A Framework of ICT Implementation on Higher Educational Institution with Data Mining Approach

Sumati Pathak, Rohit Raja, Vaibhav Sharma, Ramya Laxmi K.

Abstract—As the fundamental block of the modernized society, Information and Communication Technology (ICT), has brought changes in the principles and procedures of nearly all endeavors in education. The comprehensive changes in (ICT) have evolutionary effect on higher educational institutions on their domains of knowledge application. Hence integration of ICT is of great demand for improving efficiency of such institutions. Reports on researches reveal that the use of ICT makes students more involved in the process of learning than that with the conventional methods of learning. Therefore, it is necessary to concentrate more on implementing ICT in higher education in the view of providing easily available, inexpensive and high quality education. This paper proposes the design of ICT in higher educational institutions. On the other hand, a Sensible Data Mining (SDM) is designed by integrating both the data mining and technology for visualization in order to apply it on the evaluation system of higher education. A sensible atmosphere can be provided for users using SDM throughout the entire steps involved in evaluation.

Index Terms—ICT, Higher Education, Sensible Data Mining, Visualisation.

I. INTRODUCTION

Information and communication technology (ICT) establishes a greater impact on higher education. Hard work is being applied by universities and colleges for providing education of high quality in order to make their institutions attractive, socially useful and innovative. Mobile users are increasing these days and hence implementation of applications like ICT really works [1]. Getting closer to such goals requires digitized tools to be used by the institutions, especially in a motive to facilitate enhancement in terms of the quality in teaching and outcome of learning [2]. The objective of this study is to provide a design of ICT for the management of universities for continuing and increasing the use of ICT in learning. Due to the establishment of novel technologies, change in higher education is on process, thereby ideas for motivating teachers for using ICT is considered a critical issue for the management. A major challenging factor of ICT is that it provides newer probabilities to students as well as teachers, but it do not establish ready to use service [3]. Teaching academic nowadays provides approach to wide range of ICT services; but a limited number of features of the existing systems are in use [4].

Data mining mechanism is useful for extracting and discovering valuable and meaningful knowledge from a huge data source. In the recent days, data mining has its major applications on the field of information industry as well as the entire society. Data mining techniques currently receives a wide attention on analysis of data and it is being developed as an emerging tool for analysis [5-8].

Nowadays, Information administrative systems are recognised to be built using a tool called data mining [9]. Information administrative systems when used with business intelligence provide better values to various solutions of data mining [10]. The concept of visualization is used to visually present information in a graphical format and the hidden information are understood by the listener using a quantification system. The ability to acknowledge can be enhanced through visualization, a suggestion cycle is established among graphs and end user and human intervention is required for observing fault and to avoid foolish decisions. Data mining visual representation is considered a form of interaction [11]. Using it in this form, more data are collected and hence their intelligence and reliability are elucidated. Evaluation in higher education can be carried out through visualized data mining so that flexibility, diversity and visualization can be obtained in the method of evaluation thereby improving efficiency [12].

This article demonstrates the usability of a technology called ICT in the education sector, especially the process of learning in higher educational institutions. ICT is implemented in higher education and the evaluation is done visually using the concept of data mining.

The organisation of the paper is as follows. Section 2 represents the literature review on ICT based application on higher education. The proposed work is demonstrated in section 3. Section 4 discusses the proposed work. Conclusion of the proposed work is given in section 5.

II. LITERATURE REVIEW

With the development in the ICT, it can be used in higher education using data mining. Factors supporting ICT are essential for obtaining information in education. Those factors are sub divided into different categories by several scholars. Such factors are divided into internal factors and external factors [13]. The initial categorical barrier is the external factor which consists of fund, availability, resource, etc [14]. The latter barrier is considered as the internal factor that includes trust, character and experience [15].
A well-structured ICT atmosphere can be more effective in the sector of teaching. ICT in teaching comprises of both physical and ICT infrastructures. It is reported by several organisations and ruling authorities that a better effect can be achieved on both learning and teaching through one-to-one interactive program for students [16]. At the same time, researches reveal that deficiency in ICT digital resources corresponds to inefficiency in the usage of ICT [17]. Therefore, a better ICT atmosphere improves the performance of ICT in teaching [18].

Artificial intelligence intends to enable the intelligence of human including reasoning, learning and decision making [18]. Efficiency in technical support is an evolving in today’s world providing its usefulness in equipment withstandability. This plays an important role in making ICT in education feasible, coordinate and maintainable. When the provided infrastructure is better, both student and teacher requires technical support to ensure effectiveness in ICT operation [19]. With the involvement of educational ICT, the problems related to effectiveness of ICT are increasingly noticed [20]. ICT in higher education focuses on various external factors including infrastructure, policies and abilities.

Data mining mechanisms are more useful in the view to implement learning to individual students. Some primary researches has been carried out in this perspective, where association rules are applied for developing English learning system [21]. Also by Chen and Duh (2008), where fuzzy techniques are used to indicate the complicated attribute of courseware and then the contents of courseware are decided [22]. The influence of ICT (Information and Communication Technology) is very much high in the current world. In the present work we are focusing in only higher education in India to estimate the impact of ICT in higher education in terms of access and quality. The social and economic development of any country mainly depends and relies on the quality of education [23]. Implementation of the ICT’s within the higher education system has change the way of entire methodology of the education, particularly concentrating on the major factors of the equity, management, main stack holders, quality, pedagogy and efficiency. In the present work the challenges of uses ICT in higher has been elaborated [24-25].

III. PROPOSED WORK

With the establishment of ICT, various nations explore the usage of computers and net based ICT in education. The block diagram demonstrating the usage of ICT in higher education is shown in fig.1. In higher education, ICT frames policies for academic, student service and also in administration.

A. Plan for ICT in Higher Education

The plan includes the planning the entire structure of ICT for higher education including resources and their applications, infrastructure and management for ICT support. Implementing ICT in higher education is to withstand the worldwide competition in the field of ICT integrated with education; educational principles and development satisfaction about necessities for ICT in higher education are to be met

B. Goals of ICT in higher education

Implementation of ICT in higher education categorizes the average and longer durational tasks into two different steps. The first stage mainly works on a series of established tasks in view of resolving the major issues related to ICT in higher education and developing a system in assistance with the development goals in the modernization of education. The next step focuses on the consolidation and enhancement of the design done in the former step and the specification of prioritized work of individual links and towards the improvement direction depending on the plan of work, demand in higher education and the improvement and progress of ICT in higher education

The major goals aimed at the implementation plan are discussed as follows. To develop an atmosphere of ICT aided learning where quality education is ensured, to enable an ICT aided education in the society of higher education, to provide broadband connections to all higher educational institutions, to enhance the ICT aided management system and improvement in ICT integrated with higher education. In order to obtain more efficiency the number of resources can be increased and the quality is also enhanced.

C. Connecting higher educational institutions through broadband

Connecting through the network involves establishing broadband access to every institution in addition with the
software and hardware components to provide a ICT learning infrastructure. It involves two conditions to be satisfied. Initially, every institution must be equipped with broadband connection. Next, basic infrastructure for teaching based on web applications must be done. In the view of construction, two jobs must be carried out, including the establishment of broadband connection and the net based learning infrastructure. In short, institutions must possess classrooms with internet access. Basic teaching software and resources must be provided to teachers.

D. Qualified Classrooms

Classrooms are connected with resources for learning so that teachers and students can be encouraged to access internet so that ICT learning can be improved and make a part of daily activities of higher educational institutions both in teaching and research. Sharing in learning can be improved by online classes of specialized universities, classes by excellent teachers, and Distance class. Through the feature of distant class students from remote areas can attend classes which they cannot achieve in their rural portions. Regarding classes by excellent teachers, well known teachers in the specialized arena are invited to make lectures for providing quality learning and the resources provided by those lecturers are shared wisely Online classes of specialized universities are developed to provide access to teaching materials of various specialized universities to help students through ICT learning.

E. Cyber Learning

Cyber learning can be built using an internet based infrastructure that aids students, their parents as well as teachers. The major goal is to improve quality of teachers and their ability to teach for improving their skills towards online teaching and research and communication among teacher, student and their parents. Secondly, it must provide an environment for teachers to improve themselves in ICT.

Quality materials must be made easily available. The infrastructure must provide all kinds of resources to teachers and students as they request. The environment must manage learning space. So the infrastructure’s organisational space higher educational institutions can manage both students as well as teachers.

F. Learning resource as public platform

Learning resources when applied in public infrastructure affect the gathering and distribution of educational materials. Learning resources can be applied in public platform as a cloud service. Cloud system provides sharing of resources to a greater extent with reduced cost and the obstacles in constructing ICT in higher institutions. It promotes the usage of learning materials and tries to improve the application.

G. Data mining in higher education

Data mining is considered the core of discovering knowledge among database which converts raw data into information that is of great use. Data are initially collected from data links and other modules. Some of the data collected from such sources need to be treated and then they are provided to be viewed. It possesses a master slave architecture and it makes use of certain interfaces including OLE2, ODBC and ADO. They are selected depending on the relation between the source and the target provided by the raw data. Certain data files and resources that are accessible includes EXCEL, ACCEE and SQL server.

H. SDM data mining

Major existing algorithms for data mining include decision tree, association rule algorithms for clustering. This system enables users to replace existing algorithms by new ones in the form of DLL. They are usually compiled in C++ for stability.

I. SDM visualization

It involves the steps to visualize data with more dimensions on a screen so that the viewers can be able to look into and find the different data mining tools for educational data mining. The data mining tools are categorized into two categories

1. Open source tools
2. Commercial tools.

<table>
<thead>
<tr>
<th>Tools/Developers</th>
<th>Utilities / Features</th>
<th>Methods</th>
<th>Operating system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrot</td>
<td>Enables ready-to-use modules to fetch results from different sites</td>
<td>Cluster</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>See5 and C5.0</td>
<td>Sustainable version of C4.5</td>
<td>Decision Tree</td>
<td>Windows/Linux</td>
</tr>
<tr>
<td>ALPHA MINER</td>
<td>Delivers effective cost and performance ratio applicable for data-mining field</td>
<td>Multi-data mining Tasks</td>
<td>Windows/Linux, Mac</td>
</tr>
<tr>
<td>WEKA</td>
<td>Machine learning systems for data-mining applications</td>
<td>Data pre-processing, Classifications, regressions, clusters, association guidelines</td>
<td>Windows, Linux</td>
</tr>
<tr>
<td>Intelligent Miner (IBM)</td>
<td>Enables constructed Combination, Mining scalability</td>
<td>Association Mining, Classifications, Regressions, Clusters Pattern Analyses</td>
<td>Windows Solaris</td>
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<tr>
<td>MSSQL Server</td>
<td>DM attributes</td>
<td>Combines third party algorithms</td>
<td>Windows, Linux</td>
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<tr>
<td>Mine Set</td>
<td>Robust Graphics tools</td>
<td>Association Mining, Classifications</td>
<td>Windows/Linux</td>
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<tr>
<td>Oracle Data Mining</td>
<td>Multidimensional data Analysis.</td>
<td>Association Mining, Classifications Predictions</td>
<td>Windows/Linux</td>
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IV. DISCUSSIONS

The role of ICT has an optimistic influence on education and researches. It is flexible to enable a better platform and inspiration for education system with an immense effect of advanced potentials on teaching-learning process. Such opportunities influence more over the performance of teachers and students and their success. ICT in education is beneficial for several shareholders in terms of:
A. Education
- Improved accessibility,
- Higher Flexibility of contents and delivery,
- Combined work-education system,
- Learner-oriented strategy,
- High education quality and novel interaction methods.

B. Employment
- Highly eminent, cost-efficient training and progress in place of work,
- Workers skill promotion to enhance efficiency,
- Learning culture growth,
- Cost distribution among the employees,
- Enhanced training transferability.

C. Administrations
- Promotion in economic learning and teaching network,
- Accessing of traditional education to a certain extent,
- Enhancement in the features and applicability of prevailing education organizations,
- Connecting education institutes and core curriculum to the developing systems and informative resources,
- Improving advancements and opportunities for constant education.

Database is provided as an input, a threshold suggested by the experts of evaluation in the field of education and then construct a model for data mining using association rules among numerous graduates with rules of association in VDM. The model is then trains with the data in the database of graduates.

V. CONCLUSION
As fundamental block of modern education, ICT provides a better web base learning. The various steps involved in designing a ICT based learning in higher educational institutions are described. The basic needs for implementing ICT in institutions are also provided. Visualised data mining is used for evaluation process in the field of evaluation in higher educational institutions. This investigation shows that Information and Communication technology can be easily implemented in higher educational institutions for providing better learning for students and improves the teaching skills of teachers. This analysis reveals that the implementation of ICT in modern education can improve the reach of technology easier towards students when compared with traditional learning methods.

REFERENCES
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