

# Choice Based Curriculum Design

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## ABSTRACT

*Data Mining is process of collection of important or relevant data from a pool of data. It is the computational process of discovering patterns in large data sets. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use. Data mining is the analysis step of the "knowledge discovery in databases" process. Data mining is an important process in our daily life huge amount of data needs to be mined for collecting information. In this paper, we are mainly focusing on the real-life application of data mining. There is a need to allow flexibility in education system, so that students depending upon their interests and aims can choose interdisciplinary, intra-disciplinary and skill-based courses. This can only be possible when choice based credit system (CBCS) is implemented.*

**Keywords** - Choice Based Credit System (CBCS), Choice Based Curriculum Design (CBCD), compulsory subjects, generic elective subjects, calculated weights on subjects.

## I. INTRODUCTION

We are in an age often referred to as the information age. In this information age, because we believe that information leads to power and success, and thanks to sophisticated technologies such as computers, satellites, etc., we have been collecting tremendous amounts of information. Initially, with the advent of computers and means for mass digital storage, we started collecting and storing all sorts of data, counting on the power of computers to help sort through this amalgam of information. Unfortunately, these massive collections of data stored on disparate structures very rapidly became overwhelming. This initial chaos has led to the creation of structured databases and database management systems (DBMS). The efficient database management systems have been very important assets for management of a large corpus of data and especially for effective and efficient retrieval of particular information from a large collection whenever needed. The proliferation of database management systems has also contributed to recent massive gathering of all sorts of information. Today, we have far more

information than we can handle: from business transactions and scientific data, to satellite pictures, text reports and military intelligence. Information retrieval is simply not enough anymore for decision-making. Confronted with huge collections of data, we have now created new needs to help us make better managerial choices. These needs are automatic summarization of data, extraction of the "essence" of information stored, and the discovery of patterns in raw data.

The CBCS will be having some core subjects and some elective ones. Core ones will be under the command of the university and it would vary from various streams, elective ones are chosen by the students from a list of subject provided by the university keeping in mind the updated requirements of the industry.

Another property of this curriculum process is that it provides flexibility to the students regarding the number of subjects to be studied in the semester. We can understand this by a scenario, where a student might face trouble to cope with the number of subjects in a particular semester. This process will deal with this aspect by allowing the students to choose their own subjects and all the no. of subjects in the semester they would like to study with a condition that they need to complete equal number of subjects in a year of the session. Thus, it makes the education system more student centric and student friendly.

The traditional education system does not go up to the expectations of all stakeholders of management education. While it tries to bring about parity in output, the rigid system fails on many counts at the input level. With the ever-changing market scenario, arises the need for an innovative education practices in the universities or colleges. The choice-based credit system (CBCS) is gaining popularity among the higher education institutions slowly as it allows the students to customize the program to suit their requirements and to suit with the skills they already have and it is self paced too. They can decide what courses they would like to do, choose the difficulty

level of the course, decide on the sequence of the courses, and even choose the faculty for each of the courses.

The program under the CBCS system is meant to cater to the requirements of the customers — the students. This calls for a long list of course offering, and also, the same course has to be designed for various credits and various contact hours depending on the students' requirements. Though CBCS's relevance for all higher education courses cannot be over emphasized, its specific role in making the management program more effective cannot be undermined. The main parameters of the CBCS are: course choice, pedagogy, course, timings, focus, generic, approach and faculty and building own sets of skills. The CBCS provides comfort for slow learners as much as it does for fast learners. Fast learners may pick up more credits in each of the trimester/semester. They may also acquire more credits than the mandatory requirement for the award of degree/diploma. Slow learners, on the contrary, may do courses for less number of credits and accelerate the credit acquisition or extend the program time. They may choose to finish the program for more than two years, if required.

The students of a business school come from different backgrounds. Every student would like the management education to build their strengths and fill in the gaps in their knowledge. Obviously, every student will be having different expectations. For example, a student with an engineering degree requires more courses on soft skill development than courses on quantitative subjects, while a student who has acquired the undergraduate degree in arts may have to go through a number of hours on quantitative methods. The traditional system does not provide for this flexibility. The members of a business school have varied specializations. There may be differences in the qualification, exposure to industry, and experience in academics among them. CBCS helps them to take advantage of their abilities according to their competency level. Similarly, the most common issues that faculty of business school face are related to the level of pitching of a course and the choice of pedagogy. Both these issues spring from the fact that the students are from different undergraduate program and possess varied levels of exposure to industry.

For example, a student who has experience may require more conceptual classes that helps her to

relate her experience with the theory of the subject, whereas a student who has no experience and is a fresher requires projects, industry visits and internships to understand the applications. CBCS addresses these issues to some extent. Faculty do not have to customize a course to suit all students in the program. The course must have variations in them. Though the student can also be looked at as the customer of the business school program, it cannot be disputed that the industry is certainly the ultimate beneficiary. Every business school has to work towards meeting the expectations of the industry to ensure employment for its students. Industry, no doubt, considers the undergraduate program related knowledge and skills that the student possess, but also has some definite expectations from any employee with a management degree. Since, the CBCS lets a student choose his courses and timing, she gets an opportunity to build on her strengths and fill the knowledge gaps.

Assessment mechanism should be standardized in a way that the choice of faculty is not influenced by the grades. CBCS presupposes that assessment should also be sufficiently fine-tuned to meet the set course objectives and course outcome. Similar courses, because of varying degrees of difficulty levels, may warrant different assessment mechanisms.

## **II. SURVEY**

After gaining an insight into the data mining process now we can discuss some of the applications or past work in this field. In the subsequent section, we will be discussing different works in various sectors under the sub sections.

### **A. Educational Data Mining-**

In higher educational institution, there is always an overwhelming pressure to provide up-to-date information for their accountability on student success. In this respect data mining could be used to solve problems such as student retention and attrition, personal recommender system (PRS) and analysis of course management system data. Baker and Yacef et. al [1] defined EDM as a completely new field emphasizing on all types of data that are retrieved from an educational institution used for the betterment of the students and improving the teaching learning process. In the present scenario all the educational institutions aim at upgrading the quality of the students, in which EDM can be a powerful

tool. In the following section a literature survey on EDM is provided.

#### **B. Student Retention and Attrition-**

Luan et. al [2] used data mining to predict which student would drop out and return later. By applying classification and regression tree technique Luan made an effort to identify the students who are likely to return in future. His work was effective in EDM as it suggested ways to improve student retention rate by applying both quantitative and qualitative research techniques.

In another research by Vandamme et. al [3] suggested to categorize the students in three groups, viz. low risk, medium risk and high risk from the beginning of the academic session. By using data mining techniques like neural network, random forest and decision tree it was observed that the students in high-risk group tend to fail and drop-out. This research provides a way out to identify the weak student and take effective measure to improve them from the very beginning and thus control the attrition rate. Other related works were done by Lin et al [4] by predicting which type of student would be benefitted from student retention program by using machine learning algorithms. Furthermore, Chacon et al [5] worked on practical environment to improve the student retention effort utilized at Bowie State University.

#### **C. Course Management System-**

Romero et al [6] established the application of data mining techniques to Moodle usage data. By doing so, trend of student online behavior could be recorded. This data could be analyzed to identify the student strength and weakness in every area.

Another work by Wang and Lio [7] suggests that instead of undergoing a static course content the student can go through the course at his own pace. This could be achieved by adapting learning exercises based on student progress through a course.

#### **D. Personal Recommender System (PRS)-**

The main aim of the PRS is to provide services, tools and artifacts so that the system could recognize the need of the student. While applying personal recommender system in educational context, two goals must be achieved. Firstly, it should aim at fulfilling the goal of the learner and secondly, the faculty members should be capable of controlling the

recommendations to the student. A research on personal recommender system or PRS by Huang, Chen and Cheng [8] suggests student specific recommendations by learning student behavior in an online course. This could be achieved by frequent item set mining to provide user specific recommendation for improved learning efficiency. Another work by Su, Tseng, Lin and Chen [9] suggested highly personalized, dynamic and fast learning recommendation to mobile users. This study focuses on how data mining could be beneficiary to mobile to mobile learning. Ecommerce is a domain where PRS has been widely used. Example, Amazon.com uses the recommendation system to customize the browsing history and display those products on the top which has a high chance of being purchased.

There are so many promoted methods of educational data mining but all kind of methods lie in one of following specified categories:

1) **Prediction:** Ryan S. J. d. Baker has given a detail explanation of prediction in his paper. He mentioned that “In prediction, the goal is to develop a model which can infer a single aspect of data (predicted variable) from some combination of other aspects of data (predictor variables).if we study prediction extensively then we get three types of prediction: classification, regression and density estimation. In any category of prediction, the input variables will be either categorical or continuous. In case of classification, the categorical or binary variables are used, but in regression continuous input variables are used. Density estimation can be done with the help of various kernel functions.

2) **Clustering:** In clustering technique, the data set is divided in various groups, known as clusters. When data set is already specified, then the clustering is more useful. As per clustering phenomenon, the data point of one cluster and should be more similar to other data points of same cluster and more dissimilar to data points of another cluster. There are two ways of initiation of clustering algorithm. Firstly, start the clustering algorithm with no prior assumption and second is to start clustering algorithm with a prior postulate.

3) **Relationship Mining:** Relationship mining generally refers to contrive new relationships

between variables. It can be done on a large data set, having a number of variables. Relationship mining is an attempt to discover the variable which is most closely associated with the specified variable. There are four types of relationship mining: association rule mining, correlation mining, sequential pattern mining and causal data mining. Association data mining is based on if- then rule that is if some particular set of variable value appears then it generally have a specified value. In correlation mining, the linear correlations are discovered between variables. The aim of sequential pattern mining is to extract temporal relationships between variables.

4. Discovery with Models: it includes the designing of model based on some concepts like prediction, clustering and knowledge engineering etc. This newly created model's prediction are used to discover a new predicted variable.

5. Distillation of Data for Human Judgment: There are two objectives for human judgment for which distillation of data can be done: Identification and Classification. As per phenomenon of identification, data is represented in a way that human can easily recognize the well specified patterns.

Efficiency of decision trees in predicting student's academic performance. In this paper, S. Anupama Kumar et.al has suggested an approach for predicting the student's performance in examination. They have used C4.5 (J48 in WEKA) to do the prediction analysis. In data collection, a slight modification has been done in defining the nominal values for the analysis of accuracy. As per need of system, data is preprocessed, and integer values are converted into nominal values and stored in .CSV format. After that it is converted to .ARFF format that is accessible to WEKA. In this paper, the implementation of decision trees rules can be done by dividing the data into two groups. J48 made decision trees by using a set of training data and ID3 does the same with the concept of information entropy. In decision tree the attribute for splitting at each node of tree is normalized information gain. The attribute having highest normalized information gain is chosen to make decision. This paper analyzes the accuracy of algorithm in two ways, the first is by comparing the result of tree with the original marks obtained by student and the second is comparing the ID3 and C4.5 algorithm in terms of efficiency.

Classification model of prediction for placement of students. In paper Ajay Kumar Pal has presented a new approach of classification to predict the placement of students. This approach provides the relations between academic records and placement of students. In this analysis, various classification algorithms are employed by using data mining tools like WEKA for study of student's academic records. In this approach the training algorithm uses a set of predefined attributes. The most widely used classification algorithms are, naïve Bayesian classification algorithm, multilayer perceptron and C4.5 tree. For the high dimensional inputs the naïve Bayesian classification is best technique.

Multilayer perceptron is most suitable for vector attribute values for more than one class. Nowadays C4.5 is most popularly used algorithms due its added features like supervising missing values, categorization of continuous attributes, pruning of decision trees etc. For testing, the 10 fold cross validation is selected as this evaluation approach. Here, a no of tests are regulated for estimation of input variables: chi square test, information gain test and gain ratio test. Each of the tests makes the concernment of variable in another way. According to this analysis, among three selected best algorithms, the best algorithm is Naïve Bayes classification.

Study of factors analysis affecting academic achievement of undergraduate students in international program. In this paper, Pimpa Cheewaprakobkit has done analysis to identify the weak students so that the academic performance of those weak students can be improved. In this study, WEKA open source data mining tool is used to estimate aspects for predicting the student's academic performance. In this study, data set to characterize classifier (decision tree, neural network). To predict the accuracy, a cross validation with 10 folds is used. In this study, to explore the proposal, two classification algorithms have been accepted and distinguished: The Neural Network and C4.5 decision tree algorithm. The investigation process consists of three main steps: data preprocessing, attribute filtering and classification rules. According to this analysis, it is suggested the decision tree model is more accurate than the neural network model. It can be concluded that the decision tree technique has better efficiency data classification for this data set.

### **III. OBJECTIVE**

Our objective is to make an efficient use of data mining in the field of education by allowing the students to have a proper glimpse of the colleges and the respective career programs they can pursue. We take students choices as a parameter and then we also tally their qualities that would help them to get a proper career.

The electives can be called as open elective. In other words, we can say that it can be either generic elective that would add generic proficiency to the students or it can be discipline centric, i.e., knowledge pertaining to a particular discipline or domain. All the electives might change with the course of the time depending on the current market requirements.

The prime objective of our work is to make the curriculum student friendly so that we can bring out the best from the student along with making them industry ready so that the curriculum will have all the compulsory as well as the elective subjects for the student to complete the course properly.

### **IV. WORKING PROCEDURE**

CHOICE BASED CREDIT SYSTEM (CBCS) can be a key implementation to bring out the best from the student. To implement CHOICE BASED CREDIT SYSTEM (CBCS) firstly we need to perform some quality survey by students, industry, and academician and provide weights to a vast number of subjects based on that survey. The main point of providing weights to the subjects is to calculate the average weights of every subject. This survey result is used to select the compulsory subjects of every stream for corresponding year. In any educational field it is very important to determine the subject of interest central to the students interest whether be it, he likes any particular sport or any particular subject or be it anything, for that matter now, in order to find out the interest, we have to organize tests to see if the student has the required skills/ features for the subject, the student is passionate about .Then we have to tally the scores of the students with records in the database .The database contains a certain marks for any particular given subject. The database has different interest recorded along with the test scores to study those

interests broadly. The test must also cover questions from different interest set provided giving more stress on the interest of the individual there will be certain basic subject of the interest of the student in the test which would help them grow as a responsible individual in the future and in life. As these basic subjects will be extremely helpful in the proper nourishing of their interest. There would also be certain cut off marks to these tests. If the conducted test results are equal the cut off marks, then students would be given the choice to select some elective subject based on their interests now we would compare with the weighted average result of that survey with the choice of elective subjects by the students. In this way, the compulsory subject along with the elective subjects are to be chosen. However, if the test results are negative or below pass marks then there would be a retest and based on that test result we will have to check the database record and see which interest set closely matches the student's score, then accordingly, those elective subjects along with the compulsory subjects would be given to the student.

Another important aspect of choice based curriculum design is that a student has the freedom to choose how many subjects he wants to study in a semester, in certain scenario there can be a possibility that a student is busy with some project work or personal problems and he may wish to study the rest of the subject in next year. The main objective of the CHOICE BASED CURRICULUM DESIGN is that it is student friendly and as well as it makes the student industry ready. In past, there were certain number of subjects which the student must complete in a certain semester.

Choice based curriculum design is a new way of implementing uniform education system. The CBC shifts the focus from teacher centric to student centric education by allowing the students to choose their own subjects that they would like to study. As mentioned above, this system will also provide flexibility to the students regarding the number of subjects they would like to study in a semester. The courses can be evaluated following the grading system, which is better than the conventional marks

system. The flexibility provided to the students would help to gain the interests of the students and it would also help in updating the subjects after a period according to the market's requirements. Choice based curriculum would also help the students with different interests from different interests. For example, a science student might have an interest in a commercial subject that he wouldn't be able to pursue being a science student, but this system can help such students. Choice based curriculum also provides easy mobility to the students, i.e., the student can resume the course from exactly where he left if there is any such situation of changing the institution. The choice of the subjects that are going to be the core ones and the elective ones based on various parameters need to be evaluated efficiently. So, to implement the choice based curriculum we need to assign some subjects as the core subjects for each of the courses. Core subjects are compulsory for every student in the course as instructed by the curriculum governing body. The elective courses are the ones that need to be chosen by the candidates themselves from a pool of subjects based on their respective interests/discipline/domain. Elective courses can be of different types as in it could be the disciplinary ones or regarding a domain of a course. For example, in case of a computer student the student might be interested in a computer related subject and it is not possible to follow all the subjects of a domain in a course, so he might choose a domain to go forward with. Project related work can also be given as a subject in the course and the student who are opting for it may take from the faculty members to develop new research based or real-time projects etc. The project work will be assessed and will be considered with same grade point. The university can also provide generic electives which might be out of the subjects for a better exposure in some other fields. Elective subjects can be provided by the university based on ability enhancement like soft skills, spoken English, etc. or skill enhancement that needs to be chosen by the students. So here the procedure to evaluate the subjects in order of core subjects, elective subjects is being described and implementing the process with the help of a proper survey with the help of the data mining.

The University Grants Commission (UGC), India, has brought out guidelines for the introduction of the choice based credit system (CBCS) in higher educational institutions for graduate, postgraduate, diploma and certificate program. The expressive

stated purposes of the introduction of the scheme are mainly to provide opportunity for students to have a choice of courses or subjects within a program resembling an la carte menu — as against the mostly fixed set of subjects now being offered except for the limited choice of electives in professional degrees and postgraduate program — with the flexibility to complete the program by earning the required number of credits at a pace decided by the students.

This would mean that the programs would emphasize more on students earning the prescribed number of credits to qualify rather than being herded to come out successfully within the normal stipulated time for the degree. For these reasons, the CBCS is touted as a cafeteria approach to education. The scheme is also expected to provide mobility to students within the country, and, eventually, even internationally, as the credits earned at one institution can be expected to be transferred freely. To ensure uniformity, a system of classification of courses or subjects within the program is made.

It would seem that the element of uniformity sought to be achieved is addressed, and the concept of portability in higher education has been realized. At the same time, flexibility is needed for dovetailing the structure of the program by the institutions concerned to suit local educational needs.

The authorities of higher education are moving fast to ensure that the system is adopted countrywide the next academic year onwards. Quite a few institutions, including central universities, have adopted the system in the current academic year itself. While there can be no argument against the imperative to have portability in education at college and university-level and also providing opportunity to students to choose, it is a fact that only a small percentage of the institutions in the country are in a position to bring in these changes in letter and spirit. As a matter of fact, these institutions have been offering such options for quite some time wide choice of subjects in the form of interdisciplinary and open electives to their students supported by the presence of number of diverse departments with qualified faculty members and an established culture of research and consultancy. Consequently, these institutions can smoothly change over to the new system both in style and substance.

The rich diversity of program, faculty and students is an important feature enabling this changeover. And

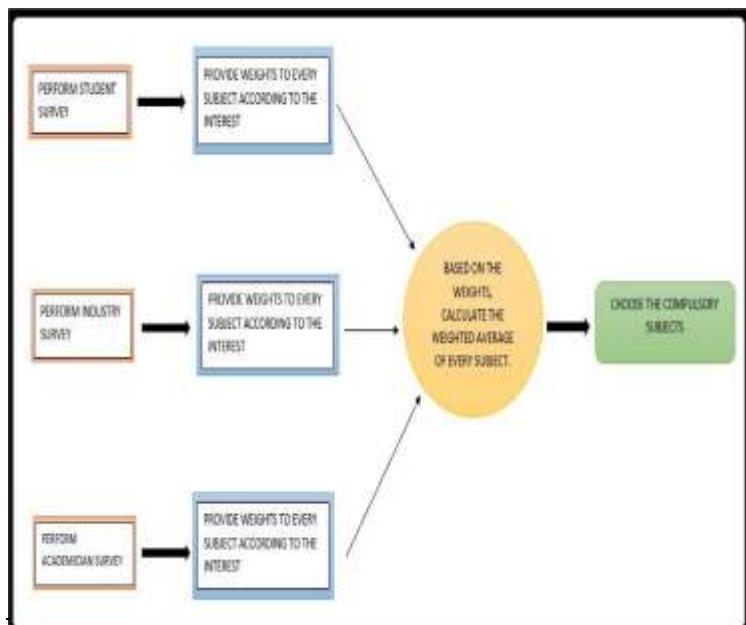
these institutions can aim at reaching the benchmarks set by leading foreign universities such as Stanford in offering opportunity for the students to major in computer and music or computer and literature simultaneously, thus providing true meaning to the word ‘choice’ and exploring its limitless possibilities. That leaves us with the bulk of institutions of higher education which, though willing to switch over to the new system, have to counter their inherent limitations to make the changeover indeed meaningful. To begin with, the professional colleges affiliated to universities established by state governments have to follow the admission norms formulated by their respective governments which often provides detailed admission criteria on the basis of ‘son of the soil’ approach, and therefore regional diversity in the form of student admissions is virtually very little. Even in the case of faculty, the preference for local candidates in recruitment is understandable as it can secure some kind of insurance against higher faculty turnover. The revenue model and the practical working condition of these colleges would not enable them to have the luxury of a number of diversified departments manned by quality teachers. In fact, even when the university curriculum prescribes elective subjects, the institutions would get around the situation by making students opt for one or, at the most, two electives for which the college has the resource in terms of faculty and other infrastructure. For these institutions, whose number is not inconsiderable, to move essentially from their present position of enabler of higher enrolment ratio at degree-level education, to a stage of quality service-provider, on the lines of the cafeteria approach in higher education, would require overcoming many obstacles calling for a graduated approach spread over a period of time. The ecosystem around which these colleges and institutions are functioning requires radical transformation. Otherwise the change would prove to be just one of style without substance.

Another aspect that is closely linked to the CBCS is adoption of letter grading system. The UGC recommends adoption of nine-letter-grades including one-letter-grade for the absence of the student in the examination. The grades may be relative or absolute. The switchover to grading system based on the process of simple mapping of percentage of marks to grades without the distribution of marks of students being taken into account can therefore serve only limited purpose and can never be considered a progressive step. It must be noted that most of the

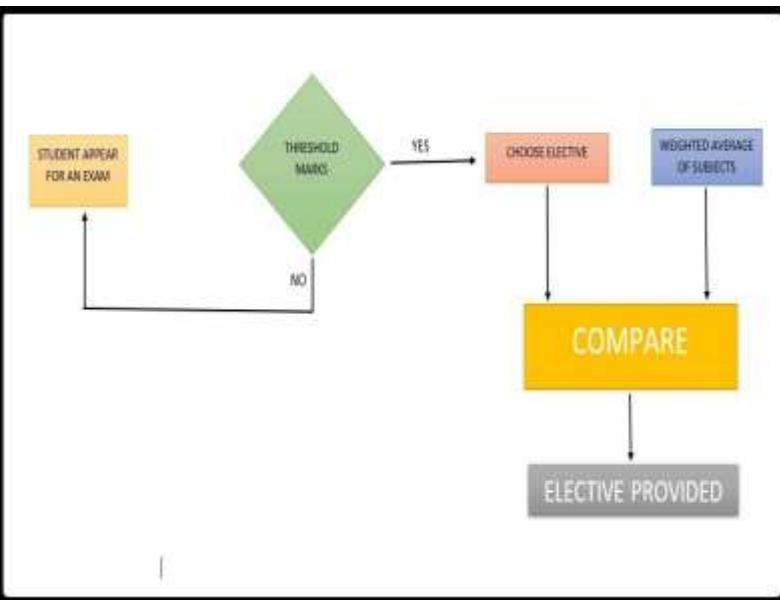
institutions of higher education have been following the system of percentage of marks and the credit system can pose no challenge as the weight of the credit can be suitably factored into maximum marks awarded for the particular subject.

In any case, the link between grading procedure and CBCS is tenuous and the emphasis on the letter grading, especially the absolute grading, seems a little misplaced. More than the system of grading, one must delve into the aspect of evaluation, especially the system of continuous evaluation. The excessive reliance on final semester examination for evaluation should give place to regular classroom and mid-term tests on continuous basis.

The way forward then would be monitoring carefully and regularly the implementation of the CBCS by the institution covered by the UGC. Offering a reasonable range of choice of subjects to students of a programmed by all institutions should be the first priority. Rather than a one-size-fits-all approach, a calibrated approach to take all institutions forward on a step-by-step basis should be followed, eventually ensuring that the institutions reach the desired level of quality and recognition. The primary focus should be on enabling the institutions to wholeheartedly provide diversity in subjects of



**Fig 1: Calculation of weighted average and choosing of compulsory subjects.**



**Fig 2:** Choosing of elective subjects based on student choice.

## V. ALGORITHM

Step 1: Firstly, we must carry out a survey by student, academician and industry and provide weights to every subject according to the interest.

Step 2: Based on the weights calculate the average of every subjects.

Step 3: The survey result will give us the compulsory subjects.

Step 4: Database will contain the information regarding various interests and eligibility criteria for each interest.

Step 5: There would be a test which would tell us the interest of the students.

Step 6: Test results are evaluated and if the results are positive then respective choices are given to the students, else students are provided with list of eligible choices.

Step 7: If the results are negative there would a retest.

Step 8: Based on the survey and calculation of weighted average and exam results we need to give the students the elective subjects.

Step 9: After proper comparison of the weighted average of the subjects and the elective chosen by the students, the final electives are to be provided.

Step 10: Suppose there are a certain number of subjects for certain semester, now a student can wish to opt for few exams in one semester and cover up the remaining in the next semester.

## VI.CONCLUSION

From the above study, we can conclude that data mining is used in almost all aspects of human life. Whether a user wants to buy a product online or to choose the reference books, knowledge discovery from previous history is needed. Similarly, for a business organization data mining plays a crucial role in holding the success. If data mining is used properly, it proves to be beneficial for humanity.

Due to the presence of practically relevant problems and scalable solutions researchers have always been attracted towards this field. Business intelligence, customer relationship management (CRM) and e-commerce all hinge on data mining. In this paper, we have put forward some of the works in the field of data mining. This review work will be helpful to the researchers for learning the progress in the field of data mining in the past. It also opens new areas where data mining can be implemented for the betterment of humanity.

In this paper, we have worked on Choice Based Curriculum Design and it will surely help the student to study freely and perform according to their standards and potentials in this way we can bring the best from the student.

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