B2B INTEGRATION

B2Bi can be implemented in three ways:

- **Cross-enterprise process applications integration** – companies integrate their business processes to optimize existing labor and time utilization. Usually, a limited number of partners are declared in a very static, fixed way and then the processes are optimally adapted (via common infrastructure of e-Business Broker, Business Management Subsystems, and Application Adapters on both ends of the process) to their needs. It reminds one of a hard-wired system once it gets going, driven by a common software/communication solution.

- **Cross-enterprise process data integration** – just data from different application components are translated by a gateway into a common standard such as XML. This reliance on a common data exchange format rather than a common infrastructure makes this solution easier to implement and extend. Instead of requiring all participating firms to utilize the same package, each party needs only to recognize how to process the documents received.

- **Vortal-oriented integration of business partners** – all parties, instead of implementing their own integration solution, apply the vortal as a system to make business deals electronically. In this case, however, only the vortal provides the choice for business partners, who are its members.

Perhaps the biggest source of frustration among firms trying to implement B2B relationships is that their partners are not at the same level of technological advancement. The issue of integrating partners via the same business process can be solved by a number of ways.

Among the first leaders of B2Bi is the Convisint automobile exchange created in 2000 by General Motors, Ford, and DaimlerChrysler. In the same year the GlobalNetXchange was formed by Oracle, Carrfour and Sears Roebuck to connect 50,000 retail buyers and suppliers.

E-MARKET INTEGRATION

E-market integration creates a market for multiple businesses. In this solution there is no common infrastructure like in B2Bi. A new participant can

join an e-market within hours. Software like e-Collaboration facilitates business deals in the e-markets. Sabre Holding Corp., a provider of airline ticket reservation services, formed an e-Marketplace for procurement for airlines. Also, eBay, the auction house, was one of the first creators of the e-market for millions of participants. Covisint created e-market for the motor industry.

MOBILE INTEGRATION

So far the integration of *intra/inter* enterprise applications (either through EAI, B2B or e-markets) has taken place at the level of data ad information transfer among servers and users equipped with PC's. However, there is the potential to make enterprise applications – ERP, SCM, and CRM – available for field workers through wireless devices.

In October 1999, the first pilot wireless access was launched by PageMart, renamed WebLink Wireless, teamed with DMR Consulting. Its goal was to develop a system for letting handheld devices tap into a PeopleSoft Vantive CRM application over the WebLink network. The pilot system applied WCTP (Wireless Control Transfer Protocol) protocol which is based on XML-based protocol for transmitting wireless messages over HTTP (Hyper Text Transmission Protocol). To do so, the pilot project used Vitria Technology Inc.'s BusinessWare 3.0 integration software to connect the Vantive applications running at customer sites to WebLink's network.

The system is designed to work like this: when a sales representative (Sales Force Automation) or other mobile employee needs to access information such as a customer's trouble call, a message is sent over a two-way radio frequency to a gateway at WebLink Wireless. That gateway, which is based on Vitria's BusinessWare, uses WCTP to send messages to Vantive applications as well as to wireless devices on the other carrier's networks. That gateway also directs the incoming wireless traffic to the appropriate applications in ERP, SCM, or CRM. Vitria Inc. offers a variety of off-the-shelf connectors ready to integrate Vantive, SAP, Siebel and Oracle applications in a wireless mode.

The mobile integration allows field workers to perform queries of open tickets, update status and close tickets right from the field. Information that would normally have to be written down and logged into a PC can now be transmitted via a wireless messaging device. First among that type of applications would be: an order entry application, a workforce management applica-

tion, and a time-card system for a construction company. In general, the best candidates for wireless access among applications are those which require a remote real-time data entry and the inclusion of remote workers in a workflow system. For those types of applications, paging networks, like WebLink's, offer a better solution to remote access than the phone network, mainly because an asynchronous messaging system does not require a dedicated, always-on modem-driven connection and, hence, can support more users.

IT DEVELOPMENTAL VISION FOR THE 21ST CENTURY

The IT developmental vision for the 21st century may influence some IT developers about how to develop IT and its applications.

The 20th century introduced the computer and Internet that created the Information Wave. The latter began to intervene in the Agriculture and Industrial Waves. In the 21st century the Information Wave in developed nations (17% of the world population) will transform from intervention into optimization of the other two Waves' development and operations. In developing nations (83% of the world population) the Information Wave should begin to intervene in the other two Waves.

The Information Wave will have the task to optimize the Agricultural and the Industrial Waves in the following scopes:

Agriculture Wave:

- Energy – increase energy efficiency through better control of farming.
- Environment – reduce pollution through better control of recycling.
- Farming – precision farming through better control of irrigation, seeding, fertilizing, and the application of robots.

Industrial Wave:

- Energy – increase energy efficiency through better control of transportation, construction, and manufacturing systems.
- Environment – reduce pollution through better control of recycling and application of "green" technologies.
- Self-assembling materials – through better control of nanosecond processing of composite materials.

- Smart materials – through embedded intelligence applied in homes, offices, and vehicles.
- Production – through better control of eco-industrial parks operating as a closed system to reduce waste pollution.
- Manufacturing – through better control of computer integrated manufacturing leading to mass customization of cars, appliances, and other products.
- Advanced robots – better flexibility through advanced sensors and artificial intelligence and control of mobility.

In order to pursue the task of optimizing these other two Waves, the Information Wave will evolve itself in the following scopes:

Computer Hardware:

- Supercomputers will apply massive parallel and neural processing.
- Computers will apply photons rather than electrons to code and transfer information.
- Biochips should be commercially available.
- Personal computers will be fully integrated with fast telecommunication, television and interactive video.
- Personal digital assistants will be widely applied to manage work and personal affairs.

Computer Software:

- Expert systems will steadily reach a wider scope of users in engineering, management and perhaps even in medicine (the malpractice issue).
- Intelligent software will support net browsers and knowbots to retrieve net-driven information.
- Information systems will be integrated through Enterprise, Local, National and Global Information Infrastructures.
- Information systems will be widely enhanced by knowledge management subsystems based on data mining.
- Software development will enter the stage of manufacturing through the wide application of CASE tools and object/component-oriented programming.

Computer Networks:

- Information super-highway will be organized under the forms of Enter-

prise, Local, National and Global Information Infrastructures (EII, LII, NII, GII) accessed by 80% of citizens of developed nations.
- EII, LII, NII, and GII will be built on ISDN, ATM, and fiber optics that will reach the majority of homes and offices in developed nations.
- Personal communication systems (PCS) for voice and e-mail communication will be popular among the majority of professionals.
- Groupware systems – will be routinely applied for concurrent learning and working at multiple sites of virtual offices and colleges.

Info-Communication Services/Systems:
- E-mail will be the most popular form of communication.
- Videoconferencing – will be the standard for a business meeting.
- Telecommuting – will engage the majority of workers who live in remote places and commute.
- E-commerce – will be the most popular form of closing business transactions.
- Online publishing – will still compete with the traditional form of publishing gazettes and books.
- Distance learning – will enhance lectures and seminars but will not replace them.

Info-tech will be the driving force of the Technology Revolution in the 21st century, which has to eliminate or minimize the threat of the "Death Triangle of Mankind." This Revolution should (but not necessary will) transform modern civilization into sustainable civilization.

BEYOND COBOL – IT SKILLS FOR THE 21ST CENTURY

In May 2000, the Information Resource Management Association (IRMA) conference met in Anchorage and featured representation from 40 countries. It was the author's good fortune to chair a panel on the industry's needs for modern IT tools/skills that are beyond classic COBOL, a very popular language in academic curricula. The author offered a question for discussion: "How to minimize the technological gap between Academia and Industry?"

Panelist Tom Bennett from the U.S. Department of Defense summarized the administration's needs by saying that post-college internships should be the

best method to develop IT specialists who would be equipped with current tools. Panelist Mehdi Ghods from Boeing provided a very surprising statistic indicating that industrial software written in COBOL is huge and perhaps for many more years will require COBOL skills.

Virtual panelist Sharm Manwani from Electrolux (UK) stated that legacy systems slow down new IT developments; however, large organizations debate about BRP development via ready-made packages (SAP, JDE, Oracle,) or via in-house Enterprise Application Integration (EAI), particularly in the areas of supply chain management and e-commerce. These integrational tools include middleware tools such as MQ, Tibco, XML, CORBA, COM, EJB, and Java workflow tools. Another area of strong industry interest is the development of data warehouses with SQL/OLAP tools for Decision Support Systems (DSS) including data mining.

Another virtual panelist, Stan Targowski, from Hewitt Associates (USA), characterized the new system landscape of the 2000's as no longer having experts with 20+ years of practice to guide college graduates and in which the user no longer accepts any application. This will be a landscape whose architectures are more flexible and complex and will therefore require a better understanding of not only IT tools, but the whole enterprise organization. A new college graduate can no longer expect a well established career path and his/her career planning must shift from management to employees. To succeed, the new college graduate from an IT curriculum needs to have a mix of skills, crossing many areas of business, from the technical to the communication areas. His/her best approach is to know everything about everything, to be a self-starter and a team player, to be a very quick learner with good organizational and project management skills, to be able to work with minimal supervision, and effectively communicating both orally and in writing. More importantly, he/she should enjoy what he/she is doing. Stan listed specific skills that are needed in the most popular areas of IT:

- Application Development: object oriented analysis and design, experience in designing GUI, event-oriented programming in VBasic, Java, C++, understanding of RDBM (Oracle, DB2, Informix), understanding architecture and tools (HTML, XML, EJB);

- Database Administration: strong RDBM skills, strong Windows NT/2000 and UNIX skills, data modeling and algorithmic skills, Network Management, Netware, Windows NT/2000, UNIX skills, understanding

of protocols TCP/IP, IPX, SPX, etc., understanding architecture (bridges, routers, gateways).

Stan also mentioned that advanced skills not necessarily required from a fresh graduate are needed to roll solutions like ERP software (SAP, PeopleSoft, Oracle, Siebel, etc.) with the support from in-house customization, focusing on components and inter-system integration. He argues that globalization and outsourcing may require assigning key in-house leaders to manage IT subcontractors in countries such as India, Ireland, or Poland. He thinks that overall intelligence, ability to learn, and enough proficiency in some specific area will get the IT worker much farther than being an expert in a very narrow area. He is optimistic in saying that if one does not know a specific technology, one will be trained in it.

Panelist Liliane Esnault (France) from Academia stated that some colleges are financially too weak to educate IT graduates in the full range of skills required by the industry today.

As a panelist for Academia, the author stated that some colleges do not train their IT students in current technology but educate them in IT critical thinking and that prepares them for a life-long educational updating. I also noticed that Academia has limited resources but that IT progress is even too fast for the industry and administration which have rich resources. In response to the industry's needs for graduates skilled in communication, the author concluded that Academia cannot "produce" very good communicators, since learning how to communicate is a life-long process, not often completed with success.

I hope that this panel provoked us to a better understanding of industry's and administration's needs for current IT tools/skills. Industry should not blame Academia because we do not train the graduate in the current technologies; we will never do it, since it is not our mission. If industry's IT function must be better managed, particularly within the scope of in-house development of talents and skills, academia must educate more knowledgeable and better motivated graduates to serve their needs.

COMPUTER CONTROVERSIES

The IT developers, who want to be aware of their work, should be familiar with their solutions' social consequences. They should read a book *Computer*

Controversy, edited by Rob King (1996), who opened the debate on such issues as:

- "The seductive equation of technological progress."
  Is it true that in developed countries almost every socio-economic problem can be resolved by technology? Perhaps it is false.

- "The dreams of technological utopianism."
  Technology has its own limits and cannot provide solutions for every issue. Also, too much applied technology may even be too dangerous in cases of employment and customer service.

- "Electronic office: playpen or prison."
  If an e-office limits too much face-to-face communication then it can be a "prison."

- "How information technology can transform organizations."
  IT can transform an organization into a paperless and buildingless organization, very lean and competitive.

- "Great expectations: PCs and productivity."
  A worker with a PC is much more productive than a worker without the information processing capability.

- "Can computer science solve organizational problems?"
  Computer science can solve only limited organizational problems.

- "Mr. Edens profits from watching his workers' every move."
  His "profits" can be shortsighted.

- "Increasing personal connections."
  This is true; e-mail increases personal connections effectively.

- "Finding a happy medium: explaining the negative effects of electronic communication on social life at work."
  E-communication limiting face-to-face communication limits a social tissue that makes humankind an advanced "animal."

- "They call it cyberlove."
  The cyberlove can be a very dangerous play for its participants, particularly for women.

- "The strange case of the electronic lover."
  It is a false promise that electronics can substitute a human touch.

- "I heard it through the Internet."
  The Internet provides a lot of garbage information.

- "On the road again." If information highways are anything like interstate highways – watch out!
  Information highways are new ways of socio-economic operations and it will better if someone will know how to "drive" through them.

- "Privacy and social control."
  Unfortunately, e-communication can be applied to limit privacy and increase social control.

- "Your personal information has gone public."
  In many cases it is true.

- "The government needs computer matching to root out waste and fraud."
  IT may help in discovering waste and fraud.

- "Privacy: How much data do direct marketers really need?"
  They need too much data; to support competitiveness it is better to analyze market as an undeterministic entity.

- "System safety and social vulnerability."
  If social life is too much computerized, it can be unsafe, since technology is technically not perfect.

- "Office automation's threat to health and productivity: a new management concern."
  It is true that work at the computer terminal without breaks can be hazardous.

- "Code of ethics and professional conduct."
  A code of ethics in a digital world should be the same or even stronger than in a physical world.

These controversies add fuel to debates, along with discussion about the development of IT. Will IT challenge and perhaps conquer our culture?

CONCLUSION

- The trends in EII development point strongly towards the profound integration of Enterprise Information Infrastructure, which in effect will become an electronic one with all enterprises interacting with the marketplace through the Internet and private computer networks.

- The development of e-Enterprise today will trigger unpredictable social consequences that should be addressed at the time of an IT project's scope and context definition.

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