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Mapping Skills and Competencies; Providing Access to Knowledge, Tools and Platforms; and Strengthening, Disseminating and Exploiting Success Outcomes for a Skilled Transatlantic eHealth Workforce

Case Study: Health and Human Services Informatics (HHSI) Master's Degree Programme: Advancing Professionals' Competencies for the Digital Era

University of Eastern Finland

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TITLE Health and Human Services Informatics Master's Degree Programme: Advancing Professionals' Competencies for the Digital Era

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ORGANIZATION

University of Eastern Finland (UEF) is one of the largest universities in Finland with approximately 14,000 students and 3,000 staff members. The university's profile underscores the multidisciplinary nature of the four faculties of the UEF, i.e. the Philosophical Faculty, the Faculty of Science and Forestry, the Faculty of Health Sciences and the Faculty of Social Sciences and Business Studies. The Department of Health and Social Management, located within the Faculty of Social Sciences and Business Studies, offers degree programmes and research in four major areas: health management sciences (since 1979), health economics (since 1997), health and human services informatics (since 2000) and social management science (since 2006). All of these disciplines have pioneered a unique role in the Finnish university education system. The department's staff comprises approximately 40 experts in the field. As of today, some 150 students have graduated from the master's degree programme in health and human services informatics and now hold positions at the national, regional and local levels in development, leadership, or governance positions.

BACKGROUND

The first step towards the expansion of informatics education was the launch of a new programme 'Information Management in Social and Health Care' which started in 2000. The program was partly financed by the European Union (EU)'s European Social Fund (ESF). This program was stabilized in 2006, and since then has been a permanent master's degree program funded by the Ministry of Education (MoE). The programme is now called 'Health and Human Services Informatics' (HHSI), which reflects its present focus. From the beginning, it was obvious to join perspectives of two important service sectors—health and social care—in the education programme based on the development activities in the Finnish society. Since 2000, the programme has engaged mostly nurses but also other health and social care workers, as well as information technology (IT) professionals. The curriculum structure for the first two years of the programme (120 credits in European Credit Transfer System (ECTS)); one credit corresponds to 27 hours of work) was compiled, drawing upon the International Medical Informatics Association (IMIA) recommendations on three knowledge and skills areas: Health Informatics core knowledge and skills, health organization and informatics/computer science [1]. Based on the international accreditation process, the HHSI programme received the "IMIA accredited" status in 2012 [2].

The Finnish higher education system includes three major activities: education and research, a societal service mission and social responsibility [3]. By investing in these areas of expertise, in the renewal of research activities and in the establishment of new activities, the role of the university is strengthened within the national and international innovation system. The university's education and research meets the needs of society and respects academic freedom. The HHSI programme was established when the change from paper-based records to electronic information systems in health and social care began in 2006. The

aim of the university's third activity was to be active in cooperation with various organizations, stakeholders and the society itself. The staff has been heavily involved in national developments in terms of defining structures and standards for electronic health records (EHRs). Cooperation has been very rewarding from a feedback and benchmarking point of view. The graduate student network includes both students currently enrolled and students who have already graduated from the programme to share real world experiences from their work life. It also provides the opportunity to update teaching content and create new research initiatives within eHealth and electronic services (eServices). Interaction with service providers and enterprises has also been very beneficial for students' practical training, presenting new training opportunities as well as prospects to secure permanent positions with them post-graduation.

STATUS/CURRENT DEVELOPMENTS

The HHSI master's degree program is one of a kind in Finland. Our strategic goal is to produce experts that possess the knowledge and skills to plan and manage information resources while having a concrete understanding about the health care and human services field as a whole, taking into account the area's special features regarding IT and management. The need for this kind of education and research is indisputable. The societal need of a HHSI program rests on informatics competencies needed in the health and social sector [4]. Our strategy is to educate health and social care professionals to be informatics experts as well as to educate information system developers to have an in-depth view of health and social care. In other words, the aim is to build a bridge between IT and service systems.

The students will obtain advanced competencies in practice and research in the field of HHSI, both nationally and internationally. Students will contribute to the evaluation, development and use of IT in health care and human services. They are able to use various methodological approaches to study digitalization within society and industry. Furthermore, the students will obtain competencies in economics and governance, and are able to integrate different aspects such as confidentiality, data security and protection as well as standards and sciences (such as health and social sciences) into the field of IT and information management. With compulsory computer science studies, students will gain adequate skills in programming. The degree comprises 120 ECTS credits and includes intermediate and advanced level studies. After completion of the master's degree programme, the student can apply for doctoral studies in HHSI.

The goal of the programme is to give the students an in-depth understanding of the service systems and to develop informatics from unique viewpoints representative of the health and social care sectors. Essentially, the goal is to strengthen planning, implementation, evaluation and administration of information resources in the health and social sectors [4].

Our education and research is following a paradigm created by the core education team based on previous studies and theoretical assumptions in health informatics (HI) development over the years. Thomas Kuhn defines paradigm as a "comprehensive model of understanding that provides a field's members with viewpoints and rules on how to look at the field's problems and how to solve them. Paradigms gain their status because they are more successful than their competitors in solving a few problems that the group of practitioners has come to recognize as acute" [5]. Based on Kuhn's theory, we believe that our paradigm initiates the following questions:

1. What should be studied and investigated?
2. What kind of questions should be presented and studied?

3. How are these questions proposed?
4. And finally, how are the results interpreted? [5, 6]

This led us to define the core concepts: data, action, technology and actors to formulate the body of knowledge in HHSI. The core concepts are defined as follows:

Actors: the users or producers of health and social care services

Data: the hierarchical continuum from data to knowledge

Action: the planning, implementation and use of services

Technology: social and technical procedures used in processing, analysing, storing and retrieving data related to actions.

By joining these concepts together, we ended up with four major research areas: steering and organizing of information management in work processes, use of IT, knowledge management and informatics competencies and data models and structures [7] (Figure 1).

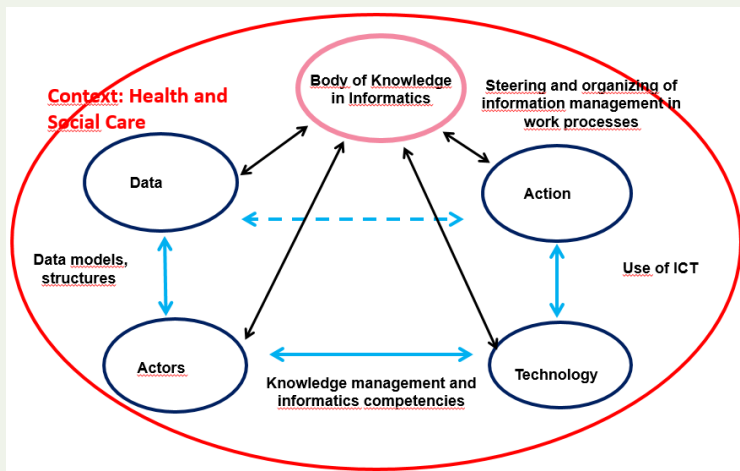


Figure 1. Paradigm of HHSI

The paradigm is used in teaching when defining research focus and shaping research questions. The paradigm gives insights into the IMIA recommendations of three knowledge and skills areas. After being in active use, we are interested in knowing the effects of the paradigm on knowledge and skills focused areas used throughout the HHSI curricula.

ACTIVITIES/MEASURES

As shared above, the HHSI program rests on the educational recommendations of the IMIA [1]. Taking into account the Finnish higher education system and the Finnish way of providing health and social services, the structure of knowledge and skill areas for the master’s degree level programme were modified. (Table 1) Possessing a bachelor degree, the first-cycle year in the European Higher Education Area (EHEA) [8], is a prerequisite for the master’s degree programme. This is because there are no bachelor degree programmes available in HHSI for students who enter the program with various backgrounds e.g. first-cycle polytechnic degrees in nursing, physiotherapy, social work, laboratory technician or radiographer, or first-cycle degrees e.g. in computer science or health management.

Knowledge/Skill Area	IMIA Workload	HHSI Workload
BMHI core competencies	80	61
Medicine, health and biosciences, health system organisation	20	37
Informatics/computer science	20	25 (computer science)*
Methodological competencies	-	22
	120	120

Table 1. IMIA master’s degree workload vs. HHSI workload comparison

*compulsory supplementary course

The students’ background education is monitored yearly in order to discover the need for supplementary studies. The university may require a student admitted to study for an academic postgraduate degree to complete the necessary supplementary studies (max 60 ECTS) in order to acquire needed knowledge and skills to be successful in the program. In the HHSI program, courses are decided based on the students’ previous studies. To be able to guarantee unified basic knowledge, in the beginning students are allowed to take supplementary fundamental courses, mainly in health and social service system studies, computer science, basic statistics, research methodology, ethics or legislation. The amount of supplementary studies are recorded based on yearly intake.

The table below (Table 2) presents the courses covering the Biomedical and HI core competencies as an example of one of the four competencies areas.

Courses	ECTS	Competencies
Introduction to HHSI	5	<ul style="list-style-type: none"> Explains and applies fundamental concepts and areas of actions as well as actors in informatics Discovers and analyzes informatics knowledge Combines national and international informatics perspectives
Data Protection and Security	5	<ul style="list-style-type: none"> Explains fundamentals in legislation and decree in data protection and security, and applies them to information management practice Differentiates and evaluates ethical standards in terms of confidentiality, data protection and security
Theory Building in HHSI	6	<ul style="list-style-type: none"> Distinguishes and evaluates theoretical basis and their implications to informatics research Applies theories used in informatics research and practice, and combines them in conceptualization with various methods
Knowledge Management in HHSI	6	<ul style="list-style-type: none"> Demonstrates and combines ontologies used in medical, nursing and social context Differentiates standardization as a process and evaluates standards in terms of their use in practice Explains and evaluates standards usage and their effects on information system development and implementation
Evidence Based Health Care	6	<ul style="list-style-type: none"> Distinguishes basic principles in evidence based methods

		<ul style="list-style-type: none"> Combines work phases of systematic literature reviews, especially assessing validity of research findings and knowledge transfer in practice
Practical Training in Health and Human Services	6	<ul style="list-style-type: none"> Generates a plan for training in HHSI' field development or research Evaluates her/his competencies in HHSI in terms of implications to practice
Master's thesis (health and human services informatics)	30	<ul style="list-style-type: none"> Concludes knowledge and is able to integrate the learning outcomes of previous HHSI studies to research processes Composes critical new knowledge related to research questions and methods relevant to HHSI and is able to appraise a method for defined research questions, data analysis and reporting the results Justifies planning, implementation and evaluation of research relevant to the biomedical and HI fields
Total	61	

Table 2. Core competencies in HSSI curriculum

CHANGES

The paradigm has been implemented into HHSI course content more thoroughly in recent years. Based on our experiences, this conceptualization gives students a good orientation to both the theory and practice of HHSI. The paradigm is analyzed in the introduction to the health and human services course at the beginning of the programme, and is applied in other core competency courses as well.

The students use the paradigm when compiling research plans for their master's thesis. Thesis seminars have a structured syllabus and follow the research process. In the beginning, the students concentrate on core concepts and define their thesis focus based on the paradigm. In the seminars, the students analyse their research plans along with the research process in team discussions. The cumulative feedback from the same team was applied two years ago during the seminar process.

RESULTS

The background of students applying for the HHSI programme has slightly changed in recent years. Previously, the majority of the students held a bachelor's degree in nursing science. In the autumn of 2017, we witnessed increased early degree variety in applicants' over previous years that included computer science, nursing science, business, engineering, social science, political science and medicine. This is a positive change in terms of the advantages that multidisciplinary backgrounds bring to the programme.

In recent years, the supplemental study requirements for students admitted to an academic postgraduate degree program has diminished. This may be due to the amount and extent of earlier studies completed by applicants.

The students' satisfaction with the teacher's educational performance is measured after each course concludes by the HHSI staff. Both structured forms and narratives are used during data collection and all results are discussed in the spring strategy seminar for HHSI staff. The comments and suggestions for improvements are assessed and also presented in department meetings, and then are carried out by the

department's teacher committee. Overall, the feedback has been constructive and most often, related to the learning outcomes for each course as well as the students' own learning outcomes. The feedback is utilized when course updates are made.

In the spring of 2017, the theses of the students that graduated from the programme were assessed based on the paradigm's research focuses. Out of 152 theses, 36% (n=54) focused on *steering and organizing of information management in work processes*, and 30% (n=46) on *the Use of IT*. The context in 22% (n=33) was *knowledge management and informatics competencies*. *Data models and structures* were found as a research area in 12% (n=19) of the theses [7]. According to the assessment, it can be stated that the paradigm, developed over the years, guides research, education and students' learning objectives. Based on feedback, the students also value supervision and tutoring in thesis seminars.

OUTLOOK/LESSONS LEARNT

The first accreditation carried out by IMIA in 2012 provided us with good guidance and the confidence to further develop out our programme. The results were analysed jointly with students and teachers; changes in both curriculum and syllabus were easy to implement following the international panel feedback. This important feedback led our team to developing a more efficient paradigm. The re-accreditation process is expected to commence in early 2018.

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Case Study Checklists

Checklist of eHealth topics (competencies)	Apply? Yes/No	Describe how topic applies to your organization/case study
<i>Role of “Peopleware”:</i> human factors, awareness, satisfaction and acceptance of health IT, usability measurements, evaluation of health IT, communication, leadership, change management, ethics and IT and similar topics	Yes	We teach several of the mentioned topics during our courses, as one of our basic principles is the importance to include citizens and professionals in each phase of the health IT implementation.
<i>Role of inter-professional approaches:</i> inter-professional versus mono-professional training and learning activities. What subjects lend themselves to inter-professional vs. mono-professional classes, learning environments and similar topics	Yes	The students have practical training, which is accomplished in public or private organizations or enterprises. As an interdisciplinary degree programme, students are used to studying in various learning environments.
<i>Role of healthcare data sciences:</i> data and information acquisition including documentation, data quality, data, information and knowledge management, data analysis and statistics, clinical decision making instruments, reporting and similar topics	Yes	Data science is integrated into research methodology courses as well as in Knowledge Management in Health and Human Services, Evidence-based Health Care, Modelling and Data analytics and Master’s Thesis.
<i>Fusion of medical technology & informatics:</i> software as a device, smart devices, automatic data acquisition via devices, risk and safety management	Yes	Compulsory 25 ECTS courses on the basics of computer science include these issues.
<i>Role of process and workflow management:</i> clinical and administrative processes, information continuity and information logistics, management of processes, workflow management systems and similar topics	Yes	Integrated especially in courses on Theory Building in HHSI and Knowledge Management in Health and Human Services.
<i>Role of ethics, legal and data protection issues:</i> ethics and IT, legal requirements, data protection and information self-determination, data safety and similar topics	Yes	These are in the core content of the course: Data Protection and Security as well a special course in Health Care and Social Welfare legislation.
<i>Role of learning and teaching:</i> learning techniques (“learn how to learn”), learning and	Yes	Students compile a personal study plan with their tutor / teacher. Different learning

<p>teaching styles (online, blended, face-to-face), learning management, information management for learning and teaching and similar topics</p>		<p>environments are used when teaching, including online (Moodle eLearning platform has been used since 2000 when the program started), blended methods (webinars, video lectures, face-to-face lectures, etc.), also several other activating methods e.g. chat discussions during lectures, Padlet group work and flipped learning.</p>
<p><i>Role of management related topics in health informatics and IT:</i> principles of management, strategic management, stakeholder and change management, leadership, financial management, risk management, quality and safety management, resource planning and management and similar topics</p>	<p>Yes</p>	<p>The Basics of Management in Health and Social Care, Effective Health and Social Care, Leading and Managing Change and Cost Accounting and Budgeting in Public Organisations courses focus on these topics.</p>
<p><i>Role of technology:</i> information and communication systems, telemedicine, telematics, assistive technologies, mHealth, life-cycle-management including systems development/engineering</p>	<p>Yes</p>	<p>These topics are integrated throughout the HHSI curricula. A special course in Research and Development of HHSI highlights field advances.</p>
<p><i>Role of consumers and populations:</i> consumer health informatics, public health informatics</p>	<p>Yes</p>	<p>The Basics of HHSI and Master’s Thesis or Practical Training in HHSI courses focus on these areas.</p>
<p><i>Role of Research:</i> information management in research, data analytics</p>	<p>Yes</p>	<p>The Research and Development of HHSI and the Master’s Thesis courses highlight the importance of information management and data analytics as well as a special course in Modelling and Data Analytics.</p>
<p><i>Role of interoperability:</i> systems integration, IT standards, terminologies and classifications</p>	<p>Yes</p>	<p>The Basics of HHSI and the Knowledge Management in HHSI courses include these issues.</p>

Checklist of eHealth topics (gaps and deficiencies)

Teaching the teachers: Are there any activities in your organisation to teach health IT/eHealth to teachers in healthcare?

Yes, we belong to the nurse educators' network. The network organizes annual eHealth seminars to share about recent field advances.

Supporting participatory design and acceptance testing/research: Are there any educational activities to teach or practice participatory design? Are there any activities including research in user acceptance testing and satisfaction measurement?

Our present research co-operation with the Virtual Hospital 2.0 consortium is focusing on user acceptance in virtual services in health care.

Integrating eHealth/health informatics into traditional curricula: Are there any activities to include eHealth/health informatics into traditional curricula of physicians, nurses and other health professionals with direct patient care?

N/A

Motivating clinicians and managers: Are there any incentives and opportunities for clinicians and healthcare managers to acquire and update digital eHealth/health informatics skills and knowledge?

Based on present healthcare reform, a lot of expertise is needed in eHealth implementation and digital service design. New knowledge and skills can be used to possibly change one's position and work environment.

Engaging women: Are there any activities to attract female students in eHealth/health informatics or employ female health IT staff?

In our programme, 2/3 of the students are female and have a health professional background. Thus, graduation from the HHSI master degree programme provides them with the opportunity to start their new career in HI.

Adjusting job descriptions and enable continuing education: Are there any activities to adjust job descriptions, e.g., for clinicians, that include health informatics competencies (also proper use of health IT/eHealth systems) and are there activities to support staff updating and upgrading their health IT related skills and knowledge? This topic is mainly related to provider organisation and also to IT vendors.

Yes, several. Based on the present healthcare reform, a lot of expertise is needed in eHealth implementation and digital service design.

Updating teaching and learning material: Are there any activities to ensure that the material is up-to-date and of high quality?

Our teaching and learning is based on research and plenty of available online material.

Availability of courses including electronic courses: Are there any additional activities to improve the availability of courses such as implementation of new courses, new course formats that recognise previous experiences/training in particular for continuing education?

Yes, there are. The adult learning center is responsible for offering these courses.

Informal caregivers: Are there any educational activities to teach health IT usage to informal caregivers, e.g. for assistive technologies?

Based on the national health IT strategy, many activities are focusing on family support to use health IT. Several patient trusts, e.g. Finnish Diabetes Association (https://www.diabetes.fi/en/finnish_diabetes_association) are organising courses and also, provide guidance on health IT adoption.

Shortage of health informatics specialists: Are there any programmes to attract health informatics specialists?

Yes, there are also tailored courses based on advances in health IT for example: data protection, standards, architectures, ecosystems, etc.

eHealth Budget: Does your organization, area or region have a dedicated budget set aside for eHealth/health informatics training, education or workforce development initiatives?

Organizations (hospitals), areas (cities) and regions (provinces) all have funding mechanisms for initiatives in terms of various development projects focused on HI implementation.

eHealth Specialty Areas: Does your organization address any of these speciality settings/areas of training or outreach for eHealth education or workforce development: ambulatory care, social medicine, geriatric/ageing medicine, rehabilitation?

Yes, we address them all.