

Creating a Health Informatics Program: Is It Good For What Ails Us?

Submission Type: Full paper

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Abstract

The state of information technology in healthcare, which for years has greatly lagged behind other industries, is currently evolving at a rapid pace. Unfortunately, very few educational programs are producing graduates with the technical and clinical skills to meet these needs. To remedy this problem, researchers and faculty at a large southern university developed and implemented a new Health Informatics (HI) bachelor's degree program. This paper evaluates the program's performance at one year after implementation to determine if the hypotheses that led to its creation are supported. Critical success factors for creating a successful HI program at other institutions are identified and discussed.

Keywords

Health Informatics, information systems, curriculum design, action research, enrollment.

Introduction

Driven, in part, by changes in government reimbursement policies and the accompanying incentives, interest has been growing among healthcare providers in implementing electronic health records (EHR) systems in their organizations. Meanwhile, medical researchers are identifying new ways to use technology to improve patient outcomes and reduce costs associated with providing care to a large number of newly insured Americans. The state of information technology in healthcare, which for years has greatly lagged behind other industries, is currently evolving at a rapid pace. However, very few programs are producing graduates with the technical and clinical skills to meet these needs (Campbell et al., 2012).

More troubling is the fact that enrollment in Science, Technology, Engineering, and Math (STEM) degree programs in the US is on the decline, leaving the US at a disadvantage globally and its workforce unable to meet the growing need for technologists in healthcare even if the training programs existed in sufficient numbers. Compounding this problem is a lack of women and minorities entering STEM fields (St. Rose et al., 2010).

In 2012, researchers and faculty in the School of Computing at the University of South Alabama drafted a plan for a new Health Informatics (HI) bachelor's degree program that would meet the rapidly increasing needs of healthcare organizations for technology workers who understand the unique legal, operating, and business requirements of the US healthcare industry while also increasing enrollments of computing students, especially female and minority students which are traditionally underrepresented in STEM fields. The proposed program was approved by the university's administration and the state's higher education governing body in 2013 and began accepting new students in January of 2014.

At the conclusion of the first year of the new program, we evaluate its performance to determine if the hypotheses that led to its creation are supported. Because of the interest this project generated in the academic community when the idea was first developed and because of the importance of the needs the proposed program sought to meet, we believe that it is important to share the results of the first year of the experimental program as well as the lessons learned from this endeavor.

Hypotheses Development

Proposed benefits of the Health Informatics Program

As mentioned above, recent legislation passed by the US Government, including Health Insurance Portability and Accountability Act (HIPAA) and the Health Information Technology for Economic and Clinical Health (HITECH) Act, are leading to widespread adoption of EHR systems and other technology that is changing the way healthcare is delivered. Many healthcare technology vendors are enjoying record sales and new companies are popping up at an increasing rate. At the same time, the security and privacy provisions of this legislation are driving up demand for skilled technologists at the hospital and clinic levels as well. As a result of these factors, experts predict that the number of jobs in Health Informatics will increase for the foreseeable future (Hersh, 2010). Unfortunately, HI as a discipline is relatively new and the number of universities offering bachelor's degrees in HI is fairly small. To address these issues, we propose that:

H1. Creating a new Health Informatics bachelor's degree program will help meet the technical workforce demands of the healthcare industry.

While many computing programs across the nation have suffered from declining enrollments in recent years, our programs have actually seen enrollments grow. Despite this, we are still not producing enough computing graduates to meet the needs of industry in our region. Any proposed program should lead to increased enrollments (especially of transfer students) without cannibalizing enrollments of our existing computing programs. To accomplish this, we had to identify a population of students that did not traditionally consider a career in computing but that might be interested in a technology-related major as a means to achieve their career goals.

At the University of South Alabama, we have an array of healthcare related programs of study including Nursing, Allied Health, and medical pre-professional programs. These competitive programs attract large numbers of students to the university, but only accept a small percentage of them into their upper divisions. This creates a large pool of students with an interest in healthcare but few options to pursue. Our curriculum was designed to mirror, as closely as possible, the preliminary coursework of the programs from which we hoped to draw most of our students in order to encourage good students who were not selected for admission to a competitive medical program to consider a degree in HI.

In doing so, we believe that offering a degree program in HI will reach a previously untapped population of students and propose that:

H2. Creating a new Health Informatics bachelor's degree program will lead to an increase in enrollments in computing disciplines.

Traditionally, women and minorities have been under-represented in STEM fields, especially computing (St. Rose et al., 2010). This was reflected in the enrollments of our computing programs in the School of Computing. Because the population of potential students that we hope to attract with an HI program includes a large percentage of women and minorities, we expect that students interested in HI will mirror these demographics and proposed that:

H3. Creating a new Health Informatics bachelor's degree program will lead to an increase in the percentage of women and under-represented groups in computing.

Methodology

To address the issues facing the fields of Healthcare and computing education, we conducted a study using an action research approach. Denscombe (2010) notes that the purpose of action research is to design a solution that directly addresses a specific problem and then use the results to derive guidelines for best practice. Using our own program as the test environment, we endeavored to create a new bachelor's degree program during a time of fiscal constraint and low STEM enrollments at the national level.

Proposed Structure of the HI Program

In order to create a curriculum for the new program, we reviewed the small number of similar programs at other schools. Because Health Informatics has its roots in the Information Systems discipline, we closely followed the guidelines of the IS 2010 model curriculum (Longenecker et al., 2012) while also incorporating elements of the American Health Information Management Association (AHIMA) model curriculum for Health Information Systems. In addition, we worked closely with members of our industry advisory board. To ensure technology industry recognition, we designed the program to meet the accreditation requirements of the Accreditation Board for Engineering and Technology (ABET) (Landry et al., 2012). Once we had identified the needs of our new curriculum, we set out to identify coursework that would provide the necessary skills and knowledge.

Because of limited state funding, the University of South Alabama allowed only limited resources for the creation of new programs and requested that any new program consist mainly of existing courses. For our new Health Informatics program, this meant that we would need to pull courses from a number of other disciplines.

The Health Informatics curriculum is shown in Appendix A. The core coursework consists of four existing Health Informatics courses that previously served as electives for our Information Systems (IS), Information Technology (IT), and Computer Science (CS) students. Students both inside and outside the School of Computing can also earn a certificate in Health Informatics by completing these four HI courses and a project management course. These HI courses were first offered in the fall 2010 semester.

Our interdisciplinary curriculum includes courses from the Nursing, Allied Health, Emergency Medical Services, and Biomedical Science programs in addition to courses from the School of Computing. Fortunately, we were able to find all of the necessary coursework within our university and did not have to create any new courses. Such an interdisciplinary structure is rare among programs at our institution.

Assessment of the Program

Using the action research evaluation principles provided by Davison et al. (2004) and Lindgren et al. (2004), we first assessed our methodology according to the following five principles:

- 1) The principle of researcher-client agreement: Due to the experimental nature of the program, we felt the need to be very upfront with any students who expressed interest in the new degree program. While we detailed the growing needs of the healthcare industry for technologists with clinical knowledge, we also clearly explained the risk involved in pursuing a degree with which many employers will not be familiar .
- 2) The principle of the cyclical process model: Over the course of the year, we conducted numerous advising sessions with our students to determine whether the courses in the curriculum are appropriate to their needs. We also conducted meetings with our healthcare industry partners to solicit information about the skill sets that they are looking for in a potential employee. Based on these discussions, we made refinements both at the curriculum level and in our health informatics courses. As the healthcare industry continues its process of rapid change, we anticipate our program will necessarily continue to evolve.
- 3) The principle of theory: While designing the curriculum for the new HI degree program, we consulted a number of sources including the IS model curriculum and the AHIMA model curriculum for Health Information Systems. In addition to these sources, we consulted the literature on STEM education theory

to determine the best instructional methods for our students. From the literature, we identified design elements that have been shown to positively impact the success rate of a STEM educational program including: a focus on group work and problem solving (Avery and Reeve, 2013; Pardue et al., 2014); an integrated curriculum design utilizing courses from a range of related disciplines (Herschbach, 2011); a specific employment-oriented approach to curriculum design built in consultation with healthcare organizations (Westfall, 2012); and the use of faculty as “learning guides” instead of oracles who know the answer to any question that may be asked (CSMC, 2012).

4) The principle of change through action: In order to bring about the change we sought, we believed it important that students in our health informatics program should be exposed to industry experiences as soon as possible. This led to the inclusion of an internship in the curriculum. This requirement set the HI degree program apart from all of the other degrees housed in the School of Computing. Our rationale is that since the healthcare industry is currently undergoing radical changes in the use of technology and patient care, our students should be out in the industry helping to shape the future instead of just sitting in a classroom learning about these changes that are occurring.

5) The principle of learning through reflection: Upon review of the progression of the HI program from certificate to bachelors degree, we began to wonder if this model might work with other fields that currently are experiencing a lack of skilled technologists but aren't necessarily ready for a new degree program devoted entirely to a specific industry. The most obvious candidate for us was technology in education. While the state of Alabama has recently approved computer programming as a math elective for high school students, many public high schools lack the resources to staff these classes. Since the education curriculum is set by state requirements, introducing a computer education degree program is not possible at present. However, introducing a small number of courses into the existing curriculum through the use of a certificate does appear to be more manageable.

Results

At the end of the first year, we examined the progress of the HI program to determine if our hypotheses are supported. The results are listed below.

H1. Creating a new Health Informatics bachelor’s degree program will help meet the technical workforce demands of the healthcare industry. – Supported

Currently, 30% of our students have or have had a paid internship in the Health Informatics field. Since many of the remaining students have been in the program for less than one semester and are not yet eligible for an internship with one of our partner companies, we expect this number to increase in the coming year.

Since the program has only been in existence for one year, we currently have only one graduate. Our first graduate interviewed with a number of companies both inside and outside of the healthcare industry. He was considered for a number of non-healthcare related jobs because of the similarity of his coursework and skillset to a traditional IS graduate. He received multiple offers and accepted a position as an Electronic Health Records Implementation Consultant at a large healthcare organization based in Washington, DC.

Incidentally, we have had a number of IS majors who completed the Health Informatics Certificate that have taken jobs with some of the largest healthcare technology companies in the country as well as some local healthcare organizations. It is our belief that these relationships will prove even more valuable as our HI program begins to produce more graduates.

H2. Creating a new Health Informatics bachelor’s degree program will lead to an increase in enrollments in computing disciplines. – Supported

Approximately 90% of our students have transferred in from other programs from both inside and outside our university. Our use of courses from other programs (e.g. nursing and allied health) have allowed a large number of students from these programs and other pre-professional health programs to transfer to HI without losing credit for the work already completed. Our current enrollment numbers exceed the numbers in our proposal to the Alabama Commission on Higher Education. [See Table 1 below.]

H3. Creating a new Health Informatics bachelor’s degree program will lead to an increase in the percentage of women and under-represented groups in computing. – Supported

Our HI student population is currently 70% female and 35% African-American/Native American/Native Hawaiian. This compares favorably to the population of the School of Computing as a whole which is 21% female and 19% African-American/Native American/Native Hawaiian.

Table 1: Predicted Enrollment and Completion Rates Report to the state’s Commission on Higher Education vs. Actual First Year Numbers

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
New Enrollment Headcount	5	10	13	16	23	67
Expected Completion Rate	0	0	6	8	10	24
Actual Enrollment Headcount	20					
Actual Completion Rate	1					

Discussion and Conclusion

Lessons Learned

Although the program’s performance exceeded our expectation for the first year, we encountered a few issues that required flexibility from both our faculty and our students. Because of the interdisciplinary nature of our curriculum, we expected some challenges for students taking coursework in a number of different colleges. One example occurred after our first HI student enrolled in the nursing course. We quickly realized that the nursing courses were not necessarily appropriate for our HI students. Nursing students, by nature of the work they do, go through very stringent skills evaluations where they must physically interact with the patient and conduct certain physical examinations. This was not necessary for our students. Fortunately, through our partnership with the College of Nursing, we were able to provide an HI-specific version of the nursing course that uses the same instructional content as the nursing version. HI students attend the same class meetings as the nursing students, but complete course projects instead of performing hands-on patient assessments.

Our original curriculum did not contain a traditional programming course. In order to follow the IS 2010 model curriculum we deemed our SQL course to fulfill the programming requirement. We have since realized that our students are more competitive if they have programming experience. To address this, we now require our HI students to take an introductory programming course and encourage them to take a second programming course as an elective. We have not yet pursued ABET accreditation for the HI program and are evaluating all accreditation alternatives to see which would provide the most value for our students.

Direction for the Future

Enrollments have steadily increased throughout the first year. Although we experienced the most interest in the late summer right before the start of fall semester courses, many students joined the program mid-semester. As our advertising and recruiting efforts ramp up, we expect our growth rate to continue to be strong.

Our first efforts to recruit new students to the program involved reaching out to advisers for the Allied Health and pre-professional programs that we had previously identified as potential sources of new students. Our current efforts involve completing transfer agreements with area community colleges and forming relationships with area high schools that provide specialized tracks for their students based on their career interests. In fact, the coordinator for our Health Informatics degree program serves as the curriculum mentor for the bio-medical specialized diploma at one of the area's largest high schools.

The first faculty members who taught in the Health Informatics Certificate program generally held degrees in technology areas such as Information Systems and also had research interests in healthcare technology. More recently, with the start of our bachelor's degree program, we hired faculty with clinical healthcare experience (i.e. RNs and MDs) who have taken an active role in the adoption of technology in healthcare. As more universities offer advanced degrees in this area, we believe it will become easier to hire faculty. We should note that one of the authors of this paper is currently pursuing a doctorate degree in Nursing Informatics.

Critical Success Factors

While our experiment in creating a Health Informatics program is doing well at the end of the first year, we recognize that a similar program might not work at every institution. There are a number of factors that exist at the University of South Alabama that we believe have played a critical role in the early success of our program. These factors include:

1. The support of the Nursing, Allied Health, and the medical pre-professional programs at the University of South Alabama that provide courses and refer students to our program. Our university offers a wide array of programs in the healthcare field. The majority of these programs are housed in the College of Medicine, College of Nursing, and the College of Allied Health Professions. Although thousands of students apply for admission to these programs every year, only a small percentage of them are accepted to the programs of their choice because of limited availability. While some of these students are accepted to a program at another school, some of them decide that a Health Informatics degree is a good path to achieve their career goals. Because of the relative novelty of the Health Informatics degree, it is imperative that any institution considering such a program first identify sources of potential students. We hope that one day the field is well known enough to attract a large number of freshman students; until that time, new Health Informatics programs will almost certainly rely on other healthcare programs to provide students.
2. The support of our administration at both the university and college level. Our administration has been incredibly supportive of our efforts despite a very tight budget and reduced state funding. It is obviously very difficult to launch a new academic major without the support of administration. Any university considering the addition of a Health Informatics program should evaluate the level of support they have at the college and university level before proceeding.
3. The availability of adjunct faculty with a desire to help the HI program succeed. We have benefited greatly from the willingness of clinical healthcare workers (MDs and RNs) with advanced degrees to serve as adjunct instructors for some of our courses as we build the program. Any institution considering a similar program will need to identify a reliable group of professionals to assist in the first few years of a Health Informatics program before enrollments justify full faculty lines.
4. Last, our area benefits from an abundance of local hospitals and other healthcare related employers who are willing to provide internship opportunities to our students. We believe they will continue to support our program as more of our graduates enter the job market. While experts have predicted that the number of jobs in the field of Health Informatics will continue to grow for the foreseeable future, these jobs are not distributed evenly across the country. It is important for new HI programs to develop career opportunities, not only at local healthcare organizations but also at larger employers in other regions as the rapid growth in EHR vendors now gives way to consolidation in the marketplace and new healthcare legislation and technical advancements dramatically change the role of technology in the way healthcare is delivered.

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Appendix A – The Health Informatics Curriculum

School of Computing Undergraduate Check Sheet	HI	Health Informatics	Bulletin 2015—2016
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Last name: _____ First name: _____ JAG ID: _____
 Date of Entry: _____ Advisor: _____

Area I. Composition/Communication (6 credit hours)		
ROTATION		COURSE
Fall/Spring		EH 101 English Comp I
Fall/Spring		EH 102 English Comp II
Area II. Humanities and Fine Arts (12 credit hours) ¹		
Two courses in Humanities or Social Sciences: must be either a Literature (EH 215-216, EH 225-226, EH 235-236) or a History (HY 101-102, HY 135-136) sequence		
Fall/Spring		CA 110 Public Speaking
		(1) Art, Drama, Music ¹
		(1) Literature ²
		(1) Fine/Perf. Arts/Hum Elective
Area III. Natural Sciences and Mathematics (17 credit hours)		
Natural Sciences (8 credit hours - must include associated lab) Approved areas: BLY, CH, GEO, GY, PH		
Mathematics and Statistics (9 credit hours)		
Fall/Spring		MA 112 or higher
Fall/Spring		(1) BUS 245 or ST 210
Fall/Spring		(1) BUS 255 or ST 310, ST 340
Area IV. History, Social & Behavioral Sciences (12 credit hours)		
Fall/Spring		PSY 120
		Two (2) Electives from AN, CJ, ECO, GEO, HY, PSC, PSY or SY
		(1) History ³

Health Informatics CORE (12 credit hours)		
ROTATION		COURSE
Fall/Spring		HI 300 Health Informatics Clinical
Fall/Spring		HI 410 Health Informatics
Spring		HI 450 Health Data Sec. & Compl.
Fall		HI 455 Health Data Mgmt.
Information Systems Environment (40 credit hours)		
Fall/Spring		CIS 115 Beginning Programming ⁴
Fall/Spring		CIS 150 Intro to Computer Apps.
Fall/Spring		ACC 211 Principles of Accounting I
Fall/Spring		ISC 245 IS in Organizations
Fall/Spring		ISC 272 Systems Architecture
Fall/Spring		CA 275 Small Group Comm.
Fall/Spring		MGT 300 Mgmt. Theory & Practice
Fall/Spring		CIS 321 Data Comm. & Networking
Fall/Spring		CIS 324 Database Design
Fall/Spring		ISC 360 IS Analysis & Design (W)
Fall/Spring		EH 372 Technical Writing (W) or EH 373 Writing in the Prof. (W)
Fall		ISC 462 IS Strategy & Policy
Fall/Spring		ISC 475 IS Project Management
Fall/Spring		CIS 496 Internship (0 credit hrs.)
Health Care Environment (23 credit hours)		
Fall/Spring		BMD 114 Human Anat. & Phys. I
Fall/Spring		BMD 115 Human Anat. & Phys. II
Fall/Spring		BMD 210 Inf. Dis. in Health Care
Fall/Spring		EMS 210 Medical Terminology
Fall/Spring		NU 325 Health Assessment
Fall/Spring		NU 327 Patho. Basis of Nursing or EMS 200 Human Systems & Patho.
Fall/Spring		EMS 401 Seminar in AHP
Approved Electives (3 credit hours)		
Fall/Spring		ISC 285 Scripting & Windows Prog.
Fall		ISC 464 IS Security & Risk Mgmt.
Fall		ITE 373 File Sys. for Dig. Forensics

¹ Approved courses: ARS101, DRA110, MUL101, ARH100, ARH103, ARH123, ARH240 or 242

² Approved Lit courses: EH 215 EH216, EH225, EH226, EH235 or EH236(W)

³ Approved History courses: HY 101, HY 102(WC), HY 135 or HY 136(US)

⁴ DS 090, MA 112 or higher, or math placement score of 65 or higher

Special Symbol Used: W Writing Intensive Course