

# Job Analysis and Curriculum Development of Medical Information System Engineer

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## Abstract

Usages of a medical information system are progressing at great speed. As a consequence, there is a need for new professional human resources who can operate and manage a medical information system in the hospital. In this paper, a new job, 'Medical Information System Engineer', was defined and its job analysis and curriculum development was undertaken. The job analysis was conducted by using the KRIVET(Korea Research Institute for Vocational Education and Training)'s job analysis tool which is a kind of DACUM method.

## Keywords:

Medical Education, Job Analysis, Curriculum, Medical Information System Engineer

## Introduction

After scientists had begun to use the terminology called 'medical informatics' in the 1960s, information technique have been used directly and indirectly to patient's medical examination and treatment process. The knowledge and information industry began to expand rapidly from the 1980s, and spread of network technology changed business process of all industry fields. These technical growth affected medical industry. Medical professionals can give medical treatment to their patients without paper-based record in the near future.

This computerization trend also affected hospitals in Korea. Computer System has been used at Korean hospital from the 1970s. A characteristic of Korean medical information systems is the fact that systems are not designed for the quality of medical care but for the efficiency of business process. Actually, all major Korean hospitals are using the OCS(order communication system) for the business efficiency and the productivity. Now, some hospitals are migrating their systems to the EMR(electronic medical record) that will improve the quality of care. Another characteristic is that it is all-in-one integrated system. Unlike foreign occasion that information system is built by their own unit, in Korea, it is general that Korean hospital system is built all at once by turn-key method. Although Korean medical information system is not designed to be care-oriented and has a weakness for a special problem solving, it is a very convenient and efficient system. It can share the medical information with all staffs in each position and transmit data to anyone who wants information without any

manipulation. In Korean hospital, all medical processes, such as admission, discharge, transfer, medical examination and treatment can be performed by using computer. Therefore, it's not too much saying that stop of information system is gridlock of medical care process. Usages of a medical information system are progressing at great speed. As a consequence, there is a need for new human resources who can operate and manage a medical information system in the hospital. They should be able to understand hospital business processes and communicate with medical professionals.

So, in this paper, a new job, what is called 'Medical Information System Engineer(hereinafter MISE)', was defined and its job analysis was undertaken. Then, curriculum was developed to educate the MISE in college or academy.

In 2000, IMIA (International Medical Informatics Association) had announced 'Recommendations on Education in Health and Medical Informatics'<sup>1</sup>. The recommendations centered on educational needs for health care professionals to acquire knowledge and skills in information processing and information and communication technology<sup>1,2</sup>. On the other hand, this paper centered on the educational course for information engineer who can manage the HIS(hospital information system).

## Methods

There are a variety of techniques and tools that can be used to complete a job analysis (see Table 1)<sup>3</sup>.

Table 1: Method of Job and Task Analysis

<b>Small Group Method</b>	This method requires a minimum of three incumbent workers to participate in developing the job and task analysis.
<b>Research Method</b>	This method requires a worker who is performing the task and a person trained in job and task analysis to observe and analyze the task.
<b>Job Observation Method</b>	This method requires a worker who is performing the task and a person trained in job and task analysis to observe and analyze the task.

Each of the methods can yield valuable information. The techniques are frequently combined to provide a wide range of data. It is important to verify or validate the initial

occupational analysis either through multiple data collections or the use of alternative data collection methods. The validation process provides a check to assure that the data is accurate and remains representative over time and across groups/organizations.

The MISE job analysis was conducted by using the KRIVET (Korea Research Institute for Vocational Education and Training) job analysis tool which is a modification of a small group method known as DACUM(developing a curriculum)<sup>4</sup> to apply Korean vocational education field. Figure 1 shows how the MISE job analysis proceeded.

The council for job analysis consisted of a leader, 3 teaching professionals and 6 SME(subject matter expert)s. The process began with the identification of a job title and definition. Then, duties and tasks were specified. At second stage, occupational specification was drawn up in consultation with SME council. At third stage, detail task component which include knowledge, technique and skill was specified in task specification. At fourth stage, the council prepared knowledge/skill matrix for subject profile. And lastly, the MISE job analysis was completed by

drawing up educational roadmap.

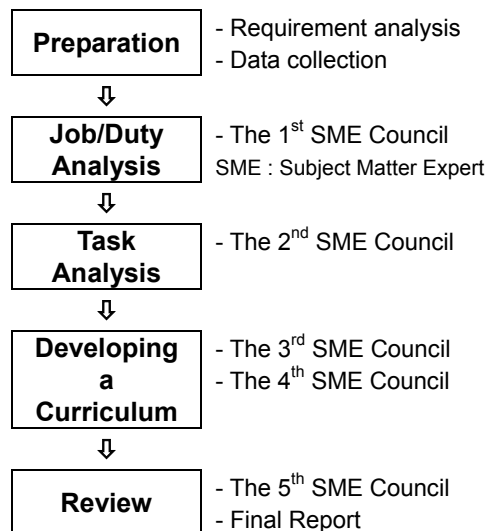


Fig. 1 Job analysis procedure

Duty	Task				
<b>A</b> Specification Review	<b>A-1*</b> Requirement analysis	<b>A-2*</b> Specification analysis	<b>A-3*</b> Environment analysis	<b>A-4*</b> System planning	A-5 Specification preparation
<b>B</b> System Development	<b>B-1*</b> Sys. analysis & design	<b>B-2*</b> Program development	<b>B-3*</b> System integration	B-4 System test & rehearsal	<b>B-5*</b> System debugging
	B-6 System Check-out				
<b>C</b> System Operating	<b>C-1*</b> Hardware operating	<b>C-2*</b> Software operating	<b>C-3*</b> Network operating	<b>C-4*</b> Database operating	C-5 Security check
<b>D</b> Education & Training	D-1 End-user training	D-2 Sys-manager training	D-3 Safety education		
<b>E</b> Clinical Info. Management	<b>E-1*</b> OCS maintenance	E-2 EMR maintenance	<b>E-3*</b> PACS maintenance	E-4 Tele-medicine maintenance	
<b>F</b> Admin. Info Management	<b>F-1*</b> MIS maintenance	<b>F-2*</b> AIS maintenance	<b>F-3*</b> System asset management	F-4 HRMS maintenance	F-5 PBIS maintenance
	<b>F-6*</b> PIS maintenance	OCS : Order Communication System EMR : Electronic Medical Record PACS: Picture Archiving and Communication System MIS : Management Information System		AIS : Accounting Information System HRMS : Human Resource Management System PBIS : Planning and Budget Info. System PIS : Patient Information System	

Fig. 2 Job model of MISE (\*: key task)

## Results

### MISE : Job Definition

The MISE must have good knowledge of computer and information system. The MISE can collect, manipulate and reproduce all medical information in process of medical care. The MISE can review the specification of information system, and carry out software system development. The MISE can manage the hospital information including administration data. And the MISE, as an information officer of a medical institution, should support all departments who use any kinds of information in medical processes.

Figure 2 shows what duties and tasks the MISE should do.

### Curriculum and Educational Road Map

The MISE is not a simple computer operator but an information professional in medical field. The MISE should be able to program the software and should be able to integrate the all components of medical system such as hardware, software, network and database system. The MISE should understand the hospital business process, administration and management to design the medical

information system. The MISE needs knowledge from the diverse fields. So, educational course has 4 main streams (Fundamental Medicine, Medical Administration Practice, Computer & Information Processing Practice, Medical Information System Practice) as shown in figure 3.

**Fundamental medicine** is essential course for ability to communicate with a doctor or other medical experts. This course consists of ‘medical terminology’ and ‘fundamental medicine’ and should be preceded before any other subjects.

**Medical administration practice** course is to educate the MISE to understand hospital business process and information flow which is needed to design a medical information system. This course consists of ‘legal basis for health service’, ‘hospital management & administration’, ‘medical insurance’, etc.

**Computer & information processing practice** is technical course for programming and developing a medical information system. This course consists of various subjects form ‘introduction to computer science’ to ‘advanced programming’. So, this is core course to train the MISE as an engineer

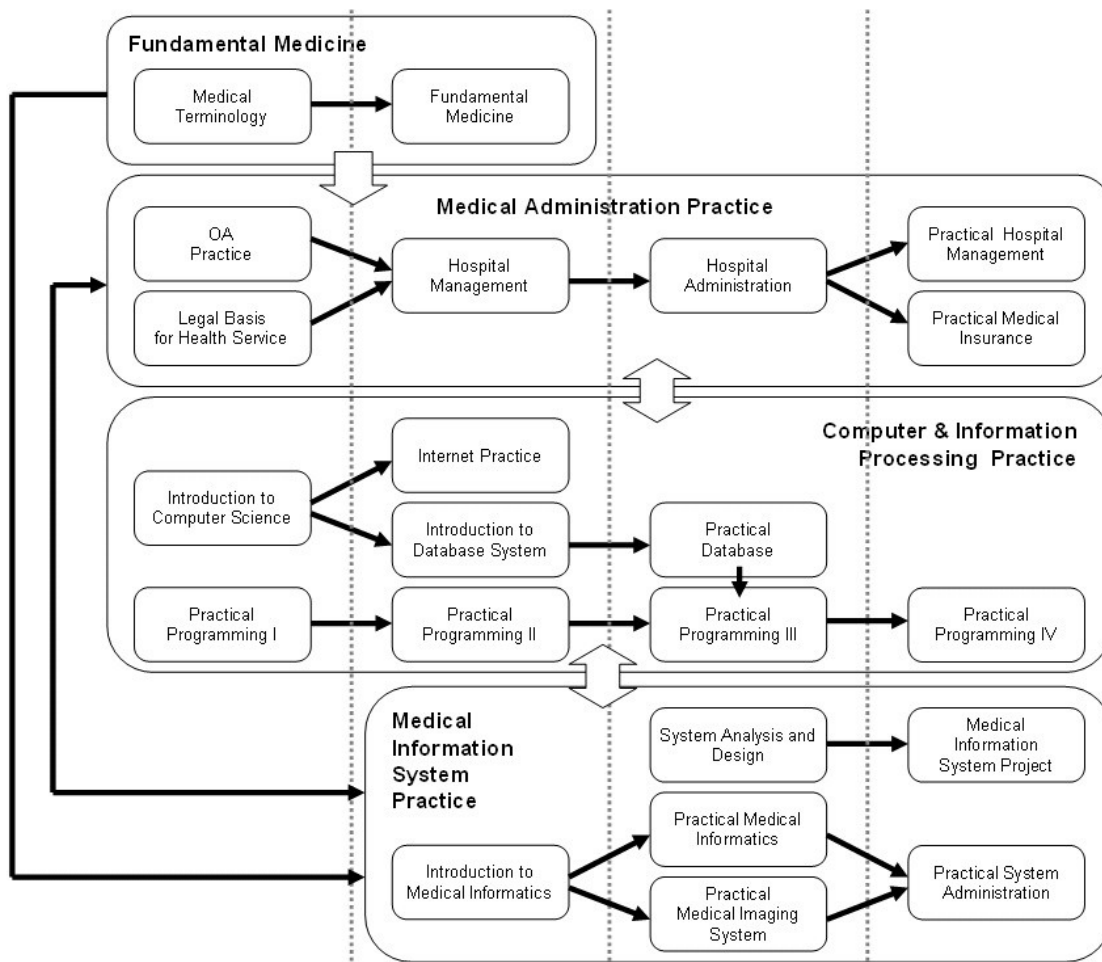


Fig. 3 Educational road map for MISE

**Medical information system practice** is very important to train the field adaptability. In this course, subjects mainly consist of practical training. The goal of this course is to train the MISE as not only as a system operator but also as a system administrator.

Proposed curriculum is composed of 22 subjects. In order to achieve the levels of knowledge and skills, each subject, as a college course, may consist of a 3 hours/week lecture given in one semester with 14 weeks of lecturing and practical training. This workload corresponds approximately four ECTS(the European Credit Transfer System) credits<sup>5</sup>.

## Conclusion

In these modern days, technological knowledge is explosively increasing, and life cycle of information system is shortened very relatively. With the changes of the technologies, a lot of new occupations are emerging, but on the other hand, others are disappearing. It is not exceptional to medical industry. In 1998, a new department of 'medical information system' was established to meet the needs of the times, and now, over 500 students are studying in Korean junior college. At this point, it is very important to define the MISE as a professional occupation, and to clear the aim of education.

Proposed curriculum was designed for the 2-year-course colleges or academies and it is good for the MISE at present. It is necessary that job definition and curriculum should be revised with the changes of the times.

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