Enterprise Application Integration in Education

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Introduction

Although the Internet was a result of government and university collaboration, the digital tsunami that has blown through various industries has barely affected the way higher education institutions conduct business. However the winds of change are now slowly starting to affect these institutions as colleges and universities take a page from dot.com businesses and ramp up front and back-end systems by using EAI and other technologies such as portals to transform the business of education. Legacy data that includes student information systems, human resources, academic and administrative records are being web-enabled to provide better access to institution stakeholders. This is being done partly to improve internal efficiency and workflow, but is also a result of external competition from private e-Learning institutions. It is ironic that although the Internet was a product of advanced research project that has its genesis in academia, it has taken such a long time to permeate the ivory towers of education.

The vertical market of Higher Education (which includes colleges, universities and private institutions that provide degree-based education) with its unique mission, goals, and organizational culture is often overlooked by EAI vendors offering technology-based services to industry. The business side of Higher Education that is concerned with increasing revenue and making a profit similar to other businesses is usually not understood except by some companies that provide specific services. This article will provide information on operations typical to higher education institutions, challenges of integrating EAI, and successful projects that are being developed and integrated to realize productivity gains in this nebulous environment.

Academic Environment

Academic institutions have been steeped in tradition that has evolved over decades (and in some cases centuries). These bricks-and-mortar universities can be compared to old economy companies where innovation and agility is difficult in comparison to new economy companies that use creative and innovative approaches and business models. The age-old traditions apply not only to the academic process of teaching and learning, but also administrative and business processes that support the academic infrastructure. Since many educational institutions believe that there is no direct economic incentive to do business electronically, it is not surprising to find traditional processes still prevalent in day-to-day operations. For example, placing an order for office supplies would typically generate series of paperwork that includes purchase requisitions sent to Accounts Receivable office where the item is located from different catalogs by a staff member. Once the item identified, it is hand coded into a legacy system so a purchase order can be generated to be mailed to the vendor. Using this process, lag time is considerable and chances of error also increase especially with complicated orders such as chemicals needed for a research laboratory. Reengineering this process to e-procurement in which each department is responsible for ordering their own supplies using a purchasing card can offer productivity benefits that many institutions have yet to realize.
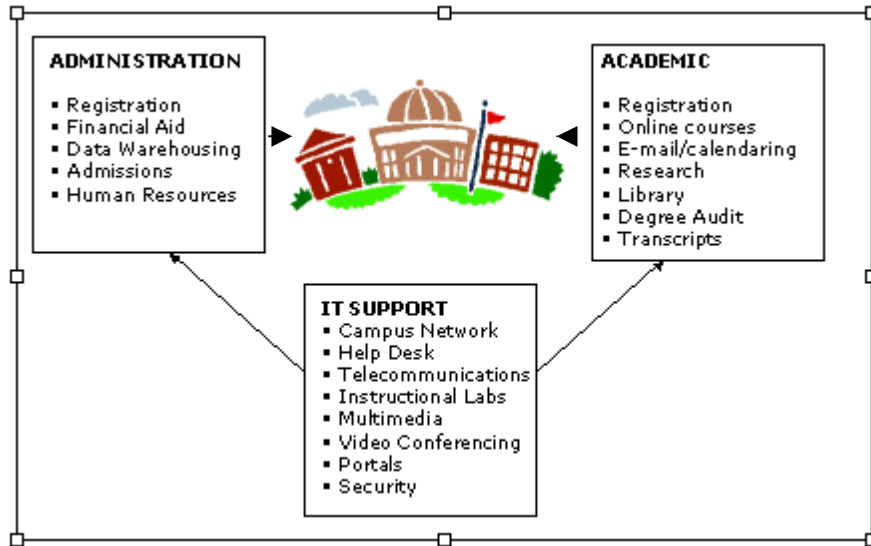
EAI in Education

While educational institutions have traditionally been slow to respond to market changes, competition from dot.com universities has created a sense of urgency in traditional universities to stem the market share of students who are defecting to private institutions that offer individual courses as well as degree programs online. Online education has come on the radar screen of dot.com ventures as they realize that higher education being a $300 Billion industry, and more than 50% of U.S. adult population pursuing continuing education, the new economy is driving "new education". Students enrolling in these online programs are mostly adult learners who are motivated, self-directed, and not interested in football teams, well-groomed campus grounds, or fraternities and sororities.

These students are savvy consumers looking for good education in the fastest time that culminates in a degree to help them further their professional career. The dot.com players have transformed Education to a digital commodity. Taking a page from Customer Relationship Management book, private institutions are marketing aggressively to students by identifying, contacting, providing information using various channels, and giving personalized attention. In addition, these private online universities are also forming partnerships with corporations to provide customized curriculum geared towards employees. Examples of Executive MBA programs that offer classes online and have minimum residency requirement with face-to-face classes being held on weekends (if at all) are very common today. Traditional universities have failed to leverage the Netcentric economy to market aggressively and meet the dot.com university challenge.

Enterprise Application Integration involves linking various systems and applications in an environment that provides unified and secure access to data and information no matter where it is located. EAI can prove to be beneficial to stakeholders in education institutions. EAI enables consolidation of information based on need, and ensures end-user satisfaction through reliable online access to current information. The type of data may include Administrative (admission, personnel, financial records), Student information (registration, transcripts, demographic, health records, grades, GPA calculator), Academic (library, university catalog, reference material, access to individual course materials, academic deadlines, exam schedule), and Campus Information (academic calendar, student organizations, dining, transportation schedules, parking, computer labs availability, housing). EAI can be used to transform antiquated business processes in educational institutions. Application and data integration, middleware, process flow, application hosting, portals, wireless technologies etc. can find an appropriate place in higher education institutions. A consortium of universities have joined forces to tackle problems such as campus network architectures, authenticated DHCP, digital libraries, directory services, network commerce, enterprise calendaring, metadirectories, and portals that are enablers of EAI.

To a certain extent, the Internet is starting to change the landscape of Higher Education and technology is directly contributing to educational change. Universities are undergoing e-business transformation (albeit at a slower rate compared to most industries) by undertaking Internet initiatives. These projects are first targeted to internal employees (deans, directors, faculty, staff), then to students and external suppliers of goods and services. Benefits of electronic transactions for education institutions can be tremendous. These include significant cost savings, higher quality of service, and improved workflow between administrative and academic units. Internal IT units are charged with supporting the institutions' strategic plan and mission by developing and deploying technology applications and services such as communication infrastructure, enabling technologies, and business process support structure, that closely integrates with academic information systems to exchange data common to multiple units within an institution. This may be achieved by creating data warehouses, e-procurement systems, digital imaging, workflow tools, accounting and human resource systems that support processes such as academic advising, registration, billing, and online course environments. Academic infrastructure may include e-learning, support for multimedia, videoconferencing, streaming audio/video mobile devices, and interactive collaborative tools. External partners and suppliers such as publishing companies, bookstores, web hosting companies collaborate with institutions to provide value-added services. In addition, larger educational institutions that have adequate IT staffing resources are looking at other initiatives that include buy and sell-side e-commerce in which there is consolidation of suppliers, reduced paper-based transactions, and maximum efficiency gain on both the Administrative as well as Academic sides. The Figure below shows interaction needed between Academic, Administrative, and IT support unit to achieve this transformation.

ADMINISTRATION
- Registration
- Financial Aid
- Data Warehousing
- Admissions
- Human Resources

ACADEMIC
- Registration
- Online courses
- E-mail/calendaring
- Research
- Library
- Degree Audit
- Transcripts

IT SUPPORT
- Campus Network
- Help Desk
- Telecommunications
- Instructional Labs
- Multimedia
- Video Conferencing
- Portals
- Security

With a need to provide customer-service to an increasingly sophisticated audience of technology literate students, results of EAI projects are now appearing in some universities. Most of these are internally developed as they can be customized based on process requirements, customer need, and institution mission (Teaching, Research, Service). Many smaller institutions realizing their core competency lies in education and not technology, are outsourcing services (such as e-mail, web commerce) to ASP and MSPs realizing that technology is a support mechanism that will help them optimize information flow internally and externally to leverage efficiencies and strategic advantage in every aspect of business that supports the educational mission of the institution.

Customer service needs have driven incorporation of technology not necessarily to reduce costs but to transform the customer (student) experience. To register for courses, no longer does the student need to stand in line to get cards, which are then taken to another building to check course availability, and register for courses that may or may not be available at that time. Web registration systems allow students to select, register, and pay for courses online with the same ease as performing a B2C transaction from an online bookstore.

Consumer access to real-time information is streamlining internal operations. For example, in larger universities, the supply and demand for required courses is inequitable, and student access to real time data that shows course availability during the registration

period is crucial in determining current offerings and collecting data to plan for future. Other examples that would benefit from EAI to enhance the university experience would be: checking grades, tuition, financial aid information, degree auditing, creating class schedule, ordering textbooks, applying for parking, checking overdue library books, ordering transcripts etc. which consolidate data residing on many different systems. Student Information Systems are being developed to fully support online web services, provide information and transactional capabilities as explained above. Students have come to expect a highly connected environment and are taking this into consideration when seeking admission to colleges and universities.

The goal of implementing ERP in education is same as in industry, i.e. to provide a platform for integrating information and business processes so they can be shared for decision-making by various stakeholders in the institution. Applications of ERP in education can include sharing data from student information systems, research and grants management, and administrative records for the overall purpose of reducing paperwork, enhancing workflow, improving efficiency, and streamlining business processes. For example, at the end of a semester, when a faculty member submits final course grade for a student, this event would trigger other functions automatically such as making the grade available online to the student, updating students' transcript, updating students' record in the financial aid office, feeding data to the degree auditor program, and clearing flags for waitlisted courses that may have been a prerequisite for a course the student had conditional registration for the following semester, updating that course enrollment record, course catalog, and registration system.

Security

EAI implementation has its share of problems in university settings. One such issue is Security. University systems are known to be hacker havens. Because of the open nature of academic environment, there is a trade-off between access to information and security. While on the one hand access is needed to work on research projects this leaves systems wide open for others to exploit for nefarious purposes. Denial of Service attacks are known to use university computers because of lax security on systems. With access to

newer technologies (such as Internet2) but limited staff resources, there is an identified need but not necessarily the delivery power to take a project to fruition. With competition from industry that offers higher wages to IT professionals, it is common to see systems in departments being managed by staff (usually student employees) who do not have enough experience or adequate experience to conduct system administration tasks on enterprise wide systems. To address security issues, services such as user verification, authorization, validation, and encryption are being revamped using initiatives such a LDAP on which PKI infrastructure can be based to support smart cards, wireless projects, and access to library databases and computing resources from on and off-campus.

Portals

University portals are gaining inroads into the academic environment. With a customer base of students, faculty, administrators, staff, and alumni, and data stored in many legacy systems across different functional areas, the need to integrate information across the value chain to display relevant information to stakeholders is critical. The ultimate goal is to create a single web-enabled tightly integrated business enterprise system that allows aggregation of content, customization, and personalization. Portal development scenarios are complex in this multifaceted educational environment where individual roles are transient (for example, full-time/part-time students, staff members who may go from being an employee to a student or a combination of both each semester).

Since requirements are specific to each institution, in most cases Education portal development is taking place in-house. A campus portal is able to integrate various types of data on as-needed basis that depends on roles and access rights granted to each individual affiliated with the educational institution. Authentication against a centralized directory, proper access to secure/insecure items on campus servers, e-mail and calendar access, an efficient search tool, aesthetics/usability, ADA compliance, PDA support, integration with sub-portals etc. are some of the items that are appearing in Education portals. Since this is a huge development on part of individual institutions, and due to shared mission, there have been efforts to form education consortia to develop shared code approach that leverages resources and expertise from member institutions to lower

cost and develop an open source solution. Some companies are finally realizing the market opportunities and targeting educational institutions with custom-developed products.

Conclusion

As more educational institutions realize the benefits of EAI, applications and services are being reengineered to meet needs of administrators, faculty, staff, students, parents and alumni. The university environment is very complex and in this dichotomous setting that has one arm playing catch-up while the other engages in state-of-the-art basic and applied research, emerging technologies are known to have incubated in research institutions that have in the past led to formation of companies such as Netscape and Yahoo. EAI has a significant role in contributing to fostering growth for changing models of education in the digital economy.

This article was written when Dr. Sunil Hazari was an Adjunct Professor in the Robert H. Smith School of Business, University of Maryland, College Park. For further details, see: http://www.sunilhazari.com/education