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## Developing Faculty and Student Expertise in 21st Century Supply Chain Technology

by David J. Closs, Michigan State University

Supply chain management has become an area of critical importance for many firms as they work to transform themselves to more responsive enterprises. The need for responsive supply chains is driving customers' desire to buy integrated solutions and services rather than just piece parts. This requires more precise and integrated service and support capabilities. At the same time, firms desire to improve efficiency and responsiveness in key areas such as quality, manufacturing time, on-time delivery, and customer billing. The challenge is to match the increasingly demanding service requirements with the limited resource constraints.

To evaluate the resulting trade-offs, supply chain management is increasingly applying advanced information technology to guide more complex decisions while remaining within the increasing tight resource constraints. There are a growing number of courses focusing on Enterprise Resource Planning (ERP) technology applications in Information Technology curricula, yet there has not been the same level of focus on supply chain planning tools. These applications include software to facilitate collaboration and coordination of forecasting, supply planning, factory and production planning, inventory and resource planning, and transportation planning within individual firms and between supply chain partners. Tools such as these allow firms to meet more precisely defined service requirements with more item variations while firms operate with re-

duced resource capacities. The major providers of these applications include Aspen Technologies, i2 Technology, Manugistics, and SAP. While the historical reason for this lack of focus and offerings includes lack of awareness and interest, firms are beginning to demand expertise to support the implementation and application of these supply chain planning systems. Specific firms looking for this expertise include manufacturing, logistics integrators, and consulting firms. Even though demand for students with expertise is growing, there is still a lack of awareness and expertise regarding supply chain planning tools and applications.

The lack of awareness results from the relatively few success stories reported by firms using such technologies. While there was extensive publicity and purchases of advanced planning and scheduling applications prior to the dot-com bust, interest has declined as companies have weighed software expenditures more carefully to justify the substantial investment both in terms of financial requirements and effort. The track record for the implementation of these supply chain planning tools has not been strong enough to pass the investigation as part of the purchase process. The lack of expertise results from the lack of hardware, software, and training in these applications for faculty teaching supply chain management. Supply chain advanced planning and scheduling applications typically incorporate large-scale memory resident optimizers requiring



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Unix-based servers as hardware platforms. Because these applications operate on servers, their use in business school environments also requires substantial technical and maintenance support. With this combination of hardware and software requirements, there are few business schools that have the computing and support capacity.

A third issue regarding expertise is the combination of skill sets required to train students in advanced planning and scheduling applications. While the hardware and software itself is not trivial, a more significant challenge is to provide the training, support materials, and motivation for faculty to learn the applications and to be able to communicate that knowledge effectively in a teaching environment. While ERP systems are clearly in the domain of data processing and information technology professionals, APS systems require a balanced blend of supply chain management and information technology. The result is a need for supply chain faculty to understand the application, and to a certain extent, the technology itself. There is also the problem that few faculty, particularly those that are non-tenured, can apply the time devoted to application software training to their promotion and tenure files. So, even though the interest and demand is increasing, it is difficult for universities to access the hardware and applications as well as to develop and maintain the expertise. This is particularly evident as more and more firms are seeking individuals with the same combination of skills.

IBM, in conjunction with four universities that feature major supply chain programs, has begun to address this situation. The programs (Broad College of Business at Michigan State University, Smeal College of Business at Penn State University, W. P. Carey College of Business at Arizona State University, and the Smurfitt College of Business at University College, Dublin) have been provided grants to establish centers for the joint research and study of advanced supply chain practices. Through IBM's support of Shared Uni-

versity Research (SUR) awards (consisting of IBM software, eServer and storage technologies), the four institutions are creating Centers for On Demand Supply Chain Research, laboratories that will serve as environments for modeling, analysis, and training on the tools to create responsive supply chains. I2 Technologies has joined with IBM to provide a suite of their advanced planning and scheduling tools including Supply Chain Planner, Factory Planner, Demand Planning, and Supply Chain Strategist. In addition to the hardware and software, the grant includes faculty and graduate student training along with data environments to simulate supply chain planning in a number of industries including electronic and consumer products.

University faculty and graduate students will use the laboratory to study, simulate, and test the key relationships in end-to-end supply chains, focusing on the dynamic flow of products and information considering the resulting interdependencies between supply chain partners. Their work is expected to help IBM and other companies build dynamic supply chains that can sense and rapidly respond to changing customer demands and market conditions.

After establishing the Center for On Demand Supply Chain Research at each school, IBM plans to link the labs of the partner universities via an advanced computing Grid. When operational, the Grid of interconnected laboratories, the first Grid computing research project in supply chain management that IBM has undertaken in cooperation with academia, would allow these universities to collaborate and conduct joint applied research and teaching across a group of interconnected laboratories. The Grid network will allow the universities to share hardware and application modules. Hardware sharing will be useful when one of the schools has an assignment requiring large numbers of students to use the advanced planning and scheduling tools. Even though the project sizes for the students are small, the large number of supply chain students character-

istic of these universities would overpower even a large server. Just as industry is considering the sharing of computing capacity, universities can benefit as well. In terms of application modules, the Grid network facilitates the sharing of teaching modules so each school does not have to develop a complete set of applications. Since the hardware and application structure of each system is common, the schools can focus their development efforts on a limited number of teaching modules and then exchange them to provide an entire suite of offerings to their students. The result is a set of comprehensive planning modules focusing on supplier planning, production planning, supply chain planning, and transportation planning.

While it is not new that information technology hardware and software providers offer their products and services to universities, this situation is unique in that IBM conceptualized the relationships from the beginning as a partnership of universities rather than a series of individual relationships. Even though each of the university supply chain programs are large in their own right, there is strong motivation for the schools to work together to take advantage of development, teaching, and research synergies. In addition to the hardware and software grants, the partnership involves student recruiting initiatives, student and faculty development, common research, and executive education. While these common relationships are less than two years old, there is already substantial evidence that the common and integrated focus has allowed the universities to make significant jumps in supply chain education and research. ■

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