



# International Journal of Engineering Researches and Management Studies

## ACADEMIC EXCELLENCE THROUGH A NOBEL TECHNIQUE OF ACCREDITATION USING EDUCATIONAL DATA MINING

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### ABSTRACT

Considering this aspect in mind, we propose an accreditation method which can be well recognized and aims to increase the educational standard up to the mark so that students will accomplish their aims in professional career. High standards of education in the institutes help them in enhancing the global acceptability among the students to get enrolled for a brighter future. Through effective use of standard education the proposed system assist students to utilize cost cutting techniques without affecting the high productivity. Developing students to face international or multi-national programs is a critical and challenging issue for the future of engineering education. The purpose of such programs is both to encourage mobility of students in an inter-cultural multi-linguistic perspective, and the recognition of degrees and programs in a wider perspective than the national one in order to encourage the mobility of workers. Accreditation has now become vital for all universities in India. Without accreditation, these institutions have no legal entity to call themselves a University and award 'Degrees' which are not treated as valid for academic/employment purposes. India needs more efficient and educated people to drive our economy forward. There are many Indian around the corner who known for their capabilities and skills. To develop India as an education hub or to become a prosperous partner in global economy, India has to qualitatively and academically strengthen education in general and higher education with research and development in particular. This paper is mainly focused on the academic excellence and thus overall performance of higher education system in India. This paper also highlights existing key issues of the accreditation process and vital points that need to be incorporated to generate insights about the future of accreditation. In the context of accreditation, accountability requirements for the observance of minimum standards are at the forefront.

**Keywords:** Academic Excellence, Educational Institute, Accreditation, Educational Data Mining

### 1. INTRODUCTION

Quality assurance in higher education is by no means only an Indian concern. All over the world there is an increasing interest in quality and standards, reflecting both the rapid growth of higher education and its cost to the public and the private purse. Accordingly, if India is to achieve its aspiration to be the most dynamic and knowledge-based economy in the world, its higher education will need to demonstrate that it takes the quality of its programmes and awards seriously and is willing to put into place the means of assuring and demonstrating that quality. The initiatives and demands, which are springing up both inside and outside India in the face of this internationalisation of higher education, demand a response. The Indian Education system with its 27 states is characterised by its diversity of political systems, higher education systems, socio-cultural and educational traditions, languages, aspirations and expectations. This makes a single monolithic approach to quality, standards and quality assurance in higher education inappropriate. In the light of this diversity and variety, generally acknowledged as being one of the glories of the Nation, the report sets its face against a narrow, prescriptive and highly formulated approach to standards.

Higher education accreditation is a type of quality assurance process under which services and operations of post-secondary educational institutions or programs are evaluated by an external body to determine if applicable standards are met. If standards are met, accredited status is granted by the agency". (*Wikipedia*) Accreditation is broadly used for understanding the "Academic Excellence" of an institution. In the context of Higher Education, the accreditation status indicates that the particular Higher Educational Institutions (HEI) – a College, a University, or any other recognized Unit therein, meets the standards of quality as set by the Accreditation Agency, in terms of its performance, related to the educational processes and outcomes, covering the curriculum, teaching-learning, evaluation, faculty, research, infrastructure, learning



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resources, organization, governance, financial well being and student services (NAAC). Basically accreditation is the process by which a (non-)governmental or private body evaluates the quality of a higher education institution as a whole or of a specific educational programme in order to formally recognize it as having met certain predetermined minimal criteria or standards. The result of this process is usually the awarding of a status (a yes/no decision), of recognition, and sometimes of a license to operate within a time-limited validity.

This paper seeks to understand the mechanism of accreditation and ranking done by specific parameters and distribution of their weights, and analyse the scope, significance and limitations of this system. In the face of ongoing reform in the Indian higher education sector and increasing participation of the private sector, this paper examines the role and scope of national quality assurance agencies in the emerging global context and suggests further means for improving it so as to make students of India face the global competition.

Rest of the study is organized as follows. Section 2 is about the purpose of the study and expected benefits. In Section 3, Education system and Accreditation in India is described; Expectations from educational institutes and accreditation system are explained in section 4. Suggestions for academic excellence are mentioned in section 5, whereas section 6 discusses exploring data mining in Higher education the proposed methodology. Finally Section 7 concludes with further research directions. Lastly section 8 informs about the expected outcomes.

### 2. PURPOSE OF STUDY AND EXPECTED BENEFITS

Educational Institute like any other organization are challenged to stay relevant – both in terms of education and research. Academic institutions regularly generate huge data on students, courses, faculty, staff that includes managerial systems, organizational personnel, lectures details and so on. This useful data serves as a strategic input to any academic institution for improving the quality of education process. Today in the changing global scenario where the knowledge and technology is expanding rapidly giving rise to the talent crunch, it is the need of the hour to find out the competencies that can help to adopt the institutes to remain competitive. Data Mining technique, is the least utilized technique for the human resource data, can be proved worthy if utilized for the knowledge management and dissemination. It can be utilized in every discipline of human resource management and in many such areas which are still untouched. The information retrieved through the data mining technique can be proved worthy in organizing and extending the generated information to the academic institutions. We propose a framework for gradation of educational institutions depending on various basic parameters affecting its performance. Depending on this, students seeking admissions will be able to select any institute and branch of their choice. Further this will also create a healthy competitive culture among various Educational Institutes in an area and they will strive for improving their performance.

Since the number of colleges have significantly grown over the period of years, it becomes prudent to look at how teaching and learning have changed. The institutions have been making substantial investments for their computing infrastructure to meet their goals. In this regard the tools, which can be adopted widely by institutions to align their growth strategies and HR strategies, are 360 degree feedback, assessment centers and competency mapping. A large mismatch appears to exist between Industry demands and institutional output in recent times. Their findings show that the performance of recent graduates have clearly deteriorated, primarily because of the operational policies and inadequate level of skilled human resources, especially the quality of trained work force. This poses a need for an improved model that will offer solution to the limitations of the classical methods, improve the efficiency and accuracy of teachers' evaluation system, and consequently help in the new move for educational reform efforts.

Performance evaluation is a quality assurance scheme for higher technical education. It is open to all Institutions in Engineering and Technology, Management, Architecture, Pharmacy, Hotel management and Catering Technology, Town and Country Planning, Applied Arts and Crafts in India which provide technical education to students. The purpose of the evaluation is to promote and recognize excellence in technical education in colleges and universities—at both the undergraduate and post graduate levels. Institutions, students, employers, and the public at large all benefit from the external verification of quality provided



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through the process. They also benefit from the process of continuous quality improvement that is encouraged by the developmental approach to promote excellence in technical education

### 3. EDUCATION SYSTEM AND ACCREDITATION IN INDIA

In India, there is a wide variety in terms of quality across higher educational institutes. On the one hand, there are 'Centres of Excellence' such as Indian Institutes of Technology (IITs), and on the other are the institutes that have failed to maintain even a minimum standard of quality. Not only is there a wide gap between the world and Indian averages of quality, but there also exists a vast disparity between the institutions across India. The reasons for this low quality are multifaceted and interlinked — poor governance being the main reason. Resource constraints and poor infrastructure further worsen the situation. Many private institutes, especially in the field of professional education, provide low-quality education as they are mostly interested in cutting cost and making profits (Chattopadhyay 2009). A corrupt and ineffective regulatory system aggravates the problem as many educational institutes are engaged in subversion of duties and in maximising the benefits that accrue to the authorities without any effort to improve the quality of education. Also, there has been an age-long trade-off between excellence and inclusion (Velaskar 2010). Since the quality of education largely depends on that of the students and teachers, an institution may choose to be extremely selective and only offer seats to brainy people in order to maintain its quality. This selective competition may make HEIs more hierarchical and exclusive (Clotfelter 1996; Winston 1999). While we consider the fact that in India only 15 per cent in the age group of 18–23 years enter into a college, 'excellence' appears to be an 'elite' term. However, maintaining a minimum quality in all the HEIs is imperative. The problem is to appropriately define and quantify for effective monitoring and enforcement of minimum quality of education. This is critical because unfair practices and poor quality of education can ruin the entire life of students and affect their families, societies and the nation. Keeping this problem in mind, quality assurance mechanisms in higher education were adopted in India and at present the popular agencies are:

- (a) National Institutional Ranking Framework (NIRF) under the Ministry of Human Resource and Development (MHRD)
- (b) National Assessment and Accreditation Council (NAAC) under the University Grants Commission (UGC);
- (c) National Board of Accreditation (NBA) under the All India Council of Technical Education (AICTE);
- (d) Accreditation Board under the Indian Council of Agricultural Research (ICAR).

Among these, the most popular accreditation agencies are the NIRF, NAAC and the NBA

Though all these agencies have made the accreditation process quite stringent, still some more features need to be included to ensure the students, to prepare them to face the global market. The process of accreditation seems to be more institute oriented rather than student oriented. Also since Educational institutes generate huge volumes of data which consistently keeps on increasing, so a need arises to segregate useful data from the massive data generated.

We propose to build an accreditation system combining the major features of NAAC and NIRF (NAAC for parameters selection and NIRF for weightage of the parameters for calculations) besides including some more internationally recognized parameters for accreditation of any educational institutes. Thus the generated process of accreditation will ensure the students graduating from the different educational institutes compete with their global counterparts and enable them to excel in the field they chose for their future prospects. We also plan to apply EDM after collecting data from the institutes. Based on the data collected further classification, association rules and generation of decision tree can be used for knowledge discovery.

### 4. EXPECTATIONS FROM THE EDUCATIONAL INSTITUTES AND ACCREDITATION

With rise in global competition for attracting international students, Indian HEIs will try to gain international recognition. There are some international agencies such as the International Accreditation Organization (IAO), International Network for Quality Assurance Agencies in Higher Education (INQAAHE) or the Washington Accord, which accredit many institutes across nations. If Indian quality assurance agencies join these international agencies or if Indian HEIs begin to be accredited by them, the institutions will get global reputation. But at the same time the applicability of uniform norms and standards across a diverse world is also questionable. If Indian quality assurance agencies follow these, then the



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country may emerge as a favoured global knowledge destination for international students. But the accreditation agency must not neglect the local value judgements and needs of the specific society before evaluating performance of an HEI. Norms and standards should not be rigid but flexible, depending upon the need of the hour and that of the society. Further, India is at the threshold of opening the doors to foreign education providers if the Foreign Education Bill is approved.

Institutes of higher education, through their curriculum, are expected to provide knowledge, know-how, wisdom, and character to the students. “Knowledge” enables them to understand what they learn in relation to what they already know, and creates an ability to generalise from their experiences. “Know-how” takes them beyond merely understanding and enables them to put their knowledge to work. “Wisdom” makes them capable of deciding their priorities. ‘Character’ development is the combined effect of knowledge, know-how, and wisdom, coupled with motivation. Character development is recognised by certain traits, viz., honesty, integrity, initiative, curiosity, truthfulness, cooperativeness, self-esteem, and ability to work alone and in a group. However, most of the educational institutions hardly pay any attention to the development of either wisdom or character. Many educators have not developed wisdom themselves and hence throw up their hands at the thought of imparting it to the students. They think that these elements are to be taken care of by someone else. Wisdom and character, the two important human Qualities, are best developed by making students participate in creative team activities, wherein they learn to set priorities, to work together, and to develop the social skills required in a society where teamwork is essential to success.

### Implementing Quality Measures

How the faculty and administration of an educational institute prepare for implementing total Quality management and assessment? How the introduction of Quality implementation influences the goals, roles, and mission of an institute? Who are the key players and what are their individual goals and motivations? How will the culture of an institute change in an environment of increasing demand for demonstrable Quality and outcomes? Answers to such questions should be available in the institute. Most of the Quality Standards for accreditation state that assessment principles are complementary to the institute’s mission. Clearly defined mission, goals, and objectives guide faculty, administration, staff, and governing bodies in making decisions related to planning, resource allocation, programs and curriculum development, and definition of program outcomes. These goals and objectives should focus on student learning, other outcomes, and institutional improvement for achieving excellence.

## 5. SUGGESTIONS FOR ACADEMIC EXCELLANCE

### Make the problem visible

Regular assessments are needed to measure progress in learning and make the current levels visible in a way that can be understood widely. India should participate regularly in international assessments like Trends in International Mathematics and Science Study and Programme for International Student Assessment so as to set goals and benchmark its performance and progress. The quality of national assessments should be improved and third party assessors like Annual Status on Education Report and Educational Initiatives should be encouraged to provide periodic feedback..

### Build systematic and institutional capacity system

The biggest problem in the educational system today is a severe shortage of capacity. Consider two initiatives – the Continuous and Comprehensive Evaluation (CCE) and the Teacher Eligibility Test (TET). Few people disagree that these initiatives are based on sound principles and good ideas. Yet, many—some may say most—well-intentioned ideas do not achieve their goals due to people across the system not having the required skills. In the case of the TET test, pass percentages have been between 1% and about 15% and the initiative has not had the intended impact. It raises questions both on our teacher training capacity and also the capacity to understand and execute the assessments successfully.

However, research needs an ecosystem and we now need to kick-start such an ecosystem. We recommend the creation of a research fund (similar to the American National Science Foundation Fund), which will provide grant support for innovation to take root and grow in research institutions non-governmental organisations



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(NGOs) and private players based on their track record and quality of research, and direct research towards areas of national and state priorities.

### Invest in technology for education

Hand-in-hand with educational research inherent in all the initiatives above, there is a need to research and develop ways to use technology to drive the change we desire. The focus should not be on installing hardware but creating new, high-quality content such as intelligent teaching systems and tools that will help students to hone basic skills like reading and mathematics, and developing content in multiple Indian languages. ICT-based remediation programmes should be encouraged, in which the service provider is reimbursed based on the measured student improvement. ICT should also be used to track teacher attendance. Free high-speed internet connections can be provided to all schools through a simple scheme by which the government reimburse internet service providers directly.

### Quality of education

Given that we need to compete globally in the 21st century, our education system should adopt certain benchmarking techniques for improving instruction models and administrative procedures in universities/colleges to move forward. It is suggested that we need a thorough study and evaluation of models implemented elsewhere and work out strategies to adopt such models in our system. Benchmarking in my opinion would provide benefits to our education system in terms of reengineering, setting right objectives, etc. The country is showing consistency in economic growth pattern, leading the world in terms of information and technology, modernization various economic activities and pushing for higher share of industries and services sectors of the economy but there is one area which needs reform is “education system”. While it is true that some investments are taking place in the country’s higher education system, we are yet to establish world class research facilities, recruiting profound academicians in universities/colleges/research institutions, etc. to sustain and forge lead in economic development.

### Technical and Vocational Training

Technical and vocational education and training have led to significant employment and increase in wage in the newly industrialised world. Some limited evidence also shows that such programmes are relatively cost-effective. Within India, a study of a vocational-training programme offered found those participating in the programme were more likely to be employed and to have higher earnings than non-participants, with those completing the programme faring better still. India has some national policies to provide equal access to technical and vocational education, but, unlike some other newly industrialised nations (Mexico, Turkey, Zambia), does not have laws guaranteeing this.

### Basic Computer Skills , Management , Accounts and Finance Lessons

The reason that we suggest this point is very straightforward. It is the era of Information Technology and hence, education is nearly incomplete without having basic computer training in it. *Be it accounts, engineering, teaching or just the simple back office jobs, computers are everywhere and so, our pupil should have the basic knowledge about them.*

### Smart Classes

Though many of the Indian schools and institutes are already following this concept, but we should take a step where all educational institutes can be connected with the concept of smart classes. With the help of different audio-video devices, multimedia concepts and other necessary IT elements, we can make our students learn and understand in a much better and modern way.

### E-libraries

Introducing this concept in our education system will be of great help as anyone will be able to access the books and required study material from anywhere with ease. Moreover, the E-libraries can be updated quickly with new material and books.



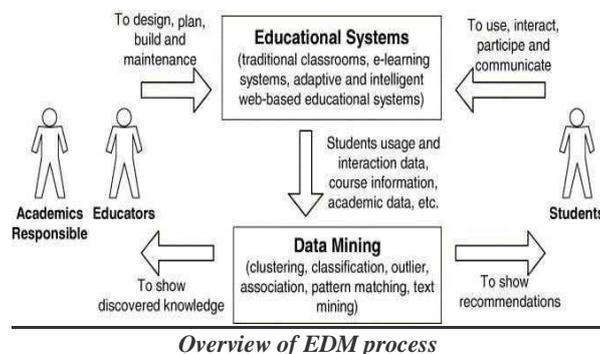
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### 6. EXPLORING DATA MINING IN HIGHER EDUCATION: METHODOLOGY PROPOED

Data mining, also called Knowledge Discovery in Databases (KDD), is the field of discovering novel and potentially useful information from large amounts of data. The amount of data stored in databases is increasing quickly but the rate of increasing resources analyzing data is too lower than rate of data increase. There is an essential and necessary need for automatic and intelligent tools and methods. This need directs us to a new area named data mining and knowledge discovery [1]. Data mining is: Discovering the methods and patterns in large databases to guide decisions about future activities. It is expected that data mining tools to get the model with minimal input from the user to recognize. The model presented can be useful to understand the unexpected and provide an analysis of data followed by other tools to put decision-making are examined and it ultimately leads to strategic decisions and business intelligence.

Recently Educational Data Mining (EDM) is emerging as multidisciplinary research area due to introduction of new technologies. Substantial growth is been observed in the use of interactive learning environments, intelligent tutoring systems, educational hypermedia systems and learning management systems (LMS). E.g. general purpose LMS such as Moodle, specialized ITSs like SQL Tutor, professional education and training systems such as simulators, eHealth and patient education such as Philips Motiva etc. At the same time the wider use of information communication technologies in education has allowed the collection of huge amount of data.[2]

Data mining, also called **Knowledge Discovery in Databases (KDD)**, concerns the discovery of novel and potentially useful information from large amounts of data [Witten and Frank 1999]. Baker makes the distinction that educational data mining methods differ from standard data mining methods in that educational researchers must explicitly account for the multi-level hierarchy and non-independence in educational data. Models drawn from the psychometrics literature are often used in educational data mining.



“In **discovery with models**, a model of a phenomenon is developed through any process that can be validated in some fashion (most commonly, prediction or knowledge engineering), and this model is then used as a component in another analysis, such as prediction or relationship mining. Discovery with models has become an increasingly popular method in EDM research, supporting sophisticated analyses such as which learning material sub-categories of students will most benefit from ,how different types of student behavior impact students’ learning in different ways, and how variations in intelligent tutor design impact students’ behavior over time”

The most commonly used techniques in data mining are:

- **Artificial neural networks:** Non-linear predictive models that learn through training and resemble biological neural networks in structure.
- **Decision trees:** Tree-shaped structures that represent sets of decisions. These decisions generate rules for the classification of a dataset. Specific decision tree methods include Classification and Regression Trees (CART) and Chi Square Automatic Interaction Detection (CHAID) .



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- **Genetic algorithms:** Optimization techniques that use processes such as genetic combination, mutation, and natural selection in a design based on the concepts of evolution.
- **Nearest neighbor method:** A technique that classifies each record in a dataset based on a combination of the classes of the k record(s) most similar to it in a historical dataset (where  $k \geq 1$ ). Sometimes called the k-nearest neighbor technique.
- **Rule induction:** The extraction of useful if-then rules from data based on statistical significance.

Many of these technologies have been in use for more than a decade in specialized analysis tools that work with relatively small volumes of data. These capabilities are now evolving to integrate directly with industry-standard data warehouse and OLAP platforms.

Data mining is relatively a new technique to the world of information sciences. Successful implementation of this technique requires a sound methodology built on best practices. In this research study, we plan to follow popular data mining methodology called Cross Industry Standard Process for Data Mining (CRISP-DM), which is a six-step process:

**Problem description:** Involves understanding project goals, transforming this information into data mining problem description and making project plan to reach the related goals.

**Understanding the data:** Involves identifying the sources of data, obtaining an initial set of data to assess the information coverage of the data for the problem on hand.

**Preparing the data:** Includes pre-processing, cleaning, and transforming the relevant data into a form that can be used by data mining algorithms. For pruning the data, we have planned to use Apriori algorithm. It is a classic algorithm used in data mining for learning association rules.

**Creating the models:** This involves developing a wide range of models using analytical techniques. Classification and association have been chosen as the most appropriate data mining functionalities for training and performance predictions. The basic classification techniques include Decision Tree, Bayesian, and rule-based. In contrast to the first two techniques, rule-based classification learned model is represented as a set of IF-THEN rules. These rules are generated either from a decision tree or directly from the training data using sequential covering algorithm (SCA).

Rule-based classification is also attributed to accuracy and coverage. These measures whether or not a rule antecedent are satisfied and the rule cover the data set tuples. From a class-labeled data set, *coverage* refers to the number of tuples covered by the rule while *accuracy* determines the tuples correctly classified by the rule. Significant in rule-quality measures that consider both accuracy and coverage is the First-Order Inductive Learner (FOIL), a sequential covering algorithm that learns the first order logic rules.

**Evaluating the models:** This step involves evaluating and assessing the validity and the utility of the models against each other and against the goals of the study. For result analysis, ANOVA Technique may be used. Analysis of variance (ANOVA) is a collection of statistical models used to analyze the differences among group means and their associated procedures. ANOVAs are useful for comparing (testing) three or more means (groups or variables) for statistical significance. It is conceptually similar to multiple two-sample t-tests, but is less conservative and is therefore suited to a wide range of practical problems.

**Using the model:** This step is concerned with deploying the models for use in decision making process. The study aims at using the classification method of Data mining for the prediction of institute's performance. The prediction model will be developed using the Classification methods of the Data mining technique.

The goals of the proposed system it to aid higher institution management in determining institute's performance and recommend necessary actions to be taken based on the prediction from the intelligent evaluation system. The proposed system framework subsumes five components: The first and the second components take care of data acquisition and storage, responsible for storing data, gathered from different data sources. The third component is model building, responsible for obtaining knowledge, through appropriate classification models. Different classification algorithms are proposed in search for the best model with high predictive accuracy. The fourth



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component is for mapping pattern in the rules generated with the data to predict performance and the fifth component is the recommendation, responsible for recommending necessary action to be carried out

After finding out the grades of institute we can compare these with that of another institute. This will help to find out where a particular educational institute stands in a region along with its peers. This will help institute authorities examine and evaluate and find out ways to improve the parameters as needed and continuously analyze their resources for its betterment for continual improvements in the teaching learning process.

### 7. CONCLUSION

Due to unlimited, enormous, high volume data getting generated from various applications as data streams it is quite typical to handle them because of their dynamic, irregular and variant nature. Data mining can be used effectively in educational institutes for leading education activities in an effective way, for assessing its performances continuously. This area is still a challenge and has a wide chance of exploration for data mining researchers to carry their work. We have proposed a technique for assessing the academic excellence of an institute in terms of their teaching, learning skills, and the outcome can be used to find the steps needed for further improvement of their performance.

### 8. EXPECTED OUTCOMES

Accreditation and Performance evaluation of any institute is one among the prime factors related to institutional and organizational development. Using this research, the Institutional superiors will have the ability to predict not only the departmental and employee's performance but also they will come to know where their organization stands among its peer. The parameters discussed helps to analyze the performance of any educational institute in multiple ways, and help to get most efficient results for up gradation of an organization. Literature review reflects that a lot of work has been done in upgrading/analyzing the performance of students and faculty, but this area ie. Institutional performance evaluation is still an area which needs attention. Unless and until, the institutes in which the students are studying will be upgraded and loopholes overcomes, students will not be able to benefit most from the institute. If the industry wants quality students at the time of placement, the responsibility lies in the shoulders of the institutes educating them. The framework proposed helps to evaluate any institute in a speedy way, with maximum parameters of its performance included for most efficient results. If we are including more parameters, it means the evaluation will be more effective, and the results will be more realistic based on factual information

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