Information Quotient (IQ) and Transforming Higher Education

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The accelerating, chaotic pace of change on a university campus has forced CIOs to be more nimble and innovative in providing information solutions to meet the needs of an ever-changing campus information landscape. Social, mobile and cloud computing are combining to provide students, faculty and staff with more "Big Data" options that help provide new intuitive and predictive information that will help guide them to new learning outcomes. Information resources will continue to be tailored to user needs based on their role and academic acumen. Using mobile technology, information is delivered in a just-in-time model based on a student's needs. Every method in engaging students is being reviewed.

Learning Management Systems can be tailored to adapt to the spectrum of a student's needs that will accelerate the individual's learning potential. Courses that are more experiential and that integrate external learning opportunities are being developed. The information must be integrated with existing traditional campus solutions in new and different ways. National, federal and state accrediting agencies have a never-ending flow of new and different information requests, which often do not follow changing practices and "emerging standards".

Learning Analytics can assist in accelerating knowledge scaffolding. Defining student success requires new metrics as we draw connections between all levels of academic performance with job attainment and life-long accomplishments. Several projects are globally attempting to provide greater understanding of how best to tailor and use "technology-enabled assessment" (JISC 2010).

Transparent Learning Pathways from K12-Under Graduate-Certificate-Graduate-Alumni education will increase, but the integration strategies for this unstructured and diverse data becomes a challenge with our traditional tool sets. By actually looking at all the data that universities collect, we can find items that define missing elements to student success. We have obtained an enormous amount of academic data on our students, and we have access to thousands of studies which outline factors that accelerate or disrupt learning. Historically, we simply have failed at using our own research and resources to improve education. We now can track a student's success and can provide feedback triggers to the student, the faculty member and the administrator when learning is not progressing, or when students and faculty have found the 'magic bullet' to student success.

One of the barriers is that the majority of our current universities Enterprise Resource Performance (ERP) Systems are not designed for managing the growing variation and pace of change in our campus requirements. The new successful institution belongs to the ranks of those who rethink the entire information spectrum. Visualizing new information connections can unravel the complexities of learning, administrative efficiency, health care and research. Our systems must analyze data sources fluidly and in an instant from diverse and remote data sources.

Advances in mobility platforms and advanced integration make real-time informational triggers a reality. How well students are understanding a class concept, how easily students become stressed, and determining whether we need to quickly change an investment are factors in today's campus-wide experiment.

Skills IQ

The reluctance of higher education to aggressively modify the curriculum to include courses, certificates or degrees that focus on high demand expertise in "Big Data", data integration and mobile application development has created a demand-supply gap for employers. Strategic, agile, innovative, and entrepreneurial institutions could quickly become national and international leaders in filling this skills deficit, while the traditional campuses will still be arguing in faculty senate about what to name a course. Big data analytic intelligence is on most academic roadmaps, and demand is growing faster than current supply.

New reports are exceeding the projected mega-shortage of analytics experts warning, that was outlined in the 2011 McKinsey[1] report. It is estimated that in just two years, there will be about two million Big Data jobs in the United States.[2] The informatics or analytics skills that will be necessary require a possible unique combination of courses including statistics, advanced mathematics, information security, cluster analytics, business intelligence, metadata analytics, and data mining. Both quantitative and qualitative skills will be needed. New courses in data ethics and privacy should be a required element in any informatics curriculum. The volume, size and complexity of data in formats that are both structured and unstructured formats require data integration across multiple systems. Very few traditional faculty members have these skills. The vast majority of the data will be both collected and displayed on mobile devices. Universities are still in their infancy of including courses in mobile application development. New university partnerships with businesses are beginning to emerge to help with the predicament.

The demand for informatics expertise will be driven by every sector, including higher education. Institutions can no longer rely soley on their monolithic, inflexible ERPs and data warehouses to provide the information intelligence that is necessary to meet the needs of their students, boards, state, government and accrediting agencies. Even if universities are in analytics denial, the business and student populations will acquire these skills, with or without university involvement. Companies have begun creating their own online training and MOOCs to improve the informatics skills that are necessary to compete in an integrated data driven, outcomes centric, mobile society.

Integration IQ

Like business, higher education has started adopting cloud technologies. Many vendors have been successful in prodding institutions to adopt Cloud solutions, most noticeably in the areas of student recruiting systems, student advising and support systems, course evaluation software and LMSs. Looking forward, more institutions are likely to move to the cloud. Known as Software as a Service (SaaS), this approach will bring some relief for those institutions who are dealing with aging data centers, and in some cases an aging workforce, needing replacement. Now with the advent of advanced analytics in the form of big data systems and adaptive and personalized learning, institutions have new challenges in integrating data from disparate sources and extracting knowledge from this mass of data.

The type of data being integrated has and continues to shift from transaction data originating from ERP systems (systems of record) to unstructured and faster-moving data originating from social media sites and systems, audio and video files uses as part of courses and marketing, myriads of office documents either born digital or converted and logging data from web sites, mobile solutions, security systems and similar sensor data (systems of engagement). The shift from the primacy of systems of record to systems of engagement presents new integration challenges. The variety of this kind of data and its often lacking metadata can often exceed the skill and capacity for many higher education IT shops.

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The changes in technology, most noticeably cloud and social media, are causing a seismic shift in data integration strategies. While getting to a single source of truth in all things analytic were difficult in the past, doing so now is doubly hard. Many of these technologies are more easily adopted by colleges, departments and service units outside of the control of central IT. The plethora of disparate systems arises from institutions commonly falling into decentralized approaches to management.

> **To survive the digital future, institutions need to raise their integration IQ.**

While improved data integration technologies and big data systems can enable faster and deeper insight into institutional challenges and opportunities, many institutions have decision-making processes that are not evidence-based. Information still is power and human nature is such that individuals and groups will still tend to hoard information and prevent its sharing in order to either gain advantage or avoid harm. These self-serving methods in which information is not fully utilized by decision-makers is problematic. If institution management teams cannot comprehend the change around them, their strategic plans may be misguided and lead the institution astray. Now more than ever, institutions need to understand clearly the nature of the competitive threat and stakeholder demands. Big data systems can help, but big data systems can also lead to big denial.

The integration of tomorrow will require rapid movement of data from and between systems of engagement to a suitable analytic store that can extract knowledge from this mass of data. This will require institutions to reexamine their decentralized approaches for independent IT decision-making, data analytics collaboration and governance, dysfunctional decision making and core integration approaches to data consolidation. A new era of machine-learning approaches for extraction of useful data, integration tools that can harvest data from a variety of cloud applications on a near real-time basis, and new organizational designs that can cut through the political goo and catalyze the transition are needed.

Transformation IQ

Changes in technology are beginning to enable the transformation of institutions. To better tackle high-volume classes, particularly for first-year students, MOOCs can potentially replace the now well established but at one time controversial large lecture. Adaptive learning and personalization technology can now equal the performance of human tutors in helping students to master difficult material (VanLehn, 2011). Social media approaches can be used to engage students with the institution and each other and help deliver support and advising services more effectively and efficiently. Systems that digitize administrative documents and manage their lifecycle from creation to approval process to retention and destruction, can automate more administrative tasks, relieving some pressure on staff. More importantly the enormous amount of data these systems produce can now be mined using a variety of advanced analytic techniques to look for opportunities to lower the costs of education while simultaneously improving the students' educational experience and their learning outcomes.

This may very well be an historic moment for higher education. What institutions do next will determine how regulators, citizens, students, businesses and competitors react. To ensure a good outcome, institutions need to do three things well:

1. **Develop the technical skills to utilize the new tools**

2. **Marshal the centrifugal and centripetal, internal and external forces around them and develop innovative organizational solutions**

3. **Develop innovative organizational capabilities that can address the challenges facing institutions**

Technology has long been a catalyst for transformational events within human history. The events of today are scarcely different, except perhaps for the pace of change. Information technology has both accelerated the speed of market change to which institutions must keep pace and it has accelerated the speed at which institutions can implement change. In many ways, today the technology is moving faster than individuals and institutions can adapt. The flesh of technology may be willing, but the human spirit may be weak.

Institutions now need strong leadership skills at all levels that can facilitate a more orderly and hopefully beneficial transformation. The transformational expertise needed is somewhat daunting and includes the following components:

1. **Leaders who can inspire and motivate highly skilled and creative talent in staff and faculty ranks during times of transition and transformation**

2. **Detailed technical and business process expertise to know how and when either the tool or the organization needs tailoring to create an institutional advantage**

3. **Strong governance processes that can effectively facilitate the often fierce open dialog within institutions yet still confront the brutal facts and foster institutional change within timeframes required by external stakeholders and competitive pressures**

4. **Financial acumen that can identify resources, help manage risk and monitor the fiscal performance of transformational initiatives**

The new technologies today are more closely linked with the value that institutions bring to their regions and markets they serve. Institutions must regularly assess and improve their skills IQ, their integration IQ and their transformation IQ. How institutions foster transformational leadership capabilities within their faculty and staff is now more important than how institutions chart their path through technology selection and implementation.

Footnotes and References

1 Big data: The next frontier for innovation, competition, and productivity J Manyika, M Chui, B Brown, J Bughin, R Dobbs. McKinsey Global Institute, 2011.

2 Partnerships to Bridge Big Data skills Supply Demand Gap Talent Neuron Skill Framework, 2013.

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