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An international course on strategic information management for medical informatics students: aim, content, structure, and experiences

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Summary We report on a course for medical informatics students on hospital information systems, especially on its strategic information management. Starting as course at the Medical Informatics Program of the University of Heidelberg/University of Applied Sciences Heilbronn, it is now organized as international course in the framework of the International Partnership for Health Informatics Education (http://www.iphie.org) jointly for medical information science students from the University of Amsterdam, medical informatics students, as well as health information management students from the Universities of Heidelberg/Heilbronn. In 2002, medical informatics students from the Master of Science program of the newly founded University for Health Informatics and Technology Tyrol (UMIT) at Innsbruck, Austria, joined. We report about the aim of this course, its audience, and the educational programs involved, about its content and structure, as well as about our experiences gained so far.
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1. Background

Modern information processing methodology and information and communication technology has strongly influenced our societies, including their health care (e.g. [1,2]). Because of this change, medical informatics specialists are increasingly involved in managing information systems of health care institutions, in particular of hospital information systems. E.g. 60% of the medical informatics graduates of the Universities of Heidelberg and Heilbronn, actually working in the field of medical informatics, answered in a recent survey that one of their main working fields are health information systems [3]. Almost all those graduates were focussing on hospital information systems.

As a consequence of this change, health care professionals, and in particular medical informatics specialists, need sufficient knowledge and skills of the possibilities and limitations to systematically

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manage such information systems of health care institutions (cf. [4]). Appropriately designed educational programs in medical informatics/health informatics and an increasing number of well-trained medical informatics specialists will help to pursue the goal of transforming health care through innovative use of information and communication technology [5,6].

2. Objectives

Our aim is to report on a course for medical informatics students on hospital information systems, especially on its strategic information management. We report:

- about its aim, audience, and the educational programs involved,
- about its content and structure, as well as
- about our experiences gained so far.

Starting as course at the Medical Informatics Program of the University of Heidelberg/University of Applied Sciences Heilbronn [7], it is now organized as international course in the framework of the International Partnership for Health Informatics Education (IΦE, http://www.iphie.org, [8]). Our considerations and experiences on the international aspects as well as an evaluation study of our international course in 2002 are presented in [9].

3. The course 'strategic information management in hospitals: an introduction to hospital information systems'

3.1. Aims

Our course aims to give answers to the following questions:

- Why is systematic information processing in hospitals important?
- What do hospital information systems look like?
- What are good hospital information systems?
- How can we strategically manage hospital information systems?

We want to provide our students with the knowledge and skills necessary to professionally begin with practical work after graduation and to be able to do research in this field.

3.2. Audience and involved curricula

The course is given for students of medical informatics about 1 year before graduating to a Master of Science in medical informatics at a university. Necessary requirements are sufficient knowledge about health care organizations and systems, about project management, and about tactical information management (mainly methodology of information systems analysis in health care institutions, see [10] for the Heidelberg/Heilbronn Medical Informatics Program). Mandatory for all medical informatics students, but obligatory for students in an informatics-based medical informatics program (see [4], Section 4.1 on informatics-based medical informatics programs) is profound knowledge in software engineering and in theory of database and information systems.

From 1990 until 2000, the course was lectured by the first author for students at the Medical Informatics Program of the Universities of Heidelberg and Heilbronn [7], mainly under the terms hospital information systems and health information systems. In addition, courses with related content had been given at the Universities of Prague (from 1993 to 1998, [11]) and Athens (in 1999, [12]).

As today national health care systems are increasingly forced to deal with global problems that call for solutions on an international level, it was decided that our students should be trained to further meet the demands of an increasingly international health care environment. Considering this development, from 2001 onward course was given in the framework of the International Partnership for Health Informatics Education IΦE [8] jointly for:

- *medical information science students* from the University of Amsterdam, The Netherlands [13];
- *medical informatics students* [7]; as well as
- *health information management students* [14] from the University of Heidelberg/University of Applied Science Heilbronn, Germany.

In 2002, *medical informatics students* from the Master of Science program of the newly founded University for Health Informatics and Technology Tyrol (UMIT) at Innsbruck, Austria, joined.

3.3. Content and structure

The course contents, presented in [15] and online available for our students, is divided into the chapters:

1. *Introduction*: Significance of information processing in hospitals, progress in information

and communication technology, importance of systematic information management.

2. *Basic concepts*: Data, information and knowledge, information systems and their components, hospital information systems, health information systems, information management in hospitals.

3. *What do hospital information systems look like*? Hospital functions, modeling hospital information systems, a metamodel for modeling hospital information systems: 3LGM, information processing tools in hospitals, architectures of hospital information systems, integrity and integration within hospital information systems.

4. *What are good hospital information systems*? Quality of structures, quality of processes, outcome quality, balance as a challenge for information management.

5. *How to strategically manage hospital information systems*? Strategic, tactical and operational information management, organizational structures for information management, strategic planning, monitoring and directing of hospital information systems.

6. *Final remarks*.

The course is now organized yearly as block course with three blocks:

- Block 1: Sections 1—3 are taught separately by teachers of the respective programs either in Dutch or in German. This block also includes site visits in the respective university medical centers (i.e. Amsterdam, Heidelberg, and Innsbruck) and a presentation of the architectures and infrastructures of their hospital information systems. Students are finally introduced to their exercises. They are assigned to groups, ideally consisting of students from all three countries.
- Block 2: Students start to work on their exercises.
- Block 3: Students and teachers meet for approximately 3 days at one place (in 2001 they met at the University of Heidelberg, in 2002 at the University of Amsterdam, in 2003 they will meet at UMIT in Innsbruck). Sections 4—6 are taught jointly for all students in English. Students do group work to jointly finalize their exercises and prepare their presentations. Finally, they present the results of their exercises.

4. Experiences

Up to now, our students evaluated our course quite positive (see [9] for details). Besides the international aspects, such as working jointly with students from medical informatics programs from other countries, the combination of presenting knowledge about hospital information systems and its strategic management *and* of elaborating exercises in real clinical settings was found as very important.

Doing exercises in different clinical settings—in our case at the University Medical Centers of Amsterdam, Heidelberg, and Innsbruck—and so being able to identify different solutions concerning architecture and infrastructure of the respective information systems to related or even identical problems, was found very helpful. In particular, it became clear that students need to have specific practicals in such clinical settings in order to understand the complexity of information management in hospitals and to identify the need and relevance of an appropriate theoretical background.

It also became clear that for such a course it is very helpful, when its teachers are not only involved in *research* in the field of the course (see, e.g. [16—23]), but also in the *practice* of strategic information management in hospitals. This helps to discuss real and up-to-date problems and also to present own experiences on how to solve such problems as well as to refer to ongoing research. Like architects, when being academic teachers, should be able to provide a theoretical background in their courses *and* should be experienced in building houses, lecturers in the field of hospital information systems and its strategic management should be able to provide a theoretical background in their field *and* should have practical experience information management in hospitals, e.g. in the elaboration and transformation of strategic information management plans.

Our course is obligatory in all four curricula mentioned. Examinations for this course have to fulfil the specific legal requirements for examinations of the four universities, based on the respective laws of three nations. In addition, the members of the International Partnership for Health Informatics Education commit themselves to close collaboration in training health and medical informatics students, but also to maintain their identity, distinctive features and unique profiles. We found that this can best be solved by planing and teaching such a course with teachers from the different universities, and by 'adjunct faculty' approaches. E.g. one of the teachers of this course is a (full time) professor at one university but also adjunct professor at another, with all the rights of teaching and examining the students in this university, too. Such international affiliated faculty approaches may be helpful for universities to establish international courses, to fulfil the national legal requirements and the legal requirements of the respective universities, as

well as to preserve the quality levels required for each university.

The authors are aware of a variety of courses on hospital information systems and on its strategic management in various other health informatics and medical informatics programs (e.g. [24]). Many of these programs are documented in the IMIA Yearbooks of Medical Informatics (http://www.imia.org). The authors do not know of a related course on this topic, which is jointly organized by several universities from different nations.

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