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A Synthesis of Students’ Theses in the Accredited HHSI Master’s Programme

Ulla-Mari KINNUNENa,1 and Kaija SARANTOa

aUniversity of Eastern Finland, Department of Health and Social Management

Abstract. Education in Health Informatics (HI) has been a key priority to guarantee knowledge and skills for professionals working in healthcare settings. One of the early academic models to teach HI are the recommendations provided by the International Medical Informatics Association. The paper describes the curriculum developed for master’s degrees and the status of a paradigm used in informatics education, as well as research in the health and human services fields. The aim is to synthesise the methodological focuses in students’ theses and discuss the future needs for development. The paradigm guides informatics research. The research focuses, questions and applied research methods were coded for 152 master’s degree theses. Based on the results, the most often used method was qualitative. The most frequent research area was steering and organising of information management in work processes. The results guide teachers in supervising the theses of the Health and Human Services Informatics (HHSI) programme and tutoring new students.

Keywords: Education, paradigm, informatics, curriculum, thesis, methodology

Introduction

Beside the academic development of teaching curricula in health information technology, professional associations have had a leading role in compiling lists of competencies and the various focuses of teaching. At the European and international levels, the European Federation for Medical Informatics (EFMI) [1] and the International Medical Informatics Association (IMIA) both have had great influence on the multidisciplinary education of professionals [2]. According to the IMIA, as of autumn 2017, there were 44 academic institutions providing health and biomedical informatics education [2]. The history of health and biomedical informatics education can be traced back to the 1960s, when computerised information systems were implemented in hospitals [3]. This gave rise to a great need for learning and education, which evolved in the form of integrated courses and continuing education and, finally, in degree programmes [4].

The first recommendations on education in health and medical informatics were published in 1999 by the IMIA Education Working Group and were updated in 2010 [5]. These recommendations guided the establishment of the master’s degree

1 Corresponding Author: Ulla-Mari Kinnunen, Virranниемie 3, 78310 Varkaus, Finland; E-mail: ulla-mari.kinnunen@uef.fi.
programme in Health and Human Services Informatics (HHSI) at the University of Eastern Finland (UEF) in 2000 [6]. The wide scope, covering both health and social care in informatics education, is based on the health and social care service system in Finland, which has been integrated at the regional level. Furthermore, it has been an advantage for graduates to work in the integrated sectors when developing and designing digital service systems for the Finnish society. [7] The UEF program was among the first to obtain the endorsement “IMIA accredited”, meaning that the international criteria for the evaluation had been met [8].

In the framework of health and biomedical informatics, the field of HHSI has its origin in the implementation of digital technologies in the health and social sciences. As an interdisciplinary major, HHSI applies especially to management and the computer and information sciences [9]. HHSI is understood as the management of information resources of an entity (e.g., of an organisation), covering the activities, actors and methods in the production of health and welfare services for the public and private sectors and organisations. Resources are understood as data repositories, systems, applications, devices, communications tools and models, and, most importantly, people as sources and utilisers of information.

The aim of the research in the field of HHSI at UEF is to produce new, high-level scientific information to support the activities of the service system in the social and health care sector and to provide a theoretical understanding of the effects of electronic systems on the management of information. Furthermore, to guide research in the informatics field, the core concepts’ entities were connected to constitute four research areas: 1) Steering and organising information management in work processes, 2) Use of information and communication technology (ICT), 3) Knowledge management and informatics competencies, and 4) Data models and structures [10]. This paradigm has been used in teaching the theoretical foundations and research methods in HHSI and in supervising master’s degree theses. All basic and equally important issues, including research methodology, are highlighted and discussed during the thesis project [11].

1. The curriculum for the HHSI programme

The content of the curriculum is based on the IMIA recommendations, which comprise three knowledge and skills areas: Biomedical and Health Informatics core knowledge and skills; Medicine, health and biosciences and health system organisation; and Informatics/computer science, mathematics, and biometry. The recommended student workload totals 120 European Credit Transfer and Accumulation System credits (ECTS), which in practice means two years of full-time studies [5]. The master’s degree thesis is a compulsory part of the curriculum and accounts for 30 ECTs. The methodological component of the curriculum includes the following courses: an advanced course in Statistical Methods, Modeling and Analytics, Evaluation Research, Evidence-Based Health and Social Care, Research Methods in HHSI, Information Retrieval and Research and Development of HHSI (Figure 1). In addition to 120 ECTS, 25 ECTS of basic computer science courses are compulsory in the HHSI master’s programme. A student entering the HHSI programme must have a bachelor’s level degree and demonstrated competencies in research methods. Depending on the student’s previous education, some students must complete complementary basic qualitative or quantitative methods courses.
The purpose of the methods courses in HHSI is to expand and deepen students’ methodological competencies. Most of the methods courses in HHSI are taught in the spring semester of the first year. The aim of these courses is to prepare the student for completion of the thesis.

2. Aims of the study

Following the aims of the HHSI programme, the aim of this paper is to synthesise the methodological focuses of HHSI research areas found in students’ theses and to discuss the future needs for development.

3. Materials and methods

The data consisted of accepted master’s degree theses (n=152) from the HHSI programme at UEF in the years 2002–2017 (October). Most of the theses were written...
by a single student. Only five of them were written by a team of two students. Data in the following categories were extracted from the theses using an excel tool: year of acceptance, theoretical background, purpose, questions, data source, collection and analysis, and study context. The research purpose and questions were coded based on the paradigm concepts (e.g., actors are health professionals, data is terminology based documentation) and focuses (e.g., data models and structures). At the beginning of the coding process, the second author pilot-tested the coding scheme with 30 theses. The authors, who were familiar with the coding categories and contents, discussed the coding rules many times when applying the paradigm while teaching. The authors completed the coding independently. The inter-rater reliability was 82%, with the differences due mostly to disagreements about the preliminary concept. The data were analysed using descriptive statistics. The results are presented in the narrative description of the analyses.

4. Results

The most often used (47%) research method was qualitative (n=71), featuring data collection by various methods (e.g., interviews or registry data). Although the permission process in Finland is very strict and it is time-consuming to use register data, especially from patient records, 31 studies were based on data analyses. Quantitative methods in the form of surveys were seldom used (29%). Mixed methods or literature review were used almost as often, and data mining was used in two theses. The HHSI research area in the theses was most often steering and organizing information management in work processes (n=54). Use of ICT was also a frequently used context (n=46), as well as Knowledge management and informatics competencies (n=33). Data models and structures were found as a research area in 19 theses. The research methods used in the theses can be seen in Figure 2.

![Figure 2. Research methods and areas used in theses.](image-url)
5. Discussion and conclusions

The HHSI master’s programme follows the IMIA recommendations for educational curriculum structure and content [5]. Over the years, the paradigm has guided the research, education, and students’ learning objectives [10]. In the program, students can choose their research topics and methodology voluntarily, based on their research questions. Issues regarding thesis planning and completion, such as critical thinking and expanding knowledge and skills, conceptualisation, review of the relevant literature, research ethics and research methodology [9] are discussed during the thesis seminars. In recent years, the digitisation of health and social services has progressed actively in Finland [6]. Thus, this topic may be reflected in students’ research areas, aims and questions. It is also expected that new legislation for data reuse will raise needs for data analytics methods [7].

The results of this study guide the teachers in supervising the theses of HHSI programme students and in tutoring new students. The surveyed theses applied mostly qualitative methods to explore phenomena in health and social care informatics. The results show that students’ theses have focused on widely different research areas. More guidance and encouragement to use quantitative methods is needed by us teachers. However, steering and organising of information management in work processes and the concepts of data and action as study objects refer to recent ICT reform in Finland. Further, use of data from the national data repository may increase the use of data mining as a research method [7]. However, limitations must be considered. This study focuses on only one university programme with a small number of theses. It would be interesting to analyse international degree programmes at various levels to see what types of conceptual models, frameworks and structures are used in education and research (e.g., among IMIA academic institutions). [1, 2, 5].

References