



Information Technology Drives Innovation: A Path to Success in Business and in Higher Education

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Abstract: Information technology drives innovation and innovation is the path to business success. Innovation in business has the same impact that steam had on the industrial revolution. This article looks at two case studies: the changing face of medical care practice which has become more of a business to provide modern, convenient and efficient cardiac services through the implementation of an electronic clinical information system (ECIS), that integrates all aspects of the business, including financial and clinical applications, and uses electronic medical records (EMR) to collect and store patient data. The results include significant operational cost savings, raised revenue, expanded research abilities, and improved physician and patient satisfaction. Secondly, it looks at the business of higher education with students as its “customers”. Money is exchanged, debt is incurred, and a valuable asset in the form of a degree, certificate, or badge is obtained. Technology has shaped learning at a private university in a Southern state in the United States. In 2010 it became the first Think Pad university, and in 2014 the first iPad university. Learning Management System-CANVAS, an intuitive learning platform that provides both faculty and students to shape a different learning experience, with diverse features and tools in a single online environment was implemented. The academic technology responded to the way students now want and expect to learn, student-driven learning, interactivity & collaboration between faculty & students & assessment tools leading to customer satisfaction and student retention. Information technology fosters innovation in business and in higher education.

Keywords: Business, ECIS, EMR, Higher Education, IT, LMS.

I. INTRODUCTION

Digital revolution is key to business success. Today, even farmers use computers in agriculture- for production records, financial planning, research on technical issues, and procurement. The motto now is: drive innovation with information technology. Innovation began in the 21st century with the advent of computers and it attained momentum with the birth of the Internet. Proven business models were used in 1980's, efficiency was not a prime directive. The dawn of the World Wide web in 1991 changed the world, and several years later the Internet became popular. Information technology fosters innovation in business. Innovation results in smarter apps, improved data storage, faster processing, and wider information distribution. Innovation makes businesses run more efficiently. And innovation increases value, enhances quality, and boosts productivity. If the purpose of business is to increase profits, then innovation is the way to make more profits, faster. The story of Jan Koum gives us a clue how much big businesses value innovation. He went from food stamps to billionaire because of his invention of WhatsApp.

II. MEDICAL TECHNOLOGY CASE STUDY

Information technology (IT) efforts support the use and adoption of technology to promote quality in cardiovascular care. For more than a decade, the skilled

physicians at Mid Carolina Cardiology (MCC) have been on the cutting edge of advanced medical technology. One of their most challenging uses of technology, however, may very well be the recent implementation of a computer system that includes all patient record data in 1999. Since the majority of medical practices still utilize paper file systems, this bold step has set MCC apart as an innovator in its field. The system, (known as electronic clinical information system (ECIS), integrates all aspects of the business, including financial and clinical applications, and uses electronic medical records (EMR) to collect and store patient data. During the implementation the author, Gopal played a significant role as DBA (Data Base Administer) and later as Director of Information Technology at this practice. The innovative technology has helped MCC successfully streamline practice operations, increase efficiency and improve patient care. The results include significant operational cost savings, raised revenue, expanded research abilities, and improved physician and patient satisfaction. They purchased the system for both business and clinical reasons. They sought a tool that would support their mission statement for clinical quality, one that would enable them to implement practice guidelines and performance measures, and also enhance their ability to implement clinical accountability by providing physician feedback on both group and individual performance.



The decision to implement an EMR system resulted from the corporate culture the practice embraced six years ago when they created a chief executive officer position accountable to the board of directors. The practice had 26 physicians and 170 staff providing care to nearly 100,000 patients from six locations in North Carolina. This business approach to medicine is an important factor that distinguishes MCC from its competitors.

Goals for the organization are set based on a strategic plan and the CEO, Stephen McAdams, is empowered to achieve those goals/asserts. He and his management team are held accountable, allowing the doctors to get back to the business of practicing medicine while having the mental comfort that there is an efficient mechanism in place that oversees and monitors the business plan. Consequently, at a cost of \$1 million, MCC executives proceeded with a system developed by Gateway Electronic Medical Management System in Indianapolis, Ind., which integrated the billing system, scheduling, prescription writing, doctor visits and hospital encounters. Return on investment was achieved quickly, as the practice raised revenue by 35 percent the first year of implementation, and 18 percent and 10 percent respectively, the following two years.

Additionally, during the first year the overhead went from 62 percent to 46 percent because the practice became more efficient in every respect from checking in patients to seating them in the rooms. The system tracked all the patient's movements: when they check in, how long they sit in the waiting room, when they go into the exam room, how long they are with the doctor, and the total time of the visit.

During patient visits, the physicians are armed with hand-held pen top devices similar to small laptop computers in which they input information into the patient records electronically by using a point and click format. During the first year alone, the practice saved more than \$30,000 in paper costs, not to mention the time it usually takes for a doctor to flip through copious notes and pages of a paper file.[5].

Also, there are several billing codes that physicians used to have to remember when filling out the billing paperwork. With the new system, they have the treatment/diagnostic terms on the computer and they simply click on each one and a super bill is automatically sent to the check-out desk so patients don't have to carry any paper bills to the desk. This helps not only with efficiency, but also with the keeping track of bills which many times used to go home with patients who forget to stop at the desk on the way out. Also since billing codes change frequently, they are automatically updated electronically.

Transcription costs were also reduced by nearly \$3,000 per physician since they only need to dictate a few paragraphs compared to the pages of dictation required before the system. Additionally, medical records salaries have been reduced by \$105,000 and postage for referral letters and

reports by \$20,000. Even the cost of refilling a prescription, which is estimated to be \$10 to \$12 each to refill, was reduced to about \$2 each. [5].

The practice fills about 300 prescriptions a day and, surprisingly there are about ten steps involved in the process and between staff time and running down charts and getting a doctor's okay; it was pretty costly and time-consuming. Now, documentation is more complete and accessible at the touch of a button, and since the system allows for several people to access a record at the same time, there are fewer delays.

Perhaps most importantly, MCC believes the system helps them provide better emergency care, attending promptly to patients when time is of the essence. It helps facilitate patient care. There is no need for a doctor to be present all the time every night, all night. Doctors have access to electronic medical records in the cath lab so when the doctors in the hospital have to go see a patient in the emergency room, they just call up the record, print out what they need in literally two minutes, and take it down to the ER.

As a practice devoted to on-going quality clinical research, MCC uses the system to identify patients who would benefit from relevant clinical trials. While the concept of data mining is not new to conventional businesses, it is revolutionary in the medical industry. And MCC is benefiting from being the forerunner. Data mining creates opportunities for any practice to provide optimal patient care and enhance practice revenue and efficiency.

Although training was provided when the system was first installed, there was a little training involved the first year as physicians and staff navigated the new terrain. It was frustrating and time-consuming at first because there was a lot of data entry. They made some mistakes and they had to get used to not having to dictate as much and to manipulate the hand-held devices. [1], [5].As the director of IT, the author, Gopal had a prodigious task of training physicians to use the new technology.

III. HIGHER EDUCATION AND TECHNOLOGY CASE STUDY

The second study looked at transforming higher education using information technology. Universities are feeling the pressure to control costs, improve quality, focus more directly on customer needs, and respond to competitive pressures. Information technology (IT) has the potential to solve many of these problems. It can change the roles of students and faculty, facilitate more learner-centered, personalized education, save money through improved business processes and distance education, and expand the scope and content of the curriculum. This potential has often been more hype than reality, but hope is on the horizon. Ultimately, the goal is to educate students and faculty to be able to function effectively with technology in the 21st century.

Higher education is a business. Certain components of the business of higher education are readily identified.



Admissions are the sales team. Athletics are a never-ending cash cow, brand vehicle, and alumni-giving machine. Academic advising and residence life are the customer service centers. Academic programs are the product...the most valuable product that schools offer. We call advising "teaching" and student affairs as "student development." Keeping students at the universities are often called "retention" and "engagement" is quite similar to what businesses do when they try to retain their customers.

Higher education is a business. Students pay a great deal for the product that is higher education. The nature of "the game" has changed. For-profit universities, non-profit universities, community colleges, workforce education programs, competency-based learning initiatives, the rise of badges, and the spread of online learning are all part of this "business" that we call higher education.

Higher education has never mattered more, and information technology has more to contribute than ever. The higher education information technology (IT) enterprise has become complex. No longer simply responsible for provisioning IT infrastructure and services, the IT department increasingly helps re-envision business and service models—all in a context of cost and accountability pressures. The changing role of IT in higher education has been well documented. Information technology serves as the foundation for the business of the institution, supports new advances and approaches to teaching and learning and provides new capabilities in research. IT is so much the fabric of the university that its presence is often not fully recognized.

To that end, a medium sized private university in Charlotte, North Carolina (US) where Gopal serves as a faculty, selected a new LMS, Canvas, two years ago. Gopal uses CANVAS to teach all of her courses.

It provides powerful tools to support teaching, learning, assessment and course management. Specifically, Canvas enables faculty to find additional ways of supporting students in achieving the learning objectives and providing them with the best possible learning and teaching experiences. The report explores some of the key growth opportunities that Canvas offers the university, faculty and students. [6].

The ECAR Study of Undergraduate Students and Information Technology [3] presents findings from a survey of over 75,000 respondents at 213 institutions from across 15 countries. The study has been repeated on a similar scale since 2004. This large and deep data set indicates that:

- Blended learning environments are now the norm for students and the majority says they learn best with a blend of online and face-to-face work.
- Students expect their instructors to use technology to engage them in the learning process and believe technology benefits them, especially with regard to achieving their academic outcomes and preparing for future academic and workplace activities.

- The majority of students own two to three Internet-capable devices, which they are ready to use for academic purposes, and look to institutions and teachers for opportunities and encouragement to do so (Fig , [6]).

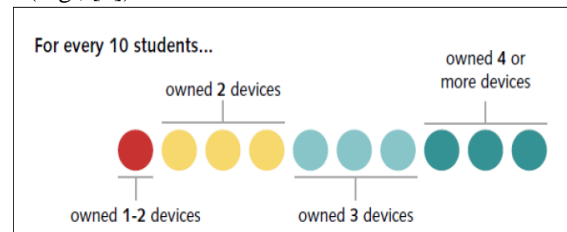


Fig. 1 Internet-capable device ownership

Students perceive that technology is critical to academic success; that it plays an important part in their future accomplishments; that it makes them feel connected to their institutions, their teachers, and other students; and that it elevates the level of teaching [4]. The following section discusses ways in which Canvas can enhance the learning experiences of students:

3.1 INTERACTIVITY AND COLLABORATION

When provided with opportunities for interaction with their peers and teachers, students are not only more motivated to learn, but also more attentive, participative and more likely to exchange ideas with others and engage in significant learning experiences [2]. Supporting this area, Canvas will provide a number of virtual classroom tools: online learning environments which allow for synchronous instruction (teacher and students are logged into the virtual learning environment at the same time), where students and teachers can collaborate in a protected platform:

- A. Chat allows students to interact with other students and their teacher in real time.
- B. Conversations, a messaging tool used instead of email to communicate with a course, a group, or an individual.
- C. Discussions, an integrated system for class discussions, allowing both instructors and students to start and contribute to as many discussion topics as desired.

3.2 THESE TOOLS CAN SUPPORT STUDENTS

- A. start thinking about an upcoming assignments or class discussions;
- B. follow-up on a conversation or questions that began in a face-to-face classroom;
- C. test their comprehension of important points made in class;
- E. brainstorm different approaches to a class problem;
- F. facilitate student/supervisor communication in research and work experience programs;
- G. build a sense of community for off-campus students though live interaction using audio and video.



3.3 STUDENT-DRIVEN LEARNING

Students can independently start their own discussion thread and start group conversations.

3.4 CALENDAR-DRIVEN LEARNING

An entirely new feature that will be available to students in the LMS is the Calendar Tool which provides each student with access to a personalized study calendar for assignments, important events and course announcements. The Calendar in Canvas is a global feature, meaning that students can see all of their assignments from all of their courses in one place.

3.5 WEB CONFERENCING

A range of additional tools will be available in Canvas to support teachers in their role (including the management and administration of courses).

3.5.1 Communicating Course Logistics & Expectations to Students

Canvas provides two simple communication tools designed for teachers to push notices and important course information to groups of students, thereby playing a vital role in their course communication strategy:

3.5.2 Announcements

It allows faculty to communicate course logistics to students:- Remind students what they need to accomplish to stay on track.

3.5.3 Course Syllabus

It is used to communicate to students exactly what will be required of them throughout the course in chronological order. The assessment tools in Canvas include:

Assignments-students submit home work that can be graded online

Rubrics-assessment criteria

Speed Grader-allows students and faculty to view and grade student submissions

GradeBook-view all grades

The University has improved its wireless infrastructure in recent years and is committed to expanding the breadth and depth of Wi-Fi across campus to support teachers and students to embrace pedagogical opportunities offered by Canvas and its mobile optimized interface.

IV. CONCLUSION

The most critical question facing the academic world is something far more fundamental: namely, what it will mean to be an educated person in the 21st century. As our study indicates, these sweeping technological changes will effectively change the skill-sets of the future workforce, as well as its approach to work in general. As a result, societies around the world will need to consider how to make the most of these new opportunities and thus ensure that they remain competitive in the global marketplace.

Business's will not prosper if they do not adopt new technologies. Likewise, higher education will stagnate without technology.

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