Decision Support System for Managing Educational Capacity and Utilization

Namdeo Badhe[1] Vaibhav Dhakan[2] Ankit Mehta[3] Param Vyas[4]
[1, 2, 3, 4] Department of Information Technology Engineering
[1, 2, 3, 4] Thakur College of Engineering and Technology

Abstract---Universities and even individual educational institutions, operate with large amounts of data, typically scattered across multiple, non-centralized information systems and applications. Support of administrative decision-making and knowledge discovery from such decentralized data flows requires a system designed with close eye on the specific needs of the academic domain. A strategic approach is needed to plan activities, optimally allocate resources. Such an approach should be based on appropriate inputs allowing decision makers to meet institutional goals by managing the educational resources and availability of faculty at universities or any educational institution at the particular time. The process must admit students in such a manner as to achieve an efficient utilization of university resources. Hence to facilitate strategic decision making, we propose to develop a decision support system, which is primarily concerned with resource allocation and performance analysis. A number of general performance descriptors like staff per student ratio, teaching load, availability of faculty, their experience in teaching the particular domain etc. are used as parameters for our proposed system.

General Terms: Academics, Organization, Data, Decision Support, Account, User, Algorithm, Faculty, Admin
Keywords: DSS, Improved System, SPW, educational supply, demand, warehousing.

I. Introduction

Decision-making in the field of academic planning involves extensive analysis of large data volumes originating from multiple systems. With the many new technology application areas evolving from the domain of electrical engineering, computer engineering, and computer science, deans and department chairs must ensure that new specializations and programs are adequately supported. The system integrates input data from relevant sources into an autonomous data warehouse. Graphical client front-end ensures adequate output presentation to the decision-makers by revealing significant details and dependencies in the data. Applying the system as an "on-the-fly" decision-support utility by the policy-makers leads to significant acceleration of planning procedures, deepens the insight into the data and the underlying methodology, and, consequently, provides for more efficient academic administration.

This system also contains primitive methods of sharing information. The idea is to make the sharing and learning process dynamic which would result in instant collection of resources. It includes collaborative learning methods which would allow the users to exchange ideas, information, documents, etc. "State-of-the-art" decision making within most universities around the globe has the form of an argumentative pie-cutting barely backed up by any solid quantitative analysis. However, the emergence of advanced information technologies has altered the operational environment of universities world-wide offering them an opportunity to move on towards more systematic and efficient management of their assets.

II. Problem Definition

Decision-making is supported primarily by means of intelligent information presentation and by providing options for its explorative analysis. Focusing on the exploration rather than on generating readymade solutions has the advantage of ensuring the model's adaptability and applicability for a wide range of problems. Our DSS targets to support the administrative task of planning the university's educational capacity in terms of the number of students its courses can accommodate under the specified resource constraints. Decision-makers are able to evaluate various strategies and generate forecasts by means of simulating with the input data.

From the early days of information systems administrative academic processes such as effective resource distribution, teaching personnel management, automation of student Admission and registration, student performance, retention and dismiss, to name the major ones, have been among the "hottest" educationalist issues.

The goal of this project was to propose a more comprehensive framework for assessing the university's resources in form of a DSS for academic policy makers. Major tasks of the systems were defined as follows.

- Relevant input data has to be extracted from heterogeneous sources, brought into a consistent state and integrated into a single repository to provide a data basis for querying and computations.
- A sound computational model for measuring the educational capacity and its utilization has to be designed. The model will account for frequent unavailability of parts of the input statistics by supporting different precision levels.
- The proposed concept, as well as alternative approaches, is to be implemented in a user-friendly interface. Apart from standard computations and report generation, the system supports specification of user-defined simulation scenarios that may be used for testing various policy proposals and studying their implications.

III. Development Idea

Decision-making is supported primarily by means of intelligent information presentation and by providing options for its explorative analysis. Focusing on the exploration rather than on generating readymade solutions has the advantage of ensuring the model's adaptability and applicability for a wide range of problems. Our DSS targets to support the administrative task of planning the university's educational capacity in terms of the number of students its courses can accommodate under the specified

resource constraints. Decision-makers are able to evaluate various strategies and generate forecasts by means of simulating with the input data.

To keep the model manageable and intuitive and to avoid functional explosion we opted for a single bottle-neck resource of the educational capacity, which is the teaching staff. From experience, staff availability is by far the most crucial resource constraint, expensive and hardly adjustable in the short-term compared to other resources involved, such as facilities, budget, appliances, materials etc.

Our contribution is basically twofold:

- To propose the overall methodology for educational capacity analysis, and
- To design its adequate data warehouse implementation for proper allocation of the resource for the engineering curriculum in a college

A. Functional Requirements

1) Administrator:

The administrator would log in into the system with his credentials. Then the form would be directed to his own account. The MDI form will be diplayed.It manages the whole system.

2) Faculty:

The Faculty logs in to the system, fills in his details and selects his area of interrest.

3) Development Team:

The development team will be repsonsible for checking any bugs in the system.Also the development team will report System critical error and provide patches for the system. Development team will be reponsible for adding new functionalities to the system.

B. Non Functional Requirements:

1) 24 X 7 availability.
2) Better component design to get better performance at peak time.
3) Secure access of confidential data (user's details).
4) Flexible service based architecture will be highly desirable for future extension.

IV. RESULTS

The work presented in this paper focuses on the problem of offering reliable decision support to the process of balancing educational demand and supply in universities. The academic structure is modeled as a supply-demand relationship between teaching resources and students. The methodology for assessing the educational capacity is based on correct and accurate mapping of cross-faculty dependencies into a university-wide curricular contribution matrix. The model is implemented as a multiuser DSS for online construction and evaluation of academic scenarios. The system integrates data from heterogeneous university applications.

Fig. 1: Login screen

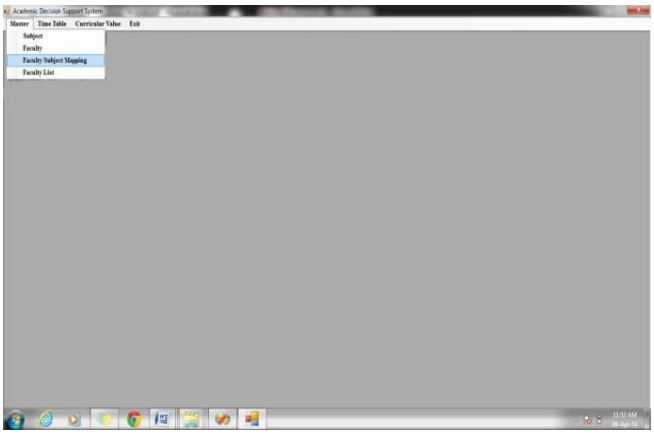
Fig. 2: Home screen

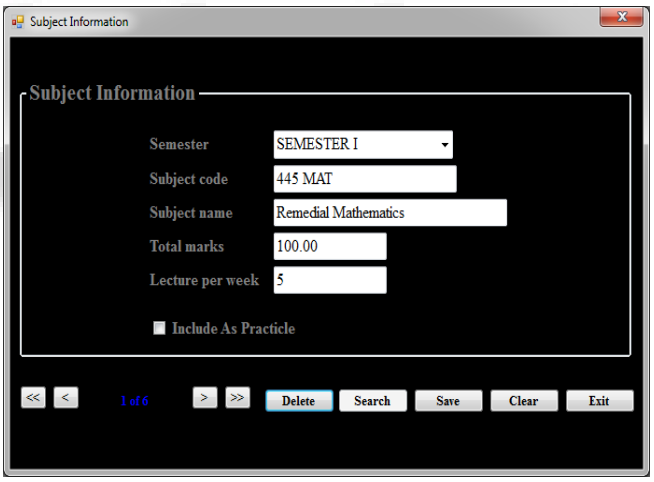

Fig. 3: Subject Information Form

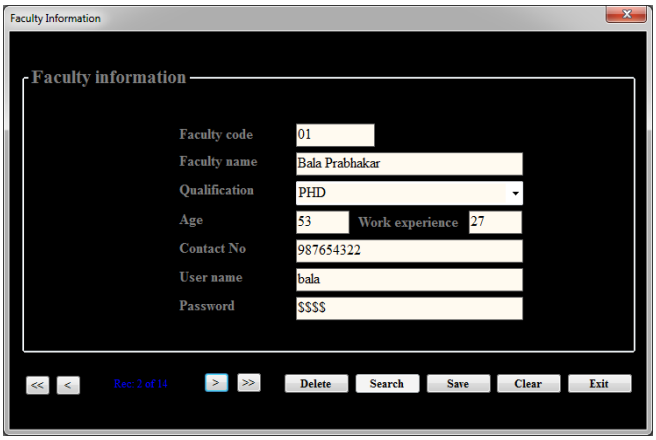

Fig. 4: Faculty Information Form

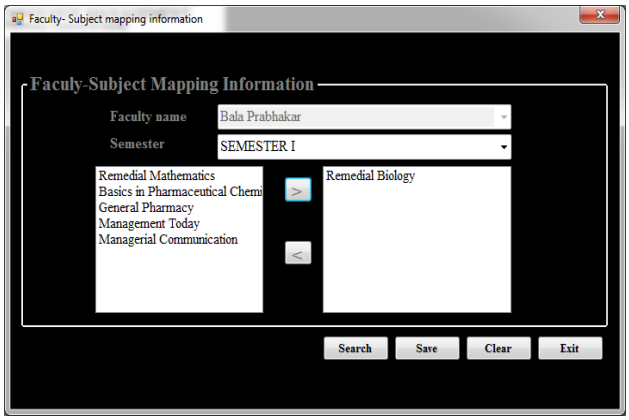

Fig. 5: Faculty Subject Mapping Form

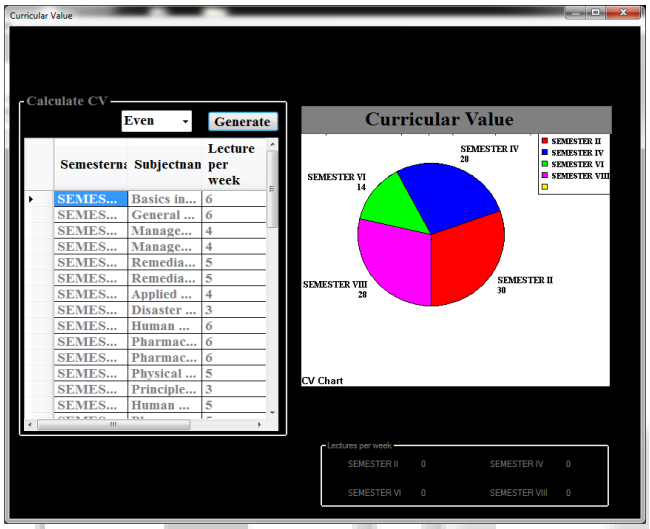

Fig. 6: Curricular Value Form

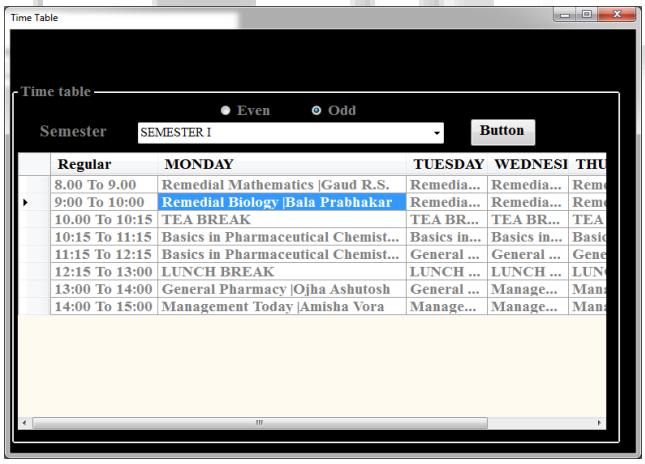

Fig. 7: Time-Table Generation Form

V. Discussion

We have proposed a system for managing educational capacity and utilize the resource. To increase user friendliness we have used simpler software for developing it. The GUI is also kept simpler so as to improve the user involvement while adding details and browsing. Our interest is in introducing the basic concepts of Decision Support Systems in the existing university / college resource utilization & allocation process.

Decision-making process is supported primarily by means of intelligent presentation of the retrieved or computed data and by providing options for its explorative analysis. Focusing on the exploration rather than on generating prefabricated solutions has the advantage of ensuring the model's adaptability and applicability for a wide range of problems. To keep pace with the requirements of the increasingly competitive environment, universities are forced to revise their curricular systematically, reallocate resources, introduce new course types or methods of teaching, or otherwise adapt to changing conditions. A minor adjustment in a course curriculum may cause significant shifts in the utilization of academic resources. Consider a worldwide emerging trend of setting up interdisciplinary study programs. Unlike with "classical" subjects, supervised by a single department for the most part, the responsibility for multi-subject degrees is shared by all involved departments. Planning of interdisciplinary curricula infrastructure is barely manageable without an accurate approach for evaluating the available resources, especially if the funding leeway for supporting additional expenses is rather limited. The proposed model helps answer a wide range of queries about the actual utilization of the university's capacities, gain deeper insight into the academic processes, and carefully plan new strategies and means for their achievement.

VI. Future Scope

The proposed system can be implemented and launched at the broader scale for commercial purposes.

This software can be linked with internet. This will provide remote access. Batch wise allocation of practical subjects can be made. Also the feedback of the teachers can be added and graphically generated.

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