Developing a Common Reference Model for the Health Informatics Discipline

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Abstract.

Unlike the IT industry, the domain of Health Informatics has not been consistently defined or commonly understood within the healthcare industry. In particular the identification of the common skills of all in health informatics, the specialization pathways and skill requirements are not clear. This means that employers are not clear on the skills required for a task, or the ability of an individual to undertake those tasks. It also makes it difficult to design suitable educational programs or to obtain global recognition for graduates from these programs. A business tool, known as the IT profession’s Skills Framework for the Information Age (SFIA) launched in 2000, has now been adopted around the globe to assist organisations to make the best use of IT. Such adoption has provided a common language rendering the deployment of the right skills possible to achieve desired business objectives. This tool is also used as a guide in the Seoul Accord signed by eight nations for mutual recognition of accredited academic computing programs that prepare graduates for professional practice. This study reports on an examination of SFIA to determine if such a process and/or the use of this tool is suitable to be applied to the health informatics discipline. During this process all known and agreed Health Informatics competencies were mapped to SFIA. The results showed that all high level SFIA skills apply but that these need to be contextualized and additional ones need to be included to truly reflect the necessary health informatics skill set. Adoption of an accord similar to the Seoul accord process could be very beneficial in promoting a global understanding of the health informatics discipline.

Keywords.

Competency based education, Learning, Medical Informatics, Nursing Informatics, Education, Curriculum, Accreditation

Introduction

Our overall aim for this project is to build on IMIA’s recommendations on education in biomedical and health informatics by developing a framework that provides a common reference model for the identification of the skills needed to develop, manage and use effective health information systems. The availability of a reference model that uses a common language and a sensible, logical structure, enables flexible educational program design to meet core health workforce skill needs and support the development and specification of specialisations.

Such a framework needs to suit a very wide range of health related business and clinical processes that are supported by many and varied technical devices, hardware and software applications used to collect, process, analyse, and report on data/information and/or knowledge. As the health informatics (HI) discipline increases in complexity and pervasiveness we have a greater need to clearly define workforce skill needs so as to improve consistency and reduce ambiguity. This can be achieved via the use of an agreed reference model and by using a common language.

Such a reference model, known as the Skills Framework for the Information Age (SFIA) has been developed and is used globally for the IT industry. Given that all base level IT skills apply to the HI discipline we decided to test its suitability to HI. This study answers the following research question: Can SFIA enable worldwide recognition of accredited academic programs designed to prepare its graduates for professional health informatics practice?

Known Health Informatics Competencies

A business tool, known as the IT profession’s SFIA originated in the United Kingdom and was launched in 2000. Its aim was to provide recognizable descriptions of the professional skills needed by people working in IT. This two dimensional framework consists of areas of work on one axis and seven levels of responsibility on the other. It’s structure is adaptable to suit specific training and development needs that can be met by suitable educational program design.

SFIA states that ‘IT capability comes from a combination of professional skills, behavioural skills and knowledge. Experience and qualifications validate that overall capability’. SFIA has now been adopted around the globe and forms the basis for the Seoul Accord signed by eight nations for mutual recognition of accredited academic computing programs that prepare graduates for professional practice. National organisations within these nations, such as the British or the Australian Computer Society, have included the Seoul accord (SFIA) requirements in their own ICT body of knowledge and educational program accreditation guidelines. In addition SFIA may be used by any organisation to develop precise descriptions of the skills required in jobs and roles or to describe the available capability. Its flexibility enables such position descriptions to include various levels of responsibility for any number or combination of skills, thus documenting a possible career pathway.

SFIA provides a relevant example of what if required for the Health Informatics (HI) discipline. This project reports on an examination of SFIA and in particular cross mapping of the generic skills to known HI competency statements to determine if such a process and/or the use of this tool is suitable to be applied to the HI discipline.

The IMIA knowledge base consists of 14 unique high level categories with a large number of generic skills in each, totaling 245. The foundation for these terms was the Health Informatics literature. This structure is similar to that adopted by the SFIA reference model but it doesn’t have any detailed descriptions for these HI skills.

The IMIA educational recommendations includes a list of recommended and optional learning outcomes where each has
been allocated one of three recommended level of knowledge and skills, introductory, intermediate or advanced for two roles, IT user and HI specialist. The completion of IMIA’s knowledge base followed the completion of the IMIA educational recommendations. Consequently the two have yet to be merged.

The Canadian Health Informatics Association (COACH) first developed a set of core competencies in 2007, their third version, consisting of 50 core competencies, was released in 2012. These competencies are structured into seven broad categories and well defined. They represent the minimum requirements necessary for a HI Professional to practice safely either solo and/or as a member of a HI team that includes multiple specialties. Ethical principles are provided as an appendix.

Methods

Previous work undertaken had included a very extensive literature review of the many projects undertaken around the globe towards the development of health informatics competency statements. An ontological perspective had then been applied to these numerous competencies to clarify this discipline’s scope of professional practice. The result was the identification of the scope of Health Informatics as a whole, the shared common skills of all working in the domain as this relates to roles and functions associated with the improvement of health outcomes and healthcare system performance in direct patient care, design and governance of healthcare organisations, the healthcare system as a whole, health knowledge discovery and management, through the application of technology (hardware, software and communication). In short the scope applies to the entire health ecosystem. Examples were used to show relationships between these skill sets, specific jobs and career pathways. The following diagram presents an outline of the scope of HI.

Our approach was to identify individual competencies and skill sets required at an entry or graduation based level relative to people working in each of eight HI role examples as follows:

1. IT Health Informatician
2. IS Health Informatician
3. Others Specialists
4. Clinical Informatician
5. Health Information Manager
6. Clinical Terminologist
7. Health informatics Administrator
8. Health Informatics Educator

No attempt had been made to define all possible roles, those identified were based upon the common knowledge groups or specialisations identified in the IMIA knowledge base as well as on existing HI related roles in Australia. In addition the level of skill expected was depicted using the revised Bloom’s Taxonomy of Learning Domains category definitions. All competencies were grouped according to the three domains used in IMIA’s educational recommendations document. The final list of competencies are closely related in terms of numbers and definitions to those listed in the 2010 IMIA recommendations and can almost be used interchangeably.

During 2011 we were also interested in identifying possible career pathways through the identification of competencies. IMIA have recognized that a person who begins in one area of qualification as an undergraduate can often lead to specialization in another area through further study, and that some people may seek university based education to prepare for careers as Health Informatics specialists. The following diagram presents the three domains of HI (Technical, Clinical and Administrative) in the context of the key domain strength of the entry level educated professional and the additional knowledge and skills required to appropriately and effectively practice in HI. Specific additional education, skills and experience are required in order to further specialize.

![Figure 1 Scope of Health Informatics Discipline](image)

![Figure 2 High Level Career Pathway for three HI domains](image)

**Mapping Known Health Informatics Competencies to SFIA**

Health informatics competencies thus identified were mapped to the SFIA version 5 structured areas of work using an ontological approach by focusing on concepts expressed, not terms used. This was followed by mapping various SFIA identified responsibilities within each work area to those expressed within the health informatics set of competencies as these relate to IMIA’s educational recommendations.

The SFIA reference model consists of six high level categories, 19 subcategories and 96 unique IT skills, each of these are fully defined by responsibility level in the SFIA 5 framework reference document. Undertaking this mapping process
exposed many limitations and demonstrated SFIA’s superiority in terms of structure and clarity. Firstly the descriptions for the HI competencies lack clarity and contain a number of different concepts that should ideally be parsed. Secondly the descriptions for each learning outcome/competency are very limited unlike the definitions provided in SFIA.

The next step was to map the fourteen high level knowledge concepts used to define the IMIA knowledge base to the 46 (IMIA has 48) competencies identified. Again this was not an easy process. We again had to focus on high level concepts as the terms used did not represent a good match.

This was followed by mapping the HI competencies to the seven high level competency areas representing the core body of health informatics knowledge as identified and defined by COACH. The competencies described in the section of the Canadian health system were considered to be relevant to any nation’s health system in terms of fundamental principles although details obviously differ.

A spreadsheet was used to document the mapping processes undertaken. This enabled us to cross reference between these sets of competencies/knowledge bases.

Results

Due to the limitations previously identified the mapping process could only be based on the best possible conceptual fit. Eight out of 47 HI learning outcomes/competencies could not be mapped to SFIA, these were:

- 1.1 Evolution of informatics as a discipline and as a profession.
- 2.1 Fundamentals of human functioning and biosciences (anatomy, physiology, microbiology, genomics, and clinical disciplines, such as medicine, nursing, allied health).
- 2.2 Fundamentals of what constitutes health, from a physiological, sociological, psychological, nutritional, emotional, environmental, cultural, spiritual perspectives and its assessment.
- 2.3 Principles of clinical decision making and diagnostic and therapeutic strategies
- 2.4 The Australian (or any national) health system, inter-organisational aspects and shared care.
- 2.6 Principles of evidence-based clinical practice
- 3.2 Ability to use personal computers, text processing, and spreadsheet software, easy to use database management systems.
- 3.3 Ability to communicate electronically, including electronic data exchange, with other healthcare professionals, internet/intranet use.
- 3.10 Mathematics: algebra, analysis, logic, numerical mathematics, probability theory and statistics, cryptography.

Five of these could fit with more than one SFIA skill. The number of ‘matches’ ranged from one to seven, thus confirming the inclusion of multiple concepts in single HI competency descriptions. Twenty nine SFIA skills out of 96 could not be mapped to any HI competency statements.

The competency described as 1.1 ‘Evolution of informatics as a discipline and as a profession’ could not be mapped to any of the COACH high level knowledge areas.

Two competencies could not be mapped to either the IMIA knowledge base nor that of COACH. These were:

- 1.16 Informatics methods and tools to support education (including flexible and distance learning), use of relevant educational technologies, incl. Internet and world wide web.
- 2.1 Fundamentals of human functioning and biosciences (anatomy, physiology, microbiology, genomics, and clinical disciplines, such as medicine, nursing, allied health).

Neither of these were considered essential requirements for all people working in health informatics, but certainly are appropriate to some specialties

Discussion and Conclusions

Out of the four sets of competency statements only COACH has defined those in a manner that meets educational requirements for clear specification of both the skill and the level of the skill which must be taught and assessed. These requirements are that all learning outcomes/competencies must be defined as being specific, measurable, achievable, realistic and time referenced. Competencies also need to be able to relate to a knowledge base that describes the scope of any domain. Again the COACH competencies are defined in that manner. The SFIA knowledge base has been related to the Australian Computer Society’s core body of knowledge. The Australian competencies, and by association the IMIA competencies, did not relate all that well to the IMIA knowledge base. Two could not be matched at all, only one competency matched with the knowledge concept 3 named as ‘Health (care) records, and another one matched with 13 ‘Using informatics to support clinical healthcare governance’. This is largely a reflection of the IMIA’s all inclusive approach, rather than the focus on what is needed by all, or most in a given situation.

The results showed that SFIA skills apply but that additional competency statements need to be included to truly reflect the necessary health informatics skill set. It also suggests that the HI set of competency statements may not reflect the full scope of HI practice, this needs to be further explored. One could argue that the non matching competencies either belong to another knowledge domain or these should be included in what could be referred to as foundational employability skills and knowledge obtained via prior study or previous work experience.

IMIA is currently using its recommendations as part of its trial course accreditation process. The lack of clarity of all competency statements complicates this process. This study has highlighted its limitations in terms of ease of use of the IMIA educational recommendations as well as the limitations of the results of the Australian study.

There is a need to parse the existing learning outcomes/competencies into generic statements that meet educational guidelines and representational norms. These then need to be structured into a more logical schema such as that used by COACH or SFIA and to describe each competency relative to several levels of responsibility with a strong emphasis on governance and accountability. Ideally each competency statement also relates to an educational level.

Every generic skill statement or competency needs to be defined in accordance with an agreed standard format such as that used by Australia’s vocational education sector. Australian competency standards define the skills, knowledge and attitudes required for effective performance in the workplace in defined roles. These standards are expressed in
outcome terms and have a common format comprising unit title, unit description, elements, performance criteria, range statement and evidence guide. They are descriptions of the competencies required for effective performance in the workplace, both in the routine conduct of the job role and in the ability to adapt to changing role definitions.

Competency standards need to be generic and relate to the industry as a whole. They can then be interpreted in terms of specific worksites or types of healthcare facilities. Educators need to be able to take the information contained within the competency standards, relate this to a particular workplace/industry, then use or customise that information to inform the education delivery and assessment processes. The IMIA knowledge base could form the foundation for a well structured standard format used to document each competency in a manner that reduces ambiguity as well as provide a framework for competency assessment. Each skill reflects how and for what purpose individual knowledge items are made use of. Each competency statement needs a standard name, code, overall description that can be contextualized to suit specific workplace instances, associated levels of responsibility defined in terms of autonomy, influence, complexity and business skills.

Once this has been achieved we’ll be in a position to better design suitable educational programs to meet individual and organizational capacity needs, better describe graduate outcomes relative to HI roles and improve the potential to have HI positions globally recognized as a job classification. The success of the global use of SFIA by educational institutions and employer organisations is testimony to its design. Once we have a suitable structure for the Health Informatics discipline, then the adoption of an accord process could also be very beneficial in promoting a global understanding of the health informatics discipline, to guide curriculum design, course accreditation processes, writing position descriptions, identify learning and career pathways.

We conclude that SFIA itself cannot enable worldwide recognition of accredited academic programs designed to prepare its graduates for professional health informatics practice. However its adopted structure provides a very useful example of a well defined reference model that reflects the scope of practice for a discipline. Similarly the Health Informatics Professional Core Competencies developed by COACH could serve as a good example or be used as the foundation for reaching a global agreement.

IMIA needs to build on the work undertaken by many around the globe to date in an effort to reach some agreement about what should be included in the scope of the HI discipline. Developing a framework using a common language that provides a useful reference model for the identification of the skills needed to develop, manage and use effective health information systems is the next step. This study represents a starting point.

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