WebSAT: A Web-based Competency Self-Assessment System  
Linking to Educational Resources  
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**ABSTRACT**

We describe a web-based system that enables an individual to assess him/herself against the set of competencies required for a variety of roles in the area of Applied Health Informatics (AHI). The competencies themselves were developed by a multi-disciplinary team under the auspices of the Canadian Institute for Health Research (CIHR), and include the knowledge, skills, and experience necessary to fulfill specific roles as an applied health informatician. Both textual and graphical information is presented to the user and potential mechanisms for correcting competency gaps are presented in this online interactive system.

**INTRODUCTION**

A key research objective in the strategic plan of the University of Waterloo (UW) is to stimulate high impact multidisciplinary research in the health sciences and Health Informatics (HI). The university has made a significant investment in faculty and supporting resources in order to achieve this objective. However, many UW students and members of the both the surrounding health community and the citizenry at large do not have any knowledge of Health Informatics, let alone what career opportunities exist in the field and what education is required.

This lack of awareness was echoed by academic experts and industry leaders from Canada, United States and Britain at the eHealth Conference 2005 in Toronto, Ontario who called for aggressive action to resolve the health informatics human resources gap. Rapid education deployment programs like AMIA’s 10 x 10 program and the Waterloo Institute for Health Informatics Research Bootcamp program have both been launched as attempts to correct this situation. However, there is still minimal awareness of the nature of Health Informatics, the education required to play a role in this field, and the opportunities for employment for graduates.

Moreover, many health-related public and private sector organizations that would benefit from Health Informatics expertise are unaware of the competencies that are required of health informaticians, that such expertise exists, or that education and training is available from graduate, undergraduate, and other programs.

The field of Applied Health Informatics (AHI) blends the informatics and health disciplines to find and deploy the best possible technical solutions to a wide range of healthcare information-related challenges. Thus, people in this field need to have a solid technical background, a detailed knowledge of the healthcare industry and of the capabilities it has produced, and a wide range of business, managerial and analytical skills.

**HEALTH INFORMATICS SELF-ASSESSMENT SYSTEM**

We undertook several years ago to address the need for Health Informatics career awareness in part by developing a unique and innovative web-based Health Informatics competency self-assessment tool. This tool helps students and potential students: (1) to understand the types of roles that exist for individuals trained in Applied Health Informatics, (2) to understand the competencies required to fill these roles, (3) to self-assess their knowledge and skills against the competencies required in these Applied Health Informatics roles, and (4) to find educational resources that enable them to address deficiencies that are identified.

The primary purpose of this tool is to serve as a self-assessment system and to provide an index to learning resources. It is intended as a resource for students, teachers and employers related to understanding the skills, knowledge and experience expected of competent Applied Health Informaticians. Furthermore, the
competencies and competency categories embodied in the tool and supporting documentation1 can assist curriculum developers in defining the educational content for Applied Health Informatics education programs.

It should be noted that our framework to define competencies and the tool we built to support self-assessment and access to learning resources are entirely general and can be applied to any discipline, not just to Health Informatics. This makes our framework and tool reusable and of broad potential interest.

**METHODOLOGY**

In earlier work1, we led a process that defined HI competencies and supporting curricula using a team of approximately 100 health and Health Informatics professionals (including HI teachers/researchers, curriculum developers, human resources professionals in healthcare organizations and HI companies, government representatives, and current and candidate students). This work involved the comprehensive documentation of HI roles, the challenges faced by professionals in each of these roles, the high-level tasks (which we called “micro-roles”) that professionals in these roles need to undertake to address the challenges, and the competencies required to accomplish the tasks1,2. This material was then used to outline broad curricula that would be used as the basis for a number of programs world-wide3. One such program has been established at Conestoga College, which registered its first students in the fall of 2005. This project was funded by CIHR, its products are frequently cited, and today it stands as one of the few definitions of HI competence that have been derived using a logical framework rather than being based on preferences and opinions of teachers.

Once having completed the documentation of competencies (there are on the order of 400) and the other components of this project, we recognized that even more significant value could be derived by packaging the competencies in a software tool that makes them available, understandable and usable in the field. This tool was constructed using the Web-based Informatics Development Environment (WIDE) developed by the Computer Systems Group at the University of Waterloo, led by D. Cowan4. The tool we developed is a Web-based self-assessment system that enables individuals to assess their own competencies versus those required for specific roles. We have called this the Web-based Self-Assessment Tool (WebSAT). This pilot was funded using internal resources and volunteer labor and is now available as a demonstration website [http://learningspace.uwaterloo.ca/hi].

Our competency definition work identified three types of HI professionals: (1) AHI (Applied Health Informatics) professionals, who define the requirements for, procure, deploy, implement, manage, guide the use of, and evaluate HI systems and methods in health enterprises and their supporting industries; (2) RDHI (Research and Development HI) professionals, who teach, do research, and develop innovative HI tools for the health system and are typically found in academia and private industry research labs; and (3) clinicians who need HI competencies to be good clinicians (called Clinician HI or CHI).

In order to make the initial version of the system of manageable scope, we limited ourselves to providing a tool for those interested in assessing their own competencies relative to those required by AHI professionals. Furthermore, we did not address many of the user interface issues, for example, we did not allow individuals to assess themselves first at a high-level (versus broad categories of competencies) and then at a more granular level within these categories.

This past year we extended the development of this tool through the able assistance of a student working in the Undergraduate Research Assistant (URA) program in the David Cheriton School of Computer Science (D. Chodos). This student added references to Web-based educational materials for sample set of competencies. This allows users to click on a link and access educational documents, on-line educational programs, and on-site courses that provide a means to correct competence deficiencies. This has turned out to be an excellent capability that supports life-long learning in this field. This latter work was reported at the recent eHealth 2005 Conference in Toronto5.
MODE OF OPERATION

WebSAT operates as follows:

- Users who access the system are asked to register under a user identity and password that they create.
- They are shown a list of potential AHI roles, provided with descriptions of each role, and asked to select a role against which they wish their personal competencies to be compared.
- They are then presented with approximately 20 groups of competencies, each containing multiple specific competencies, and asked to assess themselves as to their level of knowledge or skill (shown as seven levels from “no knowledge” to “expert”). UNA=Unacquainted; ACQ=Acquainted; PAM=Passing Familiarity; GAM=General Familiarity; FAM=Working Familiarity; CAP=Capable; EXP=Expert)
- The system supports corrections and the saving of input for later completion.
- Once the user has responded to all competencies, the system compares the user’s competencies to the selected role and provides graphical feedback (a bar chart of responses versus requirements) as well as textual feedback.
- For areas requiring further work, the users have the opportunity to receive system guidance to educational resources.

The competency categories included in the system are:

1. Personal Competencies for AHI Professionals
2. General Computing Competencies for AHI Professionals
3. Health Computing Competencies for AHI Professionals
4. Key IT Usage Competencies for AHI Professionals
5. General Health System-Related Competencies
6. General Business and Management Competencies
7. General IS Department Management Competencies
8. Team and Human Resources Management Competencies
9. Re-Engineering and Management of Change Competencies
10. Strategic and Operational Planning Competencies
11. Assessment of the Value, Effects, and Cost of IT (Competencies)
12. General Technology/Systems Life-Cycle Management Competencies
13. Procurement Competencies
14. Systems Implementation and Integration Competencies
15. Systems Maintenance and Support Competencies
16. System Customization/Ad Hoc Development Competencies
17. Project Management Competencies
18. Education and Training Competencies
19. Vendor/Service Provider Competencies
20. User and Process Observation and Assessment Competencies
21. Security Management Competencies
22. Information and Data Collection, Analysis and Management Competencies

A total of approximately 400 separate competencies allocated under these categories are addressed by the system.

RESULTS

WebSAT has now been tested by both graduate students in our HI program and by students in a new HI program at a nearby community college.

Students have reported a high degree of satisfaction with the system. They found the system useful and informative, and it gave them a clear view of what they still need to learn and where they stand relative to the requirements of various roles.

We have recognized, however, that many improvements are possible, and we have elected to enhance the system further along the following lines:

1. We are modifying WebSAT to enable its use at two levels of detail, both at the detailed competency assessment level that it currently addresses, and at the level of competency categories (groups of related competencies), thereby allowing more rapid assessment of those areas recognized by the student as weaknesses.

2. We are improving its user interface so that it can be more easily understood and efficiently used.
3. We are completing the addition of learning links to Web-based educational sources to be referenced by students with identified weaknesses.

4. We will extend the tool to incorporate Research and Development HI (academic-level) self-assessment to the same degree as the AHI assessment.

5. We are in the process of offering the system to other programs for use as a tool by students.

**SUMMARY AND CONCLUSIONS**

We have developed a Web-based competency self-assessment system for Applied Health Informatics. This system allows individuals to assess themselves as to the congruence of their competencies with those required for specific roles. The system has been tested on students and is in the process of being enhanced and disseminated. Individuals interested in accessing the system personally or using it as a component of their programs are invited to contact the first author. The system is offered without charge.

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**REFERENCES**