Identifying the Capabilities of Data Mining in Providing the Quality in Technical Education

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ABSTRACT:
In the today’s competitive academic environment, due to the increased private participation and urge to meet the growing demand & supply of technical education, most of the Higher Education Private Institutions (HEPI), imparting Technical Education in India are primarily focusing on maximizing the effectiveness of the institutions in terms of quality Education. Quality, in general is crucial for customer satisfaction, accountability, maintaining standards and attracting better stakeholders and finally surviving in cut-throat competition. The one of the ways towards solution, to meet the challenge of providing and improving the quality of education is to facilitate these institutions with new knowledge related to the educational processes and entities for the better decision-making. And such knowledge (hidden patterns) can be extracted from historical and operational data residing in the educational organization’s databases using data mining techniques. Data mining techniques are analytical tools that can be used to extract meaningful knowledge from large data sets which could further be useful for the decision making processes.

In this paper, an attempt is being made to identify and present the capabilities of data mining in the context of Technical Education.

KEYWORDS
Data Mining, Technical Education, Predication, Classification, Clustering

1. INTRODUCTION
1.1 HIGHER EDUCATION
(Technical Education) in Indian Perspective and Major Challenges:
In current scenario, Higher education has seen an expansion of manifolds in terms of number of universities, colleges, courses and enrollment rate, all over the world. Higher education in general terms means University level education provided by universities, vocational universities, degree colleges, arts colleges, technical and medical colleges, and other institutions that offers various qualifications varying from Higher National Diplomas & Foundation Degrees to Honors, Masters Degrees and Doctorates.

According to the Indian educational system, Higher education is the highest level of the educational system which further aims to provide education that will yield high-caliber students with global proficiencies, responsible citizens feeling their responsibilities towards National developments and competencies in term of research & innovativeness. [5] “India has one of the largest Higher Education system in the world” [1] and has seen a phenomenal growth in the number of technical education Universities/institutions and corresponding growth in student enrollment.

Technical education importantly includes engineering, management, architecture, technology, pharmacy related courses and programmes that produces skilled manpower, improving the productivity of industries, quality of lives and finally provides growth in the Indian economy. In India, technical education is imparted by three types of institutions namely Central Government funded institutions, State Government/State-funded institutions & Self financed institutions. As on June 30, 2009, total no. of institutions offering technical education was 9596 and total annual intake was 1917899 [17].

In today’s competitive era, the standardization of academic education increases the demand of Technical higher education. And providing the Quality in education is in fact, a major challenge for these academic institutions to meet.

1.2 QUALITY IN TECHNICAL EDUCATION
What does it mean?
Department of higher education in its Annual report 2009-2010 clearly declared “improvement in employability of trained graduates and postgraduates coming out of the technical institutes” as one of the major challenge in front of the Indian technical education system[17] And the proxy for the employability is Quality in education.

Although advisory body All India Council of Technical Education (AICTE) and agencies like National Board of
Accreditation (NBA) are continuously monitoring and controlling the development of technical education system and adopting essential measures & mechanisms including accreditation. But even then the quality of technical education in many institutions especially private institutions is suspect. The National Policy on higher education of 1986 and its plan of action in 1992 based on Radhakrishnan and Kothari Commission formulate Quality and excellence as one of the principle goal for higher education [4]. The National Knowledge commission in its report to nation 2006-2009 clearly stated that “The challenges that confront higher education in India are clear. …..It is just as important to raise the average quality of higher education in every sphere.” [2]. The Planning Commission in its 11th five year plan for social sector also emphasis on improving the quality in higher education [6].

The final report of the Commission on the Quality of Higher Education at the World Conference on Higher Education organized by UNESCO in 1998 explains the meaning of Quality in higher education as follows: “Quality in higher education is a multidimensional concept, which should embrace all its functions and activities; teaching and academic programmes, research and scholarship, staffing, students, infrastructure and the academic environment. ….. It can be implemented through comparisons between observed and intended outcomes, and constant analysis of the sources of dysfunction” [3].

A wealth of literature explores various definitions of quality, its implementation and frameworks. But regarding the analysis of quality or assessment in terms of academics has conventionally two objectives: Quality accountability & Quality improvement.

2. DATA MINING
A key to provide the solution to the current problems in educational system
Han and Kamber (2006) describe data mining as the process of discovering ‘hidden images’, patterns and knowledge within large amount of data and making predictions for outcomes or behaviors [7]. Gartner Group (2007) defines data mining as “the process of discovering meaningful new correlation, patterns and trends by shifting through large amount of data stored in repositories and by using pattern recognition technologies as well as statistical and mathematical techniques” [8]. And Jing Luan (2004) comprehends, “Data mining enables organizations to use their current reporting capabilities to uncover and understand hidden patterns in vast databases” [9].

It is therefore a commanding technology which is being applied to a variety of application areas such as banking, retail industry and marketing, fraud detection, computer auditing, biomedical and DNA analysis, telecommunications and now advanced in the application domain of education [9],[13],[16].

In recent days, technical education institutions with a large no. of annual intake are yielding a huge amount of both structured and unstructured data on the daily basis and encountering many problems stalk from knowledge gap. These problems in turn act as obstructions in achieving their quality objectives.

To manage better, the institutions need better assessment, analysis, and prediction tools to analyze and predict student related issues. The students’ information, teachers’ information, class schedules, alumni information, online information like course content and other related data is considerable for efficiently extracting significant knowledge patterns for selecting better course, managing students’ performance, improving attendance (or dropouts), providing additional support where necessary, allocating instructors in a better managed way, solving problems related to student counseling, registration, evaluation etc.

Waiyamai K.(2003) Suggested the use of data mining to improve the quality of graduates and used clustering, classification and ARM to find out the characteristic patterns of previous students who took a particular major and the patterns of previous students which were likely to be good in a given major [10]. Abdusalam S.F(2007) uses clustering and classification techniques to study the relationship between students’ performance and their learning styles in programming papers and identifies characteristic patterns of post graduate students with good programming and their learning behaviors as an explicit knowledge [11]. Similarly, decision Tree and bayesian network algorithms as well as predication are being used by Ngeh N.T, Janecek P. & Haddawy P(2007) to investigates the suitability of data mining tools for predicting academic performance (GPA) using two case studies and further achieved the patterns for predicting the academic performance of undergraduate and postgraduate students [13]. Oyelade, O. J, et. (2010) find out the explicit knowledge as the patterns of performance of the students in accordance of their previous test scores using k-means clustering algorithm by analyzing students’ result data of a private Institution in Nigeria to monitor the progression of academic performance of students in higher Institutions [14].

Likewise Quadri M. N.et(2010) analyze the problem of drop outs in any educational institution using decision tree analysis techniques [15]. Kovačić Z.J(2010) analyzes the enrollment data to predict the most important factors for student success to classify patterns of students based on variables likely to complete the course or not using classification and regression tree(CART), CHAID, exhaustive CHAID and QUEST classification tree methods [16]. Also CHAID predication model (Classification Tree Algorithm) is further being used by Ramaswami M. & Bhaskaran R (2010) to identify the slow learners and study the influence of the dominant factors on their academic performance [12].
At a glance, the data mining tools and techniques like association, classification, prediction, clustering and more are being used to extract the hidden patterns of student assessment, counseling of drop outs etc which can further help in bridging the gap between the quality objectives and the quality achieved. This explicit knowledge can also help these institutions to make plans more strategically, taking better decisions with respect to counseling, directing, assessing students and their performances, improving student’s promotion rate, retention rate, transition rate, increasing educational improvement ratio, student’s success, student’s learning outcome as well as predicting individual behaviors with higher accuracy.

3. CONCLUSIONS:
This study was an attempt to know the meaning of quality in higher education and need of applying data mining tools and techniques like prediction, classification, clustering etc for the purpose.
This study also thrust out on how the various data mining tools and techniques can be applied to the set of data coming out of technical education institutions and what new explicit knowledge or models are discovered such that this knowledge can further be applied as an input for planning new strategies and making better decision for improving the quality of education.

4. FUTURE WORK:
As a future work, the factors responsible for maximizing the effectiveness of the institutions in terms of quality education can be identified, also a study can be carried out to quantify the level of quality the technical institutions are imparting and the level of satisfaction among the students so that the measures to improve the quality of technical education in India towards excellence can further be intended and implemented.

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