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Curriculum Design for Technical Institutions -An Expert System Approach

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Abstract

This paper presents the development of expert system to assist technical institutes, universities curriculum developers, experts to analysis the gap between competencies developed in student through existing curriculum and the competencies required by the industries and the gap between competencies required to perform a specific job and competencies developed in student through existing curriculum. In this work an expert system is proposed which emphasize on various steps involved in the process of relevance based curriculum design. The knowledge acquisition to develop this expert system involved an exhaustive literature review, questionnaire and interviews with experienced industrial persons and observation by a curriculum designer by visiting various types of industries. This system will help to develop relevance based curriculum which can overcome most of the problems encountered in designing a relevant curriculum which can be implemented in educational institute and also it will be at par with the latest requirement of competencies by industries.

Keywords: Curriculum, Manufacturing, Marketing and Service Industry (mms), Expert System

Introduction

In Today looking to the globalization, the need for being up-to-date with latest technology became important and necessary. With basic knowledge of all main branches there came new branches and new subjects so vitally needed to meet the international challenges. To meet these challenges, there is an urgent need to focus and improve the quality of technical education. The core of quality technical education lies in a dynamic relevance -based curriculum and its effective implementation, which should facilitate the development of discipline specific competencies, which could ultimately create employable, work ready products from the engineering education systems.

The development of expert system has become very crucial element in the designing of curriculum for engineering institutions due to the increased need of the latter to be agile enough to adapt to quick market changes and reorientation of curriculum according to latest technology and need of industry. In this situation, expert system become a core tool to analysis quickly the gap between competencies developed by existing curriculum and the competencies required by industries in a pass out. It also analysis the gap between the competencies developed by existing curriculum and competencies required to perform a specific job in the industries. The competency mapping of pass out of specific discipline will ensure that they are fit for the job as per the requirement This paper focus on the description of a expert system for designing of need based curriculum.

Curriculum

Curriculum' is a total plan for learning. A definition given by Patil (1982) says that the curriculum is an educational programme designed and implemented to achieve specified educational objectives. Thus the major dimensions of curriculum development are curriculum planning and design, implementation and evaluation. This leads to the development of a curriculum document, which consists of complete plans for teaching/learning processes and assessment plans for the total programme of study.

As stated above, the curriculum is an educational programme designed and implemented to achieve specified educational objectives. Such a definition could suit the engineering education system. This definition suggests that:

- Decisions are made about which educational objectives are to be achieved.
- These objectives are for design as well as for implementation.

- The design and implementation are two distinct stages of the program.
- The program is implemented on the lines intended in the design.

Present Method of Designing a Curriculum

Looking to the cycle of curriculum development the curriculum designing stage started with the need assessment or requirement of competencies to perform a job in the industries. For this approximately a year is required to assess all types of industries and for documentation, validation and approval from competent authorities it takes another year. And for implementation of this document in the technical institute it takes another one year. From need assessment to implementation of curriculum in institute it takes approximately three years. From implementation to final outcome it takes 4 years if it is four year course. The total years required from need assessment to competencies developed in students is seven years.

Now if this curriculum is implemented in technical institute and student comes out after 4 year the competencies which are developed in student are obsolete because the competencies and skill which student have is according to the need assessed in year 2006. The need assessed or competencies required by industries in year 2006 will become obsolete in year 2013 and so the whole process of curriculum designing and implementation will be of no use.

It is because due to fast changing technologies, the need for being up-to-date with latest technology became important and necessary. With basic knowledge of all main branches the knowledge of new branches and new subjects so vitally needed to meet the international challenges. To meet these challenges, curriculum design and implementation should work in parallel so that the competencies posses by the pass out will be in line with requirement of industries as well as the competencies need to perform a job. The gap analysis need to be done and proper step/measure need to be taken as early as possible or in right time, expert system is developed. oa = ob , oc=od

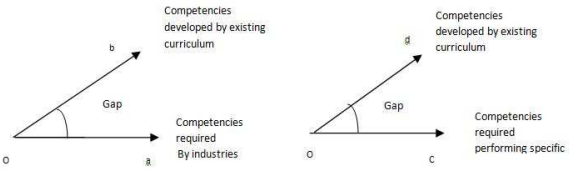


Fig 1 Gap Analysis

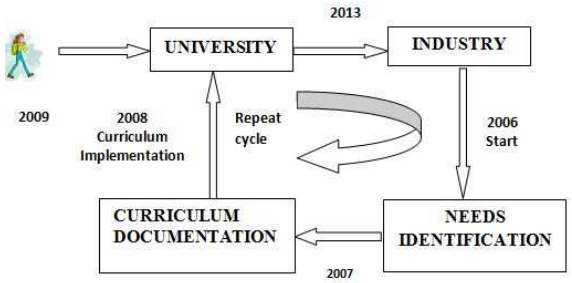


Fig 2 Existing cycle of curriculum

Expert System Development

The expert system developed for designing a curriculum for technical education system contain following components:

Data Acquisition

Data acquisition is the job of acquiring and organizing the data needed to develop an expert system. The goal of data acquisition and representation is the transfer and transformation of problem-solving and decision-making expertise from some knowledge source into a form useful for developing an expert system.

There are two stages of knowledge acquisition ie primary and secondary. The primary stage involved acquiring information by curriculum developer or designer interacting with industries experts by interview, observation of the experts, supervisors, workers performing their task, solving problems, making decisions etc. the secondary stage involved a knowledge acquisition from other knowledge sources such as books, journals, documents, technical manuals and databases, research report etc.

This information will consist of both technical and non technical competencies required by the industries. The industries can be manufacturing, service or R & D type industries. This are the competencies which is required by industries for performing job and which should be developed in college pass out. This information will help curriculum developer to design a curriculum which will develop these competencies in the student. The information about discipline, semester, course content, objectives to be achieved, competencies, assessment scheme etc.

System Development

In System development stage, information expertise will be transform into computer programmed. System developments enable testing and refining the concept of a system. System will be developed of different modules of a system. In developing prototypes, an effort is made to select only the most critical factors

and show only their most basic relationship, in order to test the underlying structure and concept of the system. IF-THEN rules are used to represent knowledge in current expert systems. Rules are written for the knowledge base in this development process. The rule contain premises or conditions in the IF clauses, and conclusions in the THEN clauses. IF-THEN rules can easily be modified to meet changing needs. Hence, it was easy to update. It also has the capability to ask users questions about information needed to deal with specific problems during consultations.

A rule-based ES is defined as one, which contains information obtained from a human expert, and represents that information in the form of rules, such as IF–THEN. The rule can then be used to perform operations on data to inference in order to reach appropriate conclusion. These inferences are essentially a computer program that provides a methodology for reasoning about information in the rule base or knowledge base, and for formulating conclusions.

Expansion and Modification

At this stage the curriculum developer can add more information from interviews, field observation and research publication such as proceeding and journals. The prototype reviewed repeatedly and rapidly until a sufficiently satisfactory prototype is achieved.

Validation

It is very important that expert systems are tested and validated before their effective employment in the intended user environment. An important step of an expert system development process is the evaluation of the performance of the systems, which involves both testing and validation. Many validation criteria such as effectiveness, adaptability, accuracy, performance, adequacy, ease of use, reliability and credibility can be used for validation. The system is compared to the expert's prediction of the final results to validate the system.

Modules In Expert System

Discipline Module

- The competency module
- Skill module
- Competency mapping
- The job profile module

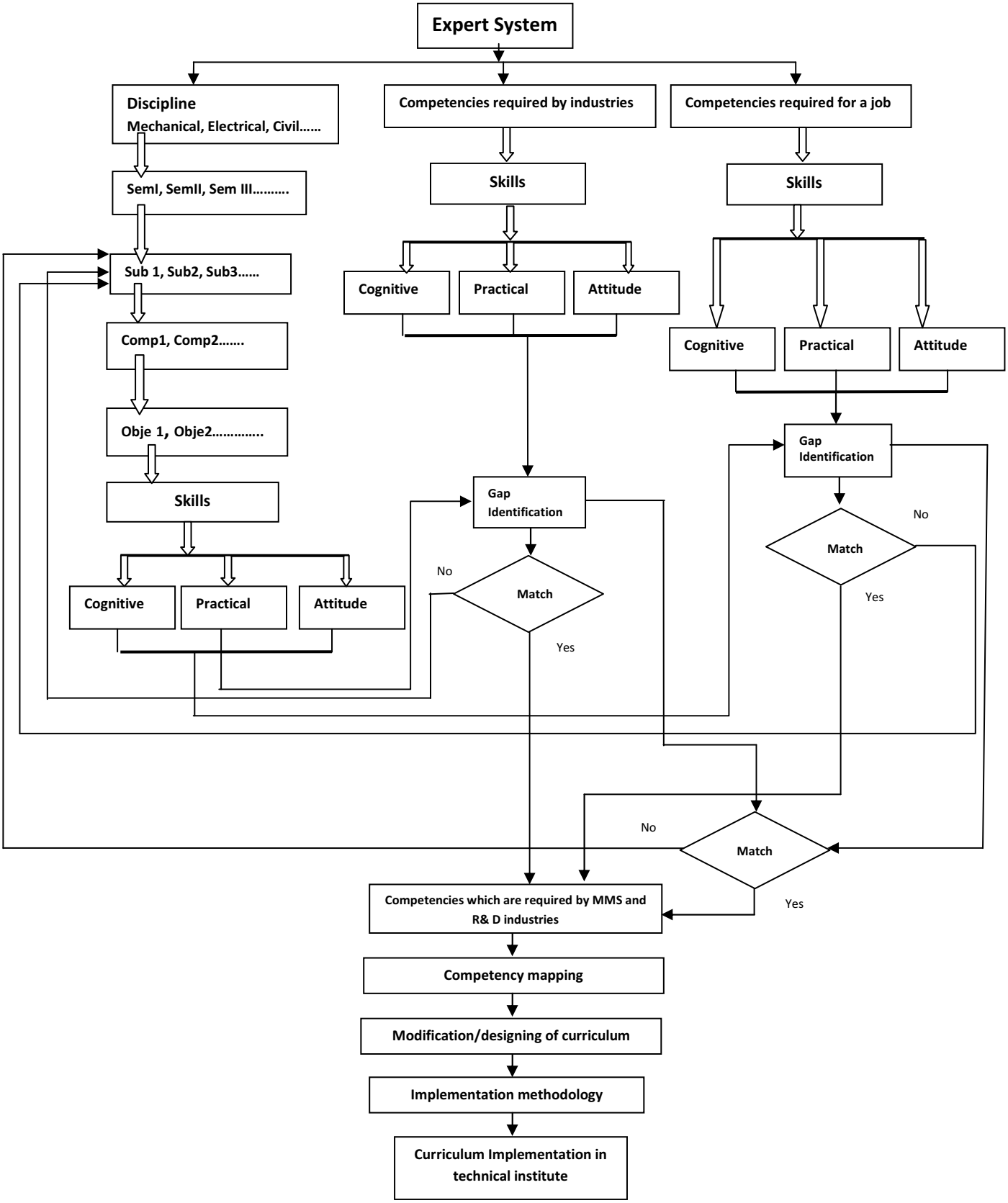
Advantage of Proposed Expert System For Curriculum Design

- Easy to update curriculum
- Less time required for updating and implementing curriculum
- Update information about industry requirement is available
- Competencies requirement of MMS and R&D type of industries available
- Information about all types skills are available at one place.
- Curriculum developer, teachers, engineers, industrial personnel can use the information.
- Lay men also use this system to update curriculum.
- modified or new curriculum can easily be implemented in institution .
- A part of curriculum can be revised easily on the basis of requirement.
- Modification and Implementation of curriculum in technical institute can easily and in earliest possible way can be achieved.

Conclusion

The objective of the research is to develop an expert system for designing a relevance based curriculum hopefully can overcome most of the problems encountered in designing a relevant curriculum which can be implemented in educational institute and also it will be at par with the latest requirement of competencies by industries. The knowledge acquisitions in developing the system involved interviews with the Experts, questionnaire etc and literature review from several books ie both primary and secondary data can be used to update the expert system. This system will also provide a sound procedure to overcome the problems encountered in manual curriculum design due to tiredness, monotonic or carelessness by the designers.

Flow Chart of Expert System Development



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