- Work with the humans who make the process work to define the process in a way that is usable by machines while rewarding the human sufficiently to compensate for their intellectual capital
- Human-facing agents for reducing complexity (incremental improvement)
- Opportunities exist to aid and manage and track the following "human" activities
  - Problem resolution
    e.g. incorrect goods received
  - Exception situations
    e.g. excessive returns
  - Decision making
    e.g. selection of a candidate

Measurement

- AI will help create better quality demand forecasts based on historical trends. Neural nets are a possibility.
- Measuring and managing end-to-end supply chain operations for optimal customer value

Medium-Term Opportunities: 18-36 Months Timeframe

Decision Support

- Preference and business rules for a variety of complex SCM decisions; need to be easy and accurate
- Strategic business decision support e.g. "What should we do?"
- Usability for decision makers throughout the process
- Distributed decision making

Man-machine Interface

- Human/computer interface
  - How to present info to users in an easy-to-use, "brain dead simple" way
- Knowledge transfer from human agent to intelligent agent
- Knowledge distribution from human agent to software agent in terms of knowledge schema
- Human/computer interfaces for AI-based agents
- Coexistence of agent- and human-experts

Biz Rules

- Integrating manufacturing execution system with planning system for supply chain. Re-plan after machine breakdowns or parts shortages
- On demand side – propose timely optimized response to dangerously disruptive events

Data

- Real time SCM data
- Automatic information extraction, normalization and aggregation from disparate data sources (e.g. different databases, dynamically changing Web sites, free text information sources, etc.)
- Data access – answers all important characteristics of a winning opportunity –
  - It solves a true problem visible to the company's

management team
- Not a threat to players within the organization
- Modest complexity

Human

- (5-10 years) Employing semantic Web technologies to dramatically increase supplier to manufacturer efficiencies.
  - Revolutionary technology will come from semantic Web and intelligent agents
- Create systems supportive of already existing human networks – e.g. automating the task of data gathering for traders
- Alignment of economic outcomes
- Create intelligent system to keep track of
  - Vendors' offerings
  - Favors / discounts
  - Emulate relationships and favors – "give and take"

Inventory Management

- A large factor in today's economic downturn has been an excess of manufacturing inventory due to unreasonable long-term demand forecasts. Inventory is expensive (20% to 40% of unit value when annualized)

Current Use of AI in SCM – Resources for Further Exploration

ILOG http://www.ilog.com/
ILOG is developing optimization software suites that enable everything from long-term planning to tactical operations, providing the tools necessary to dramatically improve decision-making in any industry.

Trilogy http://www.trilogy.com/
Trilogy develops product configurators that are essential components of cutting-edge eBusiness channels, utilizing advanced artificial intelligence algorithms.

Dejima http://www.dejima.com/
Dejima Direct is a product platform that allows people to interact naturally with technology. Dejima Direct determines user intent using artificial intelligence algorithms that enable human/machine communication similar in nature to the way people communicate with each other.

Artificial Intelligence and Supply Chain Management – Resources for Further Exploration

An Introduction to Artificial Intelligence
Offering an in-depth exploration of the subject, this site covers the history of AI and explores relevant approaches and applications. The site includes a directory of programs, as well as message boards and an interactive segment.
http://library.thinkquest.org/2705/basics.html

Artificial Intelligence and Supply Chain Management
Part of the About.com network of sites, offers short articles and many links that allow for additional exploration.
http://logistics.about.com/
(search for 'artificial intelligence')

Intelligent Agents and eCommerce
Outline of a presentation given by Maria Gini of the University of Minnesota in February of 1999. Great overview of what an intelligent agent is, and how such agents contribute to eCommerce.
http://www-users.cs.umn.edu/~gini/csom.html

Intelligent Agents for Electronic Commerce
Information about the MAGNET (Multi Agent Negotiation Testbed) and links to a couple of dozen excellent full text papers on the subject.
http://www.cs.umn.edu/Research/airvl/magnet/

These proceedings were written by Erik Steiner.