DESIGNING A DATABASE MANAGEMENT SYSTEM FOR COURSE DESIGN PROCESS IN DISTANCE EDUCATION

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ABSTRACT

DESIGNING A DATABASE MANAGEMENT SYSTEM FOR COURSE DESIGN PROCESS IN DISTANCE EDUCATION

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This study aims to apply a systematical approach to manage the costs of distance education course design in Open Education Faculty of Anadolu University. In this framework, an overview of the distance education course delivery materials design processes is presented. In particular Open Education Faculty's course delivery materials design processes are examined. It is observed that the current system does not support the collection, storage and manipulation of both used and created data during course delivery materials design and production processes. An information system is designed to provide a basis for managing the costs of future events more accurately and timely.

Keywords: Database, Management Systems, Distance Education

ÖZ

UZAKTAN EĞİTİMDE DERS TASARIM SÜRECİ İÇİN VERİ TABANI YÖNETİM SİSTEMİ TASARIMI

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Bu çalışma Anadolu Üniversitesi Açık Öğretim Fakültesi'nde uzaktan eğitim dersi hazırlanması maliyetlerinin belirlenmesine sistematik bir yaklaşım uygulamayı hedeflemektedir. Bu çerçevede uzaktan eğitim dersi hazırlama süreci ana hatları ile ele alınmıştır. Halihazırdaki tasarım ve üretim sistemi analiz edilmiş ve uzaktan eğitim ders materyalleri tasarımı ve üretimi esnasında yaratılan ve kullanılan verilerin toplanmasını, saklanmasını ve işletimini desteklemediği görülmüştür. Bu tür faaliyetleri daha tutarlı ve zamanında karşılayabilmek amacıyla bir bilişim sistemi tasarlanmıştır.

Anahtar Kelimeler: Veritabanı, Yönetim Sistemleri, Uzaktan Eğitim

to my parents

Zuhal and M. Ali Yapıcıoğlu

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INTRODUCTION

Education is an instrument to develop skills and exploit opportunities for individuals in the society. By providing new alternatives in education, democratizing the educational process and providing lifetime education opportunities, distance education is a strategic opportunity for nations in improving the educational services. It provides place and time independent access for students, to learning programs, resources, and services, including interaction among faculty and students, through synchronous and asynchronous technologies [7].

As a developing country, education is a vital issue for Turkey. The demand for all types of education is increasing whereas the resources such as schools and lecturers are limited and it is not possible to reach at sufficient levels in short period of time. Therefore, it seems it is quite difficult for Turkey to achieve an overall education level required by a modern society using conventional educational approaches and techniques.

Anadolu University's Open Education System is the major attempt in Turkey in integrating the distance education approaches with national education system. Since the involvement to distance education in 1982 as a dual-mode university, the institution contributed more than 190000 bachelor and associate graduates to the country. Although considered as one of the mega universities of the world, Anadolu University is also least known institution among the similar institutions.

In the Turkish National Education System, besides primary school level, schooling rates are below the desired levels. The schooling rates in the secondary education are low but the extension of the fundamental education from 5 years to 8 years is an effort to solve the problem. On the other hand, the bottleneck in front of the universities makes the problem more severe. Admission to higher education is very competitive and based on a nation-wide examination executed by the Student Selection and Placement Center (ÖSYM) every year. In the beginning of 1999-2000 academic year, around 1500000 high school graduates took the test and only 280000 of them were admitted to formal higher education institutions. These characteristics of the educational system in line with the impossibility of increasing capacity of formal schools in a short time and the necessity of efficient use of human resources (teaching staff) make distance teaching a highly rational alternative to increase an overall education level.

Although the arguments concerning distance education started in Turkey beginning from the year 1927, real applications are not detected until late 1950's. Correspondence Course Center (CCC) founded within the Ministry of Education in 1959 that started offering correspondence courses in technical fields as well as preparatory courses for external exams. Because of the increased demand for higher education, there had been some work to provide higher education through correspondence; but academicians and public opinion confronted these attempts with negative feelings. Between 1974-1976, the students who completed their secondary education are offered teacher training via distance education through Teacher Training Pilot College, but this project turned out to be unsuccessful and the students are transferred to other formal education institutions [3].

Current educational system of Turkey includes distance education institutions at all levels of education. Anadolu University in Eskisehir offering two and four year programs is the only institute that conducts distance higher education. Anadolu University, in dual system parallel to the conventional higher education departments, started the programs of Business Administration and Economics in 1982 with 29479

students. Today, Anadolu University with more than 450000 active students is considered one of the ten-mega universities of the world delivering undergraduate degree programs as well as other programs such as degree completion programs to Turkish people in Turkey, Northern Cyprus Turkish Republic and Europe. Anadolu University programs have been greatly expanded in recent years, although the entrance still remains competitive.

Technologies currently used in Open Education Faculty to deliver programs are typically one way and designed to reach masses. As Murphy states [2], these technologies for both programs include specially designed textbooks and other printed materials including newsletter and bulletins, television and radio broadcasts. Technologies used in the Anadolu University Open Education system include videotapes, face-to-face lectures at local universities and the interactive computer assisted instructional education softwares available to the students at local computer centers built and maintained by Anadolu University throughout the country. Recently, there are attempts to modify interactive computer assisted education softwares. As a result of these attempts the present softwares are started to be available to Open Education Faculty students in CD-ROMs. Multiple choice type examinations for all programs are offered in a variety of locations, to assess students' success.

It seems that there is an increasing public awareness towards the distance education issues in Turkey in the recent years. Two international distance education symposiums are performed in 1996 and 1998 respectively. Some universities started to utilize distance education technologies to support conventional teaching. In 1996, Bilkent University has initiated some synchronous distance education courses via satellite. Middle East Technical University (METU) has started sending experimental distance education course via Internet in 1997. Istanbul Technical University established remote classrooms via a microwave link connecting two campuses that are in different locations in Istanbul. In the same year with the initiative of the Council of Higher Education, a project is conducted by a group of researchers from different universities, for the analysis of nation-wide distance education alternatives [4]. The Council of Higher

Education has prepared rules and regulations for the distance education based on computer and communication technologies that have been effective starting with the 1999-2000 academic year.

Anadolu University, one of the most important institutes in Turkey conducting distance higher education, has maintained the mission of raising the nation's overall educational level by providing opportunities for higher education through distance learning methods. The foundation of Anadolu University goes back to 1958; in dual mode the university has initiated distance teaching since 1982. Within this time period, Anadolu University has had considerable contribution to Turkish Education System. The educational needs of high school graduates who could not receive or continue their higher education for various reasons, is the main target group for Anadolu University. In addition to offering bachelor's and associate degrees, Anadolu University has provided opportunities for improving academic or professional skills to people who are already engaged in their businesses.

The attempts that gave rise to Anadolu University in distance education system started in early 1970's. Educational Television Institute (ETV) which was founded within the Turkish-German technical aid program provided insight and familiarity in communication sciences. The mission of conducting "open education" in Turkey was given to Anadolu University by Law No. 2547 in 1982. By the 1982-1983 academic year, a distance education program is initiated at the Open Education Faculty of Anadolu University. Two four-year distance education programs, Economics and Business Administration with a total enrollment of 29471 students began education. In 1993, the departments of Economics and Business Administration are separated from the Open Education Faculty and re-structured as two different faculties: Faculty of Economics and Faculty of Business Administration. In the current situation, there are three faculties teaching at distance. The students of former Economics and Business Administration programs were transferred to the respective faculties. In this new organizational setup two functions are assigned to the Open Education Faculty. The first is the educational function of conducting two-year associate degree programs, degree completion

programs and certificate programs. The second is the tasks of student administration, course books printing, production of radio and TV programs, data processing services, academic counseling activities and the student examinations of the whole system.

One of the most important aspects of the distance education system is the selection of media used for delivery of the courses. In Open Education Faculty, course books, educational TV programs, computer instructed education software and academic counseling services are used to deliver courses to the students. In line with the course delivery materials, multiple-choice examinations are used to measure and assess students' success. Since student population of the faculties teaching at a distance is huge and diverse in terms of location and demography, Open Education Faculty employs one-way and asynchronous technologies generally. To support one-way instruction, face-to-face courses (Academic Counseling Service) and interactive computer instructed education softwares are utilized. The total design cost of a specific course is composed of sum of all of these delivery materials' design and maintenance costs and examinations' execution costs.

Determination of the cost of a specific course is very important issue in distance education. Up to date, there is no such study to find out how much a course does cost to Distance Education Faculty. Once the cost figures of a course design is determined, this information can be used in further analysis such as cost per student, total cost of a program, determination of cost forecasts about programs thought to be offered, and comparisons of distance education programs with the face-to-face programs.

In this study, the design processes of each media used in delivery of the courses and test preparation and examination, in line with the cost structure of design of distance education course components are analyzed. It is determined that an information system should be established for the structuring of cost elements during the distance education course design phase. All the data used and created during this phase should be collected, stored and maintained within this system. In the distance education course design phase, all data included in the system should be provided, entered and the system should be maintained periodically.

During the phase of the system analysis it is observed that there are severe breakdowns in the determination of cost centers. Hence, study is modified to the determination of cost drivers for each course delivery materials and designing a DBMS for the course delivery materials design and production processes. With this modification, proposed DBMS can serve three level of management. The first one is top management; they can use the proposed system as a game tool for answering what-if scenarios. Within this context, proposed system can be thought as a Decision Support System. The second is for the middle management; level they can use this DBMS as a control tool in costing of the activities. And lastly, low level management utilize the proposed system for keeping records about the costs and duration of activities, assigned personnel and their tasks as well as their assignment periods.

In Chapter 2, the basic concepts of information systems including Database Management Systems (DBMS) and Decision Support Systems (DSS) provided. Concepts of materials used in delivery of distance education courses are defined in Chapter 3. Chapter 4 presents the design processes of distance education course materials, as well as test preparation and examination. At the end of the analysis of the current processing, a database management system requirement is determined. The processing of the proposed database is explained in detail in Chapter 5. Finally in Chapter 6, suggested future work for the proposed system is discussed.

CHAPTER 2

BASIC CONCEPTS

Before going deeper into the main objective of the study, clarification of some concepts and definitions would be helpful.

2.1. System Definition

A system is an organized set of components that interact in a regulated fashion to achieve goal. All systems share common underlying characteristics. These characteristics can be listed as follows:

i. Inputs and outputs,
ii. Goals or objectives
iii. Systems boundary (environment)
iv. Feedback and control mechanism
v. Inter-related parts.

We can say that all the systems have inputs and outputs. In the case of information systems the input to be processed is 'data' and the resultant output of the system is 'information'. The activities of the system are determined by its goals or objectives. System boundary defines the elements of the systems. Inside the boundary, there exist system parts, whereas outside the boundary the environment lies. System feedback and

control mechanism refers to the information that enables the system processes to modify themselves and in turn meet the system's goals. Normally, all organizations rely on feedback and control mechanisms. All systems have objectives and in order to ensure that system objectives are met, it is important that control is exercised within the systems' processes and activities. Control can only be achieved by accurate and effective information feedback into the system that allows changes to be made to maintain the direction of a system to achieve its goals. Figure 2-1 shows a typical system graphically.

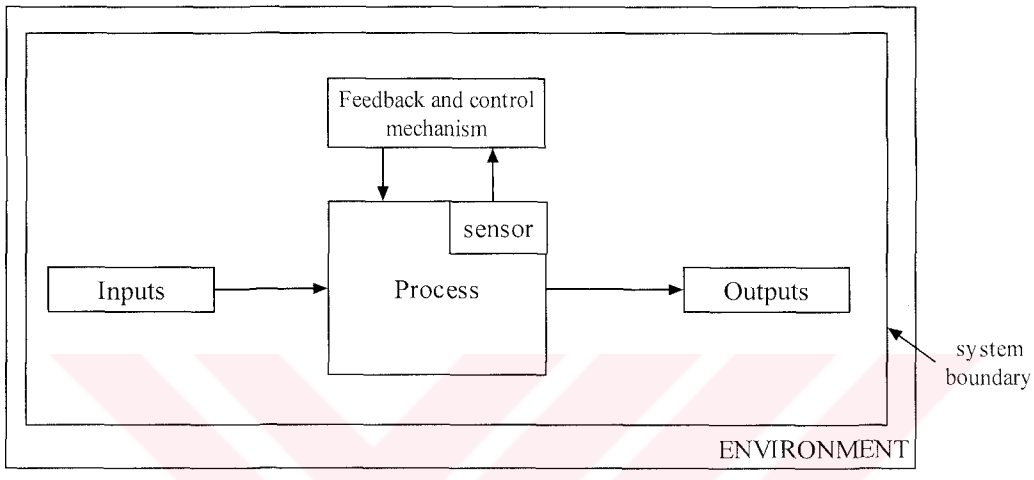


Figure 2-1 System Structure

2.2. Information Systems

An information system is a set of interrelated components working together to collect, process, store and distribute information to support decision making, coordination, control, analysis and visualization in an organization.

Information systems contain information about significant people, places and things within the organization or in the environment surrounding it. Information means data that have been shaped into a form that is meaningful and useful to users. Data are the facts representing events occurring in organizations or the physical environment before they have been organized and arranged into a form that people can understand and use. [6]

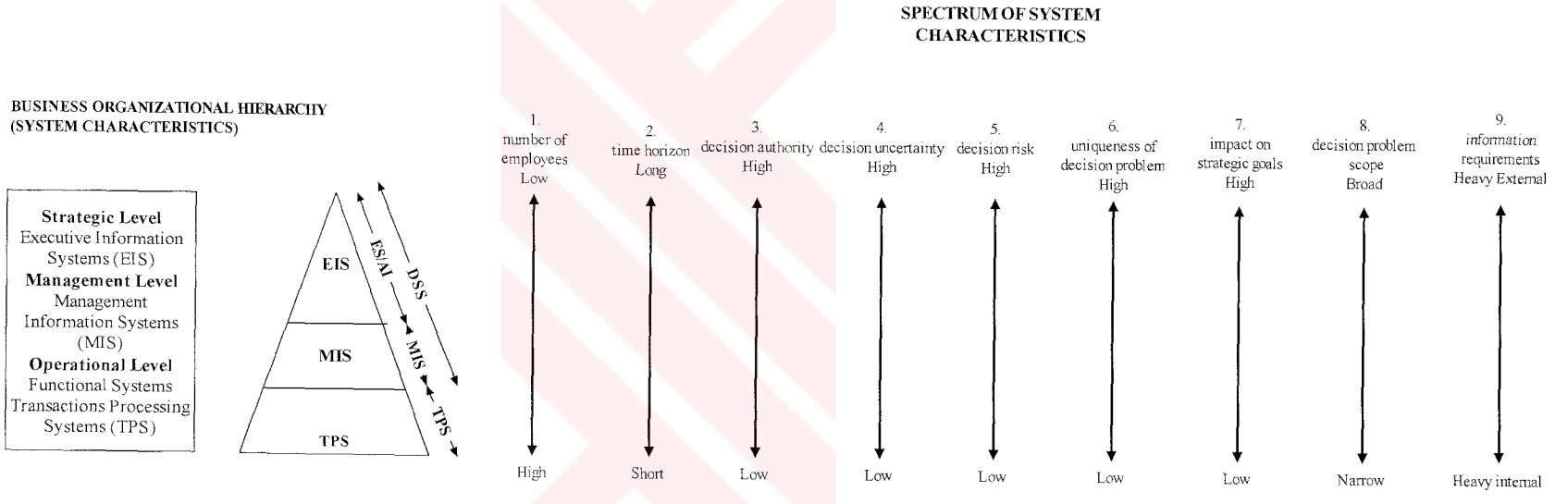


Figure 2-2 Information systems decision levels within a business organization (adapted from [5])

A typical hierarchical business will have three broad levels of organizational decision-making; these are as follows:

i. Strategic (executive) information systems (EIS): EIS is the system that provides information to senior executive managers on strategic areas of business organization's activities to aid strategic decision-making.
ii. Management information systems (MIS): MIS is the system providing information for decision-making usually intended for middle management. The information may be external to the business organization or internal to an organization.
iii. Operational information systems (TPS).

As can be seen from the Figure 2-2, Decision Support Systems (DSS) serve as a tool for the decisions at both strategic level and management level. Detail information about DSSs are provided in the subsequent section.

2.3. Decision Support Systems

A decision support system is a highly flexible and interactive IT system that is designed to support decision-making when the problem is not structured or semi structured. A DSS is an alliance between decision maker and specialized support provided by IT. [8]

DSSs are generally used by middle and upper level managers to make decisions in uncertain and complex environments. DSSs also offer forecasts for future conditions. They give managers the capability to quantitatively analyze alternative choices.

The benefits of DSSs can be listed as follows:

i. Improved decision making through better understanding of the business.
ii. An increased number of decision alternatives examined.
iii. The ability to implement ad hoc analysis.

iv. Faster response to expected situations.

v. Improved communication.

vi. More effective teamwork.

vii. Better control.

viii. Time and cost savings.

2.3.1. Components of DSS

A Decision Support System consists of four major components: a database subsystem, a knowledge base, a model base and a user interface.

Database Subsystem

Database is a collection of data organized to serve many applications at the same time and minimize redundancy by storing and managing so that they appear to be in one location. Each and every database is managed by software called Database Management System (DBMS). With the help of DBMS the user can create and maintain a database. DBMS enable individual business applications to extract the data needed without having to create separate files or data definitions in computer programs.

Database Management Systems (DBMS)

DBMS contains programs to store, retrieve and manage database as well as to provide interfaces to application programs and to the users. Functions of DBMS can be listed as follows:

i. Simplify data storage and retrieval

ii. Maintain metadata about the stored data

iii. Reduce, limit and control redundancy of data

iv. Support simultaneous data sharing to ensure consistency

v. Provide backup and recovery services for data integrity after computer failures

vi. Provide authorization and security services to control access to sensitive data

vii. Enforce business rules and data integrity to guarantee consistency among data

viii. Increase programmer productivity

A database management system is composed of three elements: data definition language, data manipulation language and data dictionary.

Data Definition Language is used to create and maintain the data dictionary and define the structure of the files in a database. Data definition language supports the user's ability to define the logical structure or properties of the information while a database is being created for the first time.

Data Manipulation Language is used to add, change and delete information in a database and search for specific information. Data manipulation language includes variety of tool such as views, report generators, query-by-example tools and structured query language (SQL). Most of the commercial database software programs support these tools.

Data Dictionary stores definitions of data elements and data characteristics such as usage, physical representation, ownership, authorization and security.

Database

Database is an organized collection of logically related data. [10] In order to create a database, the relationships among the data, the type of the data that will be maintained in the database and how the data will be used must be well understood. There are several ways of organizing data and representing relationships such as relational data models, hierarchical data models, and network data models. However, most of the commercial database packages employs relational data model.

In relational data model, all data in the database is represented as simple two-dimensional tables. This is called relation. Tables (or files) contain data that constitutes the database like personnel, courses, materials etc... In tables each row represents a unique record, composed of data elements. Data element is the field of a table that represents a specific data about the records. Relational model has the capability of relating data in any file to data in another file as long as both files share a common data element.

Another type of data model is conceptual models. Conceptual models are used in the design of databases and explain how the user perceives the data. Conceptual models benefit from the concepts such as entities, attributes and relationships. Every record in a database represents an entity. An entity is a person, place or occurrence on which we maintain information. A person is a typical entity in personnel table which maintains an organization's information about its personnel. Each characteristic that further describes an entity is called attribute. For example personnel ID, personnel name and personnel's photo are all attributes of the entity personnel. In tables, there should be an attribute that uniquely defines each and every entity. This is especially important issue when there are relationships between tables. The attribute that uniquely identifies each and every entity in a table is called key attribute or primary key. In order to represent a relationship between two tables foreign keys are used. A foreign key is an attribute in a table of database that serves as the primary key of another table in the same database.

A relationship is an association among the instances of one or more entity types that is of interest to the organization. [10] There are three types of relationships:

i. One-to-one (1:1): A department and a chairperson of the department can explain this relationship. A chairperson can manage one department and the department has only one chairperson.
ii. One-to-many (1:M): A department and a faculty can explain this type of relationship. There are several departments in a faculty but a department is included by only one faculty.

iii. Many-to-many (M:M): A studio and an ETV program can explain this type of relationship. A studio can be assigned to many ETV projects, and many studios can be used for an ETV program.

However, many-to-many relationships are not desired in designing database. Since it creates repeating groups, violating integrity of the database. Repeating groups are fields of information that appear more than once in a table. Such relationships should be removed from the database during logical database design phase of the database design explained in Section 2.4.3.

Advantages of the database can be listed as follows:

i. Program-data independency
ii. Minimal data redundancy
iii. Improved data consistency
iv. Improved data sharing
v. Increased productivity of application development
vi. Enforcement of standards
vii. Improved data quality
viii. Improved data accessibility and responsiveness
ix. Reduced program maintenance

Costs and risks of the database is as follows:

i. New, specialized personnel
ii. Installation and management cost and complexity
iii. Conversion costs
iv. Need for explicit backup and recovery
v. Organizational conflict

Knowledge base

Knowledge base consists of specific facts, rules of thumb, relationships, historical scenarios and other information that an expert knows and might use to solve problems in a particular area. It provides information about the relationships among data that are too complex for a database to represent. It contains rules that can constrain possible solutions as well as alternative solutions and methods for evaluating them.

Model base

Model base includes spreadsheets, simulation packages, forecasting tools and statistical packages. In model base, the user has the opportunity of selecting appropriate tool without developing a new model each time she uses the model base.

One of the most important aspects that must be understood dealing with the model base is that the user should take into account the limitations and the assumptions of the model in use while benefiting from the model base. By this way the user can use the model base more effectively.

User interface

The user interface allows the DSS to be questioned by the user. The objective of the user interface is to be as user-friendly as possible and let the user inter-relate with the DSS. The emphasis should be on creating a clear communication channel with the user and DSS while designing user interface.

The user interface composed of hardware and software. While designing user interface the factors that ease of use, accessibility and human-machine interactions must be taken into account.

The structure of DSS database can be seen in Figure 2-3.

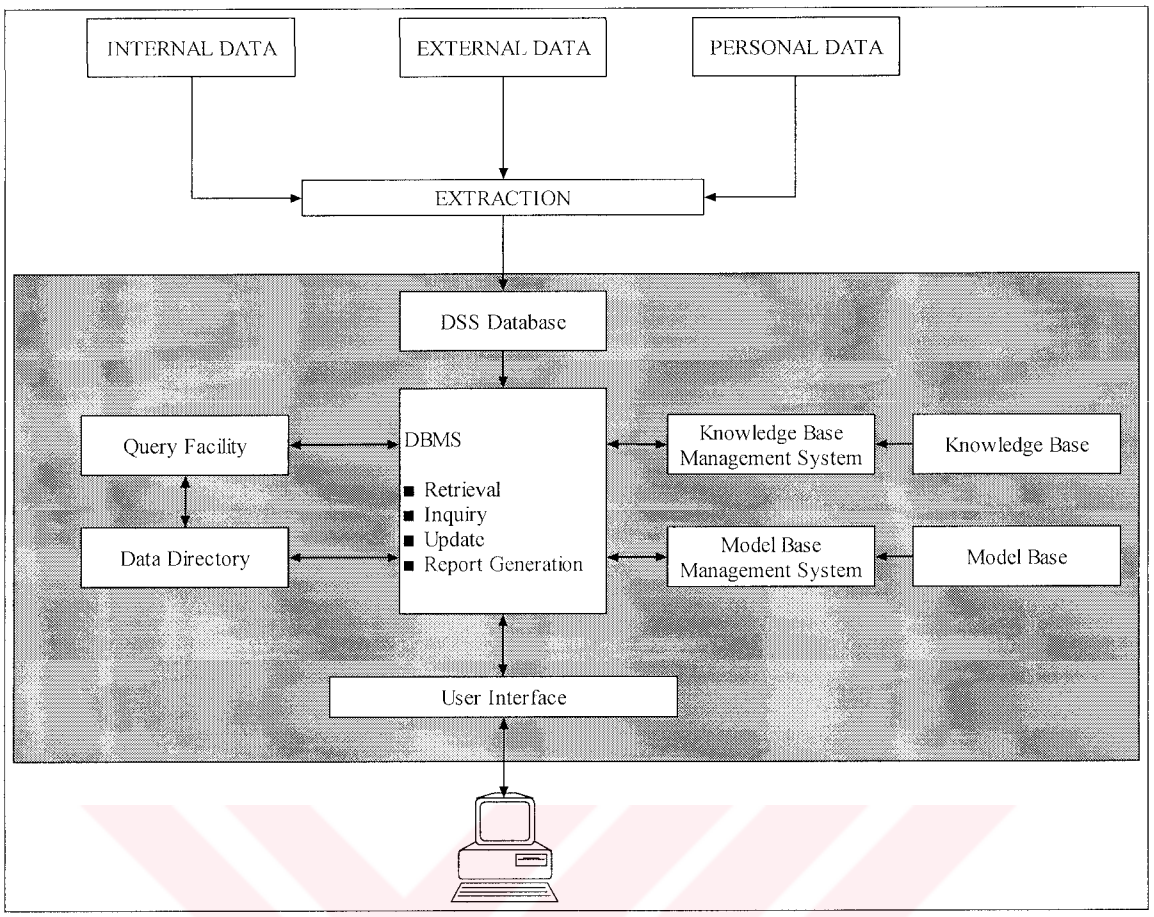


Figure 2-3 Structure of a typical DSS (Adapted from [11])

2.4. Database Development Process

2.4.1. Enterprise Modeling

In this phase of development process, the scope and general contents of organizational databases are specified. Also in this step, current databases and information systems in use are reviewed and the scope of all organizational data is outlined. The data needed for each information system under consideration for development are described. Finally, on the order of importance database development projects are selected and move into next phase, conceptual data modeling.

2.4.2. Conceptual Data Modeling

In conceptual data modeling, the overall data requirements of the proposed information system are analyzed. This is done in two stages. In first step, by using entity-relationship diagrams and other documentations, the scope of data involved in a particular database development project is determined. Next step consists of production of detailed conceptual model, including all entities, relationships, attributes and business rules. However, after all these steps the conceptual data model is still in its preliminary mode, since in later steps of database development process the programmer may find missing elements or errors. In spite of this, resultant conceptual schema is a very useful tool to verify whether all the identified functional requirements are met.

2.4.3. Logical Database Design

In this step, conceptual data model is transformed into relations. Then a detailed review of transactions, reports, displays, and queries planned to be supported by the database being designed is made.

After this overall review, each and every transaction and report should be reviewed in more detail. In this phase, the conceptual model may subject to change as needed. As the conceptual model changes, logical model is modified to ensure that all the revisions in conceptual model are included in logical model.

The final step of logical database design is to transform all the data specifications into basic elements. The rules of this step come from a process called normalization. Normalization is the process of decomposing relations with anomalies to produce smaller, well-structured relations. Well-structured relations contain minimal redundancy and allow users to insert, modify, and delete records in a relation without errors or inconsistencies.

2.4.4. Physical Database Design

In this phase, the organization of the database in computer storage and the physical structure of the DBMS are designed. The goal is to design a database that will efficiently and securely handle all data processing. During physical database design phase, all the physical infrastructure like programs, computer hardware, operating systems and data communication networks of the organization must be taken into account.

2.4.5. Database Implementation

In database implementation, logical model is turned into a program by using programming languages or commercial database packages. Database documentation, user trainings and the loading of data from existing information sources are also made during implementation phase.

2.4.6. Database Maintenance

In database maintenance, evolution of database is made. Additions, deletions and changes in the characteristics of the structure of a database to meet new demands and correction of errors are all operations contained by the database maintenance. It lasts throughout the life of the database. Conceptual and logical models of the database should be reviewed at each time the database evolves.

CHAPTER 3

COURSE DESIGN IN DISTANCE EDUCATION

Distance education offers a growing potential for the education of masses. It can be defined as process of teaching and learning in which the learner is physically separated from the teacher. Even in the most of the distance education applications, there are physical interaction between teacher and learner, however the actual amount of face-to-face contact is very small compared to normal classroom education. Thus the learning materials used to convey knowledge, skills and attitudes to the learner must be specially designed to allow learners to study by themselves. The existence of such technical media is a characteristic aspect of distance education. Furthermore, there are arrangements to test learners' knowledge, skills, and attitudes through assignments. This two-way communication differentiates distance education from teach-yourself programs and private study.

The distance education system is composed of mainly two subsystems: *materials subsystem* and *the student subsystem*. The materials subsystem involves the design, production and the delivery of course materials needed to support pre-defined curriculum. The design process includes curriculum planning, the selection of media, the writing of texts and scripts, the development of audio-visual materials, the design of computer-based learning systems and the development of assessment materials. The output of the design process is the master copy of each item. In the process of production, multiple copies of each material are duplicated from the master copies. The

physical distribution of these copies via post, broadcasting or electronic transfer constitutes the distribution phase.

The second main subsystem is the student subsystem which recruits, enrolls students, registers them on programs of their choice, collects fees and other payments like examination fees.

There are two more subsystems in distance education system: *the logistics subsystem* covers the personnel, assets and buildings, maintenance, purchasing and finance functions. *The regulatory subsystem* can be thought of as the feedback mechanism of the distance education system that is responsible for the planning and the managing of the overall system. It interrelates operating activities, and the activities of the organization as a whole to its environment. Figure 3-1 shows the distance learning system as a whole.

The scope of this study is restricted to materials subsystem; and henceforth the course delivery materials will be the primary concern.

Today the variety of the alternatives for the delivery of distance education course materials has been increasing enormously. Among the alternatives, textbooks, audio-visual materials, and face-to-face tuition could be classified as classical tools. However, with the help of improved technology, there are newly developed ones like videoconferencing, computer conferencing, computer assisted education materials and delivery of courses via the Internet. No institution uses only one alternative mentioned above to deliver its course(s). Generally, distance education institutions make use of these alternatives' in different mixtures suitable for them from the economical, technological, demographical and geographical points of view.

Since its target group is huge and scattered all over the country, Anadolu University Open Education Faculty employs generally asynchronous technologies like textbooks, computer instructed education materials and educational TV programs. One of the most important factors for employing asynchronous technologies is the absence of familiarity

of most of the students with new technologies used to benefit from synchronous course delivery tools. Another one is income level of target group; in line with the country's income pattern, these technologies are too expensive for the students to afford. To support these asynchronous technologies and promote the understanding of concepts in courses, face-to-face tuition is used by the Open Education Faculty for specific courses.

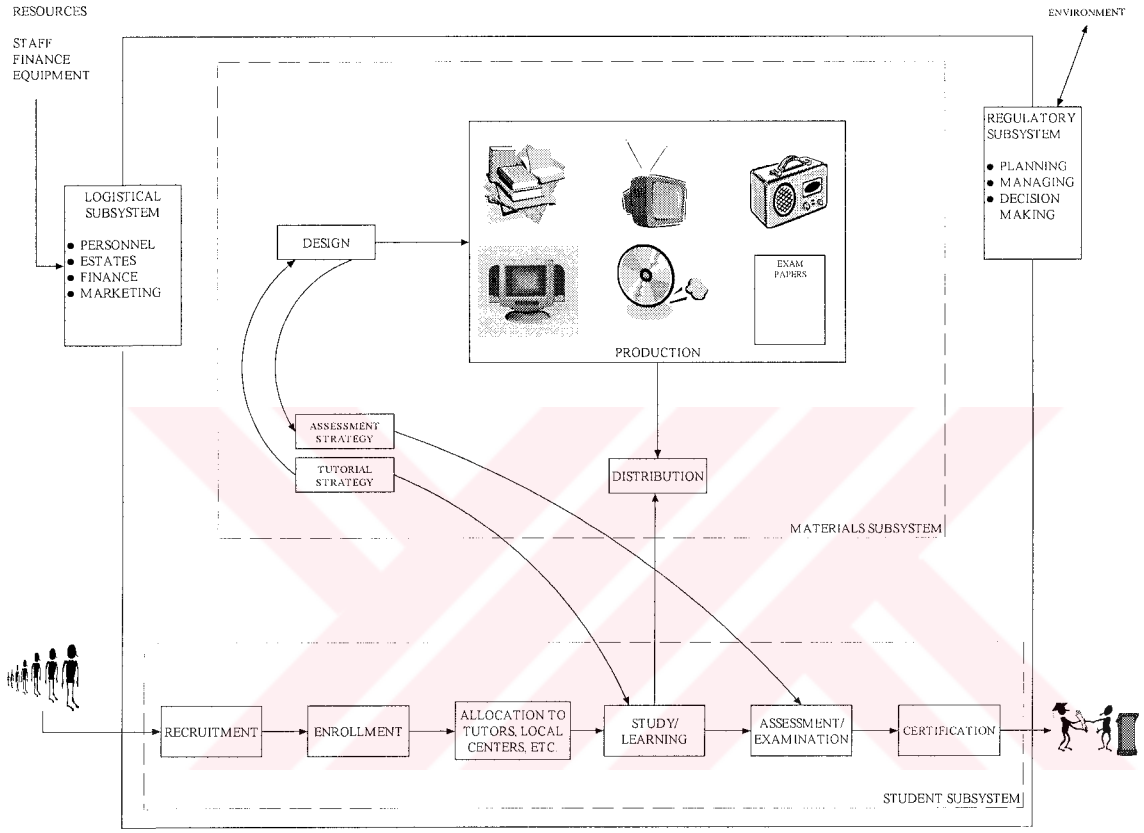


Figure 3-1 A systems view of distance education (adapted from [14])

3.1. Instructional Development Process

Instructional development provides a process and framework for systematic planning, developing, and adopting instruction based on special learner needs and content requirements. This process is essential in distance education, where the instructor and students may share limited common background and typically have minimal face-to-face contact. Although there are many instructional development

models and processes, the majority follows the same basic stages of design, development, evaluation, and revision as can be seen in Figure 3-2.

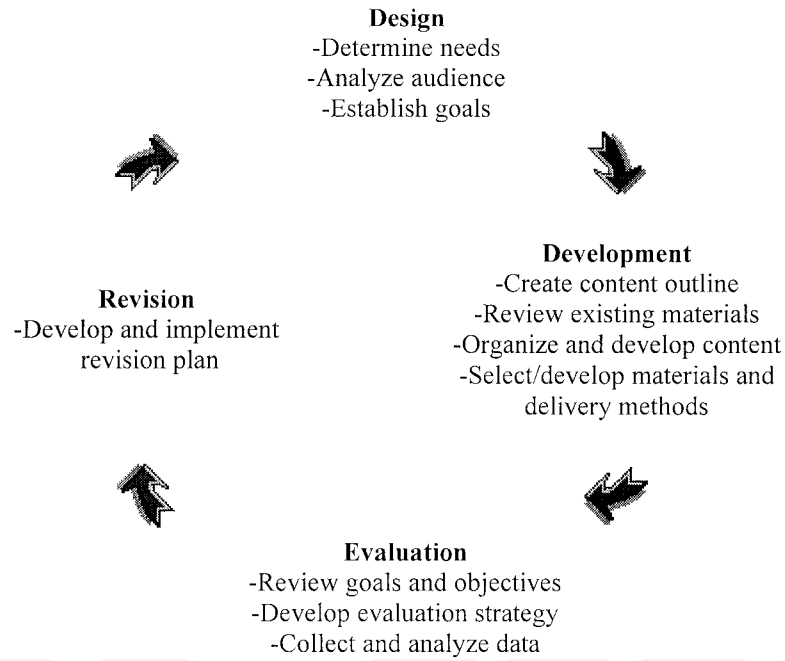


Figure 3-2 The Instructional Development Process

3.1.1. Design

i. Determine the needs for instruction: To begin, determine the need for instruction by considering what external data verify the need, what factors led to the instructional need, and what past experiences indicate that the instruction being planned can effectively meet this need.

ii. Analyze your audience: In order to better understand the distant learners and their needs, their ages, cultural backgrounds, past experiences, interests and educational levels should be considered. The evaluation of their familiarity with the various instructional methods and delivery systems being considered, the determination of how they will use the knowledge gained in the course, and understanding whether the class will consist of a broad mix of students with different characteristics (e.g. urban/rural,) are important issues. If possible, the instructor should visit the distant places and

interview the potential students, both individually and in small groups. Colleagues who have worked with the target population can also offer recommendation.

iii. Establish instructional goals/objectives: In the last step of the design stage, based on the nature of the problem as well as student needs and characteristics, instructional goals and objectives should be established. Goals are broad statements of instructional purpose, while objectives are specific steps leading to goal achievement.

3.1.2. Development

Development stage consists of four steps, explained as follows:

i. Create a content outline: Based on the instructional problems, the audience analysis, instructional goals and objectives, and an understanding of the desired course content, an outline of the content to be covered is created.

ii. Review the existing materials: Next, the instructor should review existing materials. Instructional materials should not be used solely because they are readily available or have been effective in a traditional classroom setting. This is especially true if pre-packaged materials, such as telecourses are being considered. Although many pre-packaged instructional tools are developed and marketed to reach students with similar backgrounds and experiences, they may have little relevance for distant learners who come to the course with widely varied backgrounds. If pre-packaged materials are to be used, they should be supported via well-developed introductions, conclusions, and summaries that specifically relate the learning materials to the instructional context of the student.

iii. Organize and develop the content: Perhaps the greatest difficulty facing the distance educator is creating student-relevant examples. The course content is taught using examples that relate the content to a context understood by the students. The examples should allow learners to focus on the content being presented. If the examples are irrelevant, learning is not achieved. This is a special challenge in rural and

multicultural settings where the teacher's area of experience and related content examples may be foreign to distant learners. In order to overcome this problem, discussions of potential content examples with a sampling of the target audience may be helpful.

iv. Select/develop materials and methods: The development of instructional materials and selection of delivery methods will often require integration of print, voice, video, and data technology in line with face-to-face communication. The problem here is to integrate delivery materials, based on particular learner needs, content requirements, and technical constraints. If a delivery technology planned to be used is unavailable to some class members, use of this technology would be inappropriate. The delivery systems must be available to all distant learners.

3.1.3. Evaluation

i. Review goals and objectives: One purpose of evaluation is to determine whether the instructional methods and materials are accomplishing the defined goals and objectives. The implementation of instruction represents the first real test of what has been developed. The prepared materials should be tested on a small scale before implementation. If this is not possible, the first actual use of the materials will also serve as the "field test" for determining effectiveness.

ii. Develop an evaluation strategy: After the goals and objectives are reviewed, the strategy for how and when to evaluate the effectiveness of the instruction should be developed. *Formative evaluation* can be used to revise instruction as the course is being developed and implemented. *Summative evaluation* is conducted after instruction is completed and provides a database for course revision and future planning. Within the context of formative and summative evaluation, data are collected through *quantitative* and *qualitative* methods. Quantitative evaluation relies on a breadth of response. In contrast, qualitative evaluation focuses on a depth of response, using more subjective methods such as interviews and observation to query a smaller number of respondents in greater depth. Qualitative approaches may be of special value because the diversity of

distant learners may not allow the analyst to reveal some facts about the course material and delivery technologies that cannot be determined via quantitative techniques. The best approach often consists of the combination of quantitative and qualitative approaches to assess different aspects of the course's effectiveness and the delivery technology.

iii. Collect and analyze the evaluation data: Following implementation of the course and its materials, the data for evaluation should be collected. Careful analysis of these results will identify gaps or weaknesses in the instructional process. It is equally important to identify strengths and successes. The results will provide a basis to develop the revision plan.

3.1.4. Revision

There is an opportunity for improvement even in the most carefully developed distance education course. In fact, there will likely be more confidence in a course that has been significantly revised than in one considered perfect the first time through. The revision plans are typically a direct result of the evaluation process. The best source of revision ideas may be the instructor's own critics on course strengths and weaknesses. For this reason, the revision stage should be planned as soon as possible after course completion. Often, the course revisions will be minor, such as breaking a large instructional unit into more manageable components. On the other occasions, major revisions will be needed. Significant course changes should be tested prior to future course use.

3.2. Course Delivery Materials

In the subsequent sections, technologies used for the delivery of courses by Open Education Faculty are explained.

3.2.1. Printed Materials

As almost all distance education institutions; Open Education Faculty make use of printed materials as textbooks for the delivery of the courses offered. Until the beginning of the 1970s and the initiation of two-way telecommunications technologies, printed materials were the major delivery medium for distance education. Correspondence study relied primarily on print to mediate the communication between the instructor and the learner. Currently many distance education institutions in developing countries use print based correspondence study as the main distance education medium since the use of communications technologies is often cost-prohibitive. Print based distance education is treated as the first generation of distance education technology. It is characterized by the mass production of educational materials and described as an industrial form of education. The difficulty with correspondence education has been the infrequent and inefficient form of communication between the instructor and the students. The developments of broadcast technologies and two-way interactive media have mitigated the limitations of correspondence study, especially in relation to facilitating two-way communication. However, print remains a very important support medium for electronically delivered distance education.

Print has always been the dominant medium in distance education and will continue to be the most-used form of delivery in the near future. It is the most convenient and flexible medium for the presentation of new information and ideas and can be used by students selectively and at their own pace.

Advantages and Disadvantages of the Printed Materials

Print has many advantages as an instructional medium. It is familiar, inexpensive, and portable. Its format allows readers access any section, in any order, for any length of time. It is the only medium that can be utilized without additional equipment, anytime and anywhere as long as a source of light is available.

One disadvantage of print is that it can give only a limited experience of reality, and some parts of reality are not easily conveyed in writing, such as taste and smell. But

these are also limitations of audiovisual media. Most audio and visual experiences can be described in print by reducing a large number of stimuli to a few essential observations. However, if the readers do not have the necessary experiences to figure out concrete illustrations or reality-based arguments offered by the author, they may have difficulty in learning. If their proficiency in written language is low, they may find learning by print difficult if not impossible [15]. In fact, print-only correspondence study appears to have considerably higher dropout rates than telecourse study using both television and print. In telecourses, as in most distance education, print delivers most of the instructional content. The television might be considered a pacing device, a motivator, or a medium appealing to learning styles different from those reached best by print.

The speed of interaction is another difficulty with print instruction at a distance. Adults want to know how they are doing in their studies, but by the time they receive feedback in a print-only format, they may already have lost interest in the answer, as they move on to another topic or drop the course entirely. All of the other media used in distance education may be employed in combination with print to overcome the problems of using print alone.

Many of the high-technology media and combinations of media recently developed are presented as solutions to the boredom of print-based instruction, and yet many are electronically print based themselves and others often leave most of the teaching to the print with which they are combined. The computer is a good example. Computers in many ways simulate the text or the physical operations one performs while using text. Through combination with and incorporation into other media, print will probably remain the dominant medium of distance instruction for a long time to come.

3.2.2. Audio-visual Materials

The second media used by Anadolu University Open Education Faculty to deliver distance education course is audio-visual materials. In recent years, the use of audio materials has been diminishing whereas educational TV programs have still much

importance as a delivery medium. For the delivery of these materials TRT's radio and television broadcast infrastructure is used. Audio-visual materials are also in sale in cassettes. Here are some facts about audio-visual materials:

i. Television and radio broadcast do not provide real time two-way interaction between teachers and students. These media however can be used to instruct a vast number of students at the same time even though the students do not have the ability to call back and clarify a statement or ask a question in real time. Many distance education institutions in developing countries as well as institutions in developed countries such as the British Open University, use broadcast television and radio extensively to deliver programming to a large number of distant learners.

ii. As in the case of Open Education Faculty, most of the distance education institutions make arrangements with the Public Broadcasting Service and/or a commercial television station to distribute the educational programming. One of the limitations of this type of distribution is that educational programming is confined to broadcast schedules predetermined by the broadcasting station, which may not be times convenient for students taking the course.

iii. Both radio and educational TV broadcasts are transient, cannot be reviewed, are uninterruptible, and are presented at the same pace for all students. A student cannot reflect upon an idea or pursue a line of thought during a fast paced program, without losing the thread of the program itself. A student cannot go over the same material several times until it is understood. Access to a videotape of the broadcast, however, will overcome these problems by giving the learner control over the medium with the ability to stop and rewind sections that were not clear.

iv. Despite its ability to reach a large section of the student population, open-broadcast television is a one-way communication medium. It does not provide two-way communication between the student and the teacher and lacks ability to respond to student feedback. However, live broadcasts supported with the telephone may be

used to overcome this problem. Recently live broadcasts have started to be used especially during examination periods at Open Education Faculty.

Advantages of Educational TV

i. Since most people watch television, the medium is familiar.
ii. Motion and visuals can be combined in a single format so that complex or abstract concepts can be illustrated through visual simulation.
iii. Instructional television is an effective way to take students to new environments (the moon, a foreign country, or through the lens of a microscope).
iv. Time and space can be collapsed, so that events can be captured and relayed as they happen.
v. It is very effective for introducing, summarizing, and reviewing concepts.
vi. It can effectively be used as a motivational tool.

Limitations of Educational TV

i. Broadcast quality ETV is expensive to create.
ii. Video production is time consuming and can be technically demanding, often requiring relatively sophisticated production facilities and equipment.
iii. Sites choosing to interactively participate in an ETV program may require specialized equipment, facilities, and staffing.
iv. Most prepackaged ETV courses use a mass media approach to instruction aimed at the average student. As a result, they can be ineffective in serving students with special needs.
v. When used passively, without interaction, its instructional effectiveness can be limited.
vi. Unless professionally produced, completed ETV programs often look amateurish.
vii. Once completed, ETV programs can be difficult to revise and update. [16]

3.2.3. Face-to-Face Lecturing

In order to overcome the sufferings caused by the use of asynchronous technologies like printed materials and educational radio and TV programs, face-to-face tuition and computer instructed education materials are employed.

Face-to-face tuition is used as either as purely instructional element, or a motivational tool encouraging course completion or both. The occurrence of these face-to-face sessions is dependent on the possibility, opportunity and tendency of students to participate these sessions. Some of the distance education institutions build local study centers, while the others use local institutions' facilities to handle face-to-face tuitions; as in the case of Open Education Faculty.

Generally, the use of face-to-face tuitions is not based on rational decisions. However, negative opinions of the population about distant teaching and to make distant students feel like they have no difference with the traditional setting students, force institutions to arrange these classrooms [18].

With the use of face-to-face tuitions following objectives are aimed:

i. Subject matter learning
ii. Practicing psychomotor skills
iii. Facilitating the understanding of the communication process and human behavior
iv. Encouraging attitudes and habits of relevance for the study
v. Mutual inspiration and stimulation of fellow students.

The attitudes of the students towards face-to-face tuition is fell into two categories: The first group tends to prefer studying entirely at their own pace and do not want to adopt any time schedule or join any meeting or tutorial. The second group is completely on the other side; they think that face-to-face sessions are useful for themselves [18].

One important thing concerning the combination of distance teaching and face-to-face sessions is that the actual teaching should be accomplished by the distance course. The instructor in face-to-face sessions should not be thought as the teacher, he is only the leader of supplementary oral class. The "facilitator" should not allow the students to misuse her by explaining complete content of the pre-prepared distance education materials.

3.2.4. Computer Instructed Education Materials

The second media used to provide interaction is computer instructed education materials. Personal computers are not new as technology but they are rapidly evolving into new areas. During the past decade, PC's have been used in education to run tutorials and teach students to use applications such as word processing, database management, and spreadsheets. In education, multimedia has come to mean the integrated use, in a computer-based system, of digitized text, audio, graphics, animation, and video to present elements of course content. These elements can be presented in many different ways, allowing students to choose their own path through the courseware through keyboard or mouse interactions. Developing good multimedia courseware is a highly skilled task requiring knowledge of the subject matter, instructional design skills, and familiarity with the authoring software. Multimedia courseware may be presented on a CD-ROM for use on a stand-alone personal computer or over the WWW through networked computer terminals. The current versions of CD-ROMs hold about 650 MB of digitized information. Most multimedia applications are CD-ROM-based as in the case of Open Education Faculty since video, audio, and graphic files require enormous amounts of storage space.

Students in developing countries with limited assets may have very little access to these technologies and thus fall further behind in terms of information infrastructure. Open Education Faculty tries to overcome this problem by building computer laboratories intended to serve computing needs of the distant-learners. Networks have the potential of providing a broad knowledge base to people around the world, and will

offer opportunities for expanded applications of distance education. Computer applications for distance education fall into four broad categories:

i. *Computer Assisted Instruction (CAI)* uses the computer as a self-contained teaching machine to present discrete lessons to achieve specific but limited educational objectives. There are several CAI modes, including: drill and practice, tutorial, simulations and games, and problem solving.

ii. *Computer Managed Instruction (CMI)* uses the computer's branching, storage, and retrieval capabilities to organize instruction and track student records and progress. The instruction need not be delivered via computer, although often CAI (the instructional component) is combined with CMI.

iii. *Computer Mediated Communication (CMC)* describes computer applications that facilitate communication. Examples include electronic mail, computer conferencing, and electronic bulletin boards.

iv. *Computer-Based Multimedia* HyperCard, hypermedia, and a still-developing generation of powerful, sophisticated, and flexible computing tools have attracted the attention of distance educators in recent years. The goal of computer-based multimedia is to integrate various voice, video, and computer technologies into a single, easily accessible delivery system.

The use of computers as an instructional tool in Open Education Faculty has started with the development of the computer instructed education softwares that are available for the students in computer laboratories located all over the country, especially big cities. These softwares have been developed by Computer Assisted Education Unit (CAEU), a branch in Open Education Faculty. Afterwards, as the accessibility of students to the computer technologies increases, CAEU has started to adopt these softwares to Computer-Based Multimedia tools by enriching them using animations,

graphics and videos that come from previously produced ETV programs and deliver them to students in CD-ROMs.

Theoretically, every Open Education Faculty student has an e-mail account provided by the Anadolu University. Additionally, there are discussion and news groups designed for the distant-learners of the university. These are the opportunities offered to the students to communicate among themselves, using computer and networking technology. However, because of limited access of students to the Internet, these groups are underutilized. In spite of this, utilization of these services is increasing by gradually.

Advantages of Computers

i. Computers can facilitate self-paced learning. In the CAI mode, for example, computers individualize learning, while giving immediate reinforcement and feedback.
ii. Computers provide multimedia tool. With integrated graphic, print, audio, and video capabilities, computers can effectively link various technologies. Interactive video and CD-ROM technologies can be incorporated into computer-based instructional units, lessons, and learning environments.
iii. Computers are interactive. Microcomputer systems incorporating various software packages are extremely flexible and maximize learner control.
iv. Computer technology is rapidly advancing. Innovations are constantly emerging, while related costs drop. By understanding their present needs and future technical requirements, the cost-conscious educator can effectively navigate through the volatile computer hardware and software market.
v. Computers increase access. Local, regional, and national networks link resources and individuals, wherever they might be. In fact, many institutions now offer complete undergraduate and graduate programs relying almost exclusively on computer-based resources [16].

Limitations of Computers

i. Computer networks are costly to develop. Although individual computers are relatively inexpensive and the computer hardware and software market is very competitive, it is still costly to develop instructional networks and purchase the system software to run them.

ii. The technology is changing rapidly. Computer technology evolves so quickly that the distant educator focused solely on innovation "not meeting tangible needs" will constantly change equipment in an effort to keep pace with the "latest" technical advancements.

iii. Widespread computer illiteracy still exists. While computers have been widely used since the 1960's, there are many who do not have access to computers or computer networks.

iv. Students must be highly motivated and proficient in computer operation before they can successfully function in a computer-based distance-learning environment [16].

3.2.5. Measurement and Assessment Materials

When the assessment and measurement of what distant learners learn from the courses come to the picture, there are very few alternatives for the Open Education Faculty, because of the huge number of students. On small-scale open education institutions, teachers interact with students by assigning them written and oral tasks, and essay type examinations. However, as the assessment and measurement of mass populations is the concern, there is no alternative but the multiple-choice examinations. Here are some facts about multiple-choice format.

The multiple-choice format is one of the most popular item formats used in educational testing. This format is more appropriate for testing lower cognitive skills and assumed to be unable to measure skills assessed by the essay. The multiple-choice format does have distinct limitations but on the other hand; effectively constructed multiple-choice exams also have significant advantages.

Advantages of Multiple-choice Exams:

i. Multiple-choice exams allow a more adequate sampling of content
ii. Multiple-choice exams tend to structure the problem to be addressed more effectively.
iii. Multiple-choice exams can be effectively scored
iv. Responses to Multiple-choice exams are objectively scored.

Limitations of Multiple-choice Exams

i. Multiple-choice exams are somewhat susceptible to guessing.
ii. Multiple-choice exams usually must indirectly measure higher cognitive skills.
iii. Multiple-choice exams are time consuming to construct.

CHAPTER 4

COURSE DESIGN IN ANADOLU UNIVERSITY

In this chapter, the system used for the production of distance education course materials is presented. Then the problems in costing are introduced. Before going deeper into these, organizational structure of the open education system in Anadolu University is presented in Section 4.1.

4.1. Organizational Structure

Prior to year 1993, all departments that offer degrees via using distance education techniques were organized under Open Education Faculty in Anadolu University. By the year 1993, Faculty of Economics and Faculty of Business Administration were established in addition to Open Education Faculty. In this new organizational structure two functions are assigned to the Open Education Faculty. First is the educational function of conducting two-year associate degree programs, degree completion programs and certificate programs. Second is the tasks of student administration, course book design and printing, production of radio and TV programs, data processing services, academic counseling activities and the student examinations of the whole system [7].

4.1.1. Open Education Faculty

Open Education Faculty conducts two-year associate degree programs, degree completion programs and certificate programs. This faculty has a special status among the three faculties that constitute the Distance Education System of Anadolu University because the tasks of student administration, course books printing, production of radio and TV programs, data processing services, academic counseling activities and the student examinations are assigned to this faculty. In another words Open Education Faculty has the responsibility of providing services to the system whereas the other faculties have only academic functions.

There are five academic departments in Open Education Faculty; Department of Distance Education, Department of Continuing Education, Department of Economics and Administrative Sciences, West European Programs and Department of Health Programs. Department of Distance Education is established in order to offer graduate study in the field of open and distance learning. The rest are active in offering associate degree study in vocational school status. Department of Continuing Education designs and administers continuing education programs to students coming from various backgrounds. The Department of Economics and Administrative Sciences, was established in 1992 and continue to offer associate degree programs on 12 fields. The Department of Health Programs is first established in 1990. Currently there are three fields in this program. Starting from 1999-2000 year no students are being admitted to the program. West European Programs are started at 1987-1988 academic year. These programs are intended to offer associate and BA degrees in various programs to Turkish citizens living in Europe. Various certificate and degree completion programs are being conducted in the Department of Continuing Education. One of them is Education Associate Degree Program; established in 1985-1986 academic year to provide associate degree study for the primary school teachers who are the graduates of teacher schools. Approximately 135.000 primary school teachers graduated from the program receiving associate degrees. Degree Completion Program was established in 1990 academic year to provide bachelor degree for the high school teachers who are the graduates of Education Institutes. Starting from 1997-1998 academic year a degree completion

program directed to the primary school teachers having associate degrees. Agriculture and Veterinarian Programs are developed to provide associate degree study to the technicians employed at the Ministry of Agriculture.

4.1.2. Other Faculties

These faculties started education at the 1993-1994 academic year. Each conducts four different four-year programs leading to a BA degree in various fields.

4.2. Course Materials Design Process

For the planning of a more reliable and effective media, and for the purpose of meeting the expectations of a changing student profile, all materials used to deliver courses to distant students are prepared under the management and coordination of "Distance Education Design Unit" (DEDU). A group of experts in their fields in this unit has begun to act to reform delivery technologies. In the first stage, DEDU aims at determining all knowledge that the students are supposed to gain. In accordance with this decision, DEDU first settles the order of information and then decides the means of tools it will be presented. In the next stage, the established content is transformed teaching material (books, television programs, web page etc.). The products which the students have not received yet, and are still in progress, are planned to be presented to the learners in subsequent years. During this process, a media production director (MPD) is generally responsible for media conception, planning and development. The MPD, who receives academic counseling during the production process, evaluates the produced material together with Project Coordinator and the Teaching Conception Directory, and if necessary, offers modification for the materials. The studies of this group cover all the projects at the Open Education Faculty.

The distance education system at Anadolu University provides study opportunity via various components. Main elements of the system are introduced as follows:

4.2.1. Printed Materials

As a common characteristic of almost all distance education institutions, the primary element of the open education system is the printed materials. Textbooks designed to provide self-learning are prepared by the academicians of Anadolu University and other universities in coordination with DEDU. Currently there are about 400 books used at three faculties and other programs. Books are sent to the students at the beginning of each academic year. Total number of books printed at the beginning of 2000-2001 academic year is around 2,5 million copies. Anadolu University has printing capacity to satisfy all of the university's printing requirements. Distance education course materials, bulletins, and test booklets are printed in the university facilities. The most important education medium is the printed material at the open education system of Anadolu University.

Course Book Design Process

Course book design process starts with the construction of Course Design Team. Team is composed of following people:

i. General Coordinator
ii. Vice General Coordinator
iii. Project Manager
iv. Instructional Designer
v. Graphics Design Manager
vi. ETV Coordinator
vii. Computer Instructed Education Coordinator

The main responsibility of this team is the determination of course identity. Determination of the course identity is the process of determination of the position of course in the curriculum, how the subjects are presented in the content of course and how each instructional media is used. According to decisions made in this process, sample materials are produced. The outputs of the process are a sample unit, a sample ETV program and a sample computer instructed education program.

The general coordinator then determines the subject writers who write the texts of the course book with the help of field editor. Preparation of questions about topics covered in chapter is another responsibility of the subject writers. As the chapters are submitted to the field editors, field editors process these "crude" texts according to course book identity defined in sample unit. In this process, field editor works together with language expert(s) and Measurement-Assessment Unit. Processed chapters are submitted to Vice General Coordinator with all visual materials (pictures, photos, drawings, illustrations etc.) used in chapter. The output of this work is processed chapter(s).

In the next step, Vice General Coordinator send the processed chapters to Open Education Faculty Typesetting Unit. Before this, processed chapters are checked and corrected according to grammatical rules by language advisors and question structures are checked by Test Research Center to verify the appropriateness to open education examination system; as well as according to chapter objectives. After these corrections, chapters are sent to field editors for the approval. Chapters approved by the field editors are sent to Typesetting Unit. Typesetting Unit works in coordination with Graphics Design Manager to produce visual materials included in chapter(s). Finally all materials are built up to produce the chapter of the book. The output of this process is the approved chapter that could be sent to typesetting. If necessary, Vice General Coordinator sends a copy of processed chapter to ETV Coordinator and Computer Assisted Education Coordinator for review.

In the fourth step, Open Education Faculty Typesetting Unit prepares page setup of the chapter according to design standards determined by Graphics Design Manager. The output of the process is completed chapter.

In the fifth step, Vice General Coordinator sends completed chapter to field editor for approval of the completed chapter for print. If there is no typographic error, field editor approves the chapter to print. If there are typographic errors, field editor sends

chapter back to Vice General Coordinator to convey to typesetting. This process is repeated until the chapter is granted the approval of field editor.

Chapters approved for printing are collected by the Book Coordination Unit. After collection of all chapters of the book by the Book Coordination Unit, Vice General Coordinator instructs Graphics Design Manager to design inner and outer covers, table of contents and index, as well as instructions for the learners. The output is the finished book. Finished book is reproduced and send to Open Education Faculty, General Coordinator and Graphics Design Managers in CD form to obtain their final approval before printing. This is called the master copy of the course book. When master copies are ready, course book design process is complete. Process flow chart for the course book design process can be seen in Figure 4-1. The next step is the reproduction from master copies, that is the course book printing process, which is explained in the subsequent section.

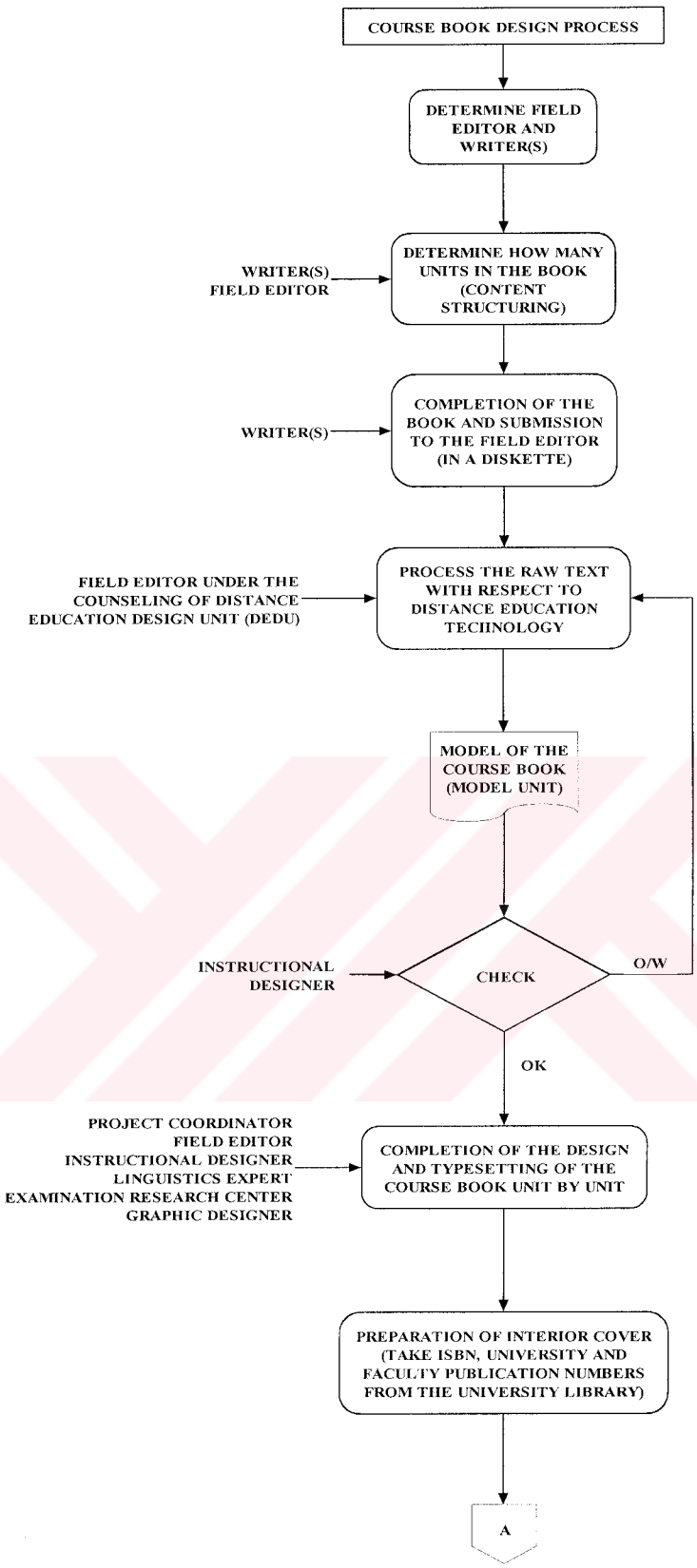


Figure 4-1 Process Flow Chart for Course Book Design Process

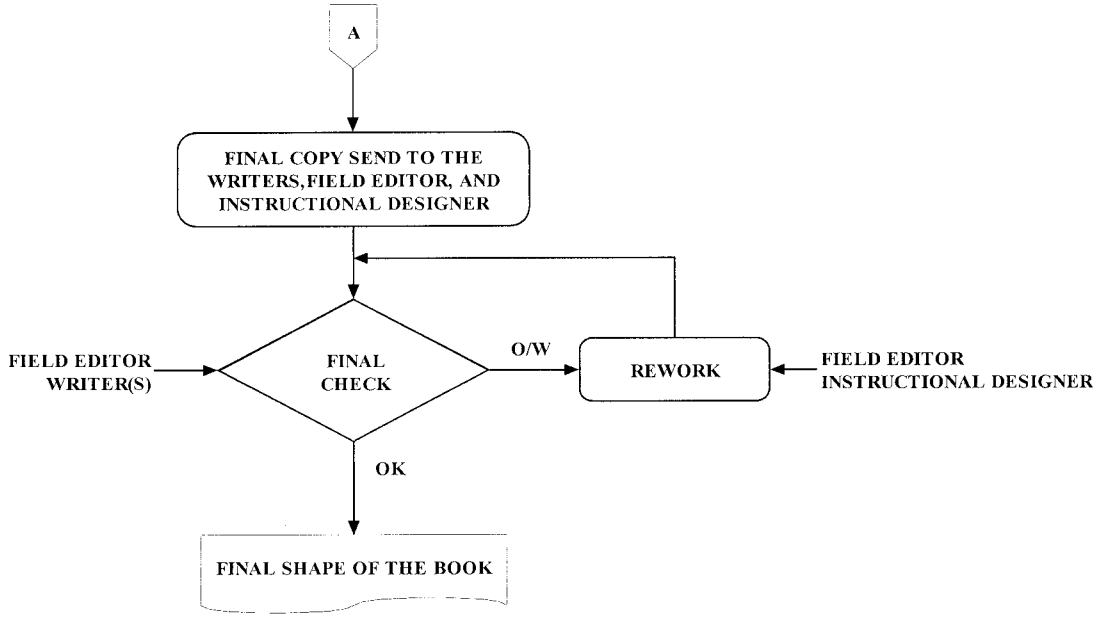


Figure 4-1 (Continued) Process Flow Chart for Course Book Design Process

Course Book Printing Process

Course book printing process starts with the arrival of master copy's laser printouts to the university's printing press. Another information necessary to start printing is the number of copies to be produced. Both of this information is provided by DEDU.

Number of copies of the laser outputs sent is determined according to book settings. If the book is black-white or includes colorful pictures, one copy of laser printout is sent. If book is composed of black-white scripts and single-colored spots, two copies of printouts are sent. One of the copies includes scripts, while the other contain single-colored spots for each page.

Printing press starts its job by taking the film of each page that constitutes the book. If the book is colorful, each page containing colorful pages is decomposed into its main colors (yellow, blue and red; and black for shadings). For the scripts a separate set of films is used, independent of the color structure of the book. The output of this process

is five films for each page for colorful books, two films for books that have single-colored spots and black- white scripts, and one film for each page for books designed in black-white. Films are also produced for the outer cover of the book, according to its color structure.

In the next step, produced films are combined to provide a basis for the production of printing patterns. Each combined sheet contains 8 sheets of film. This process will continue until all the films are combined. The output of this process is five batches of sheets for colorful books, two batches of sheets for books that have single-colored spots and black- white scripts, and a batch of sheets for books designed in black-white. These sheet batches are then used to produce lead printing patterns. Of course, as in the production of films and sheets, another set of patterns are produced for each color. Same is true for outer cover.

Once pattern sets are produced, these are placed into web-offset press units. Web-offset press units have a capacity for ten patterns at a time. Patterns are placed as to print one quire at a time. A quire is composed of sixteen pages for colorful books, while for the rest the number of pages in a quire is thirty-two.

After the completion of the production of all quires, they are combined to compose books and outer cover is attached. After trimming, book reaches its final shape. Prepared books are sent to warehouse and there, they are grouped according to departments and classes, ready to be delivered to the students Process flow chart for the course book printing process can be seen in Figure 4-2.

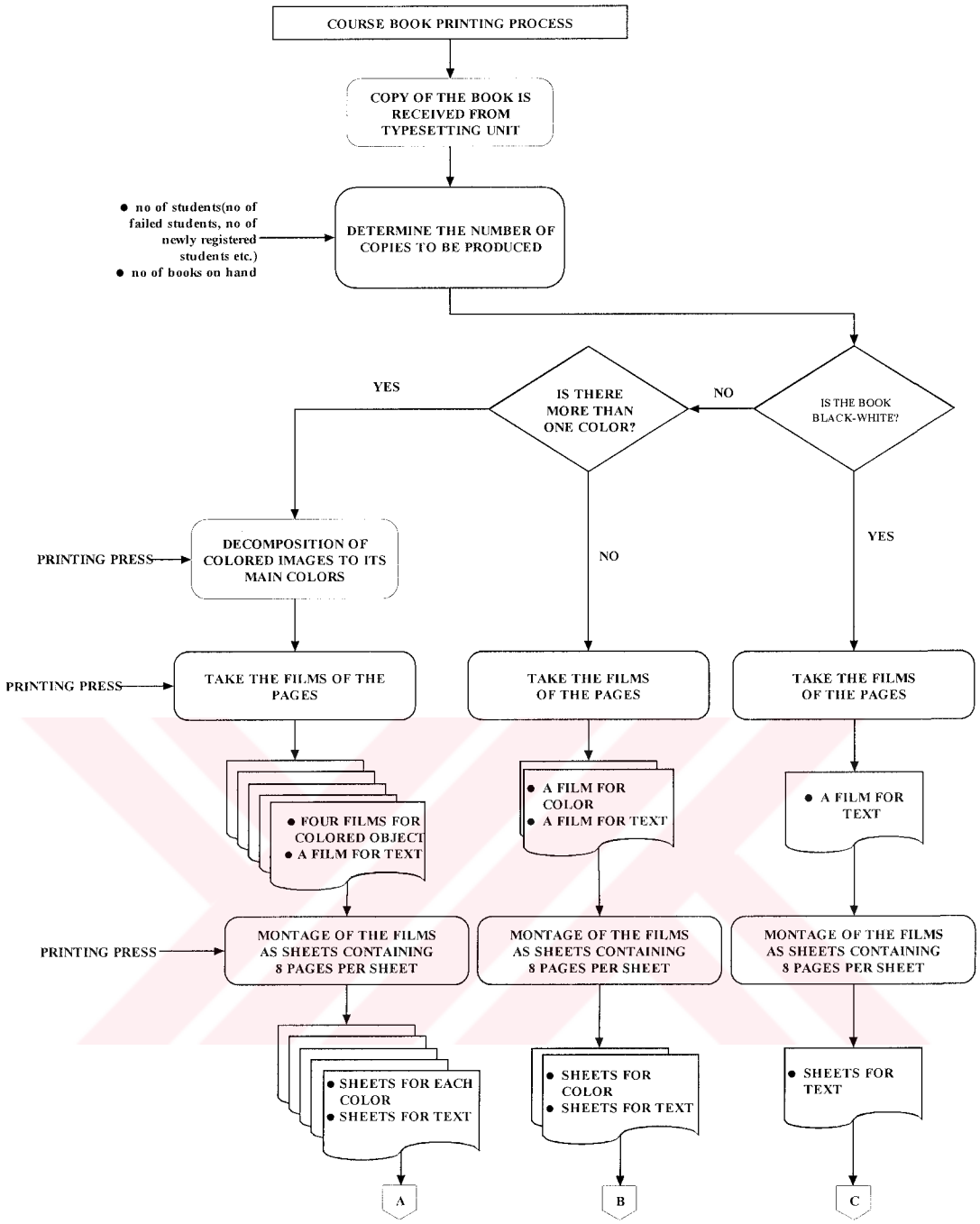


Figure 4-2 Process Flow Chart For Course Book Printing Process

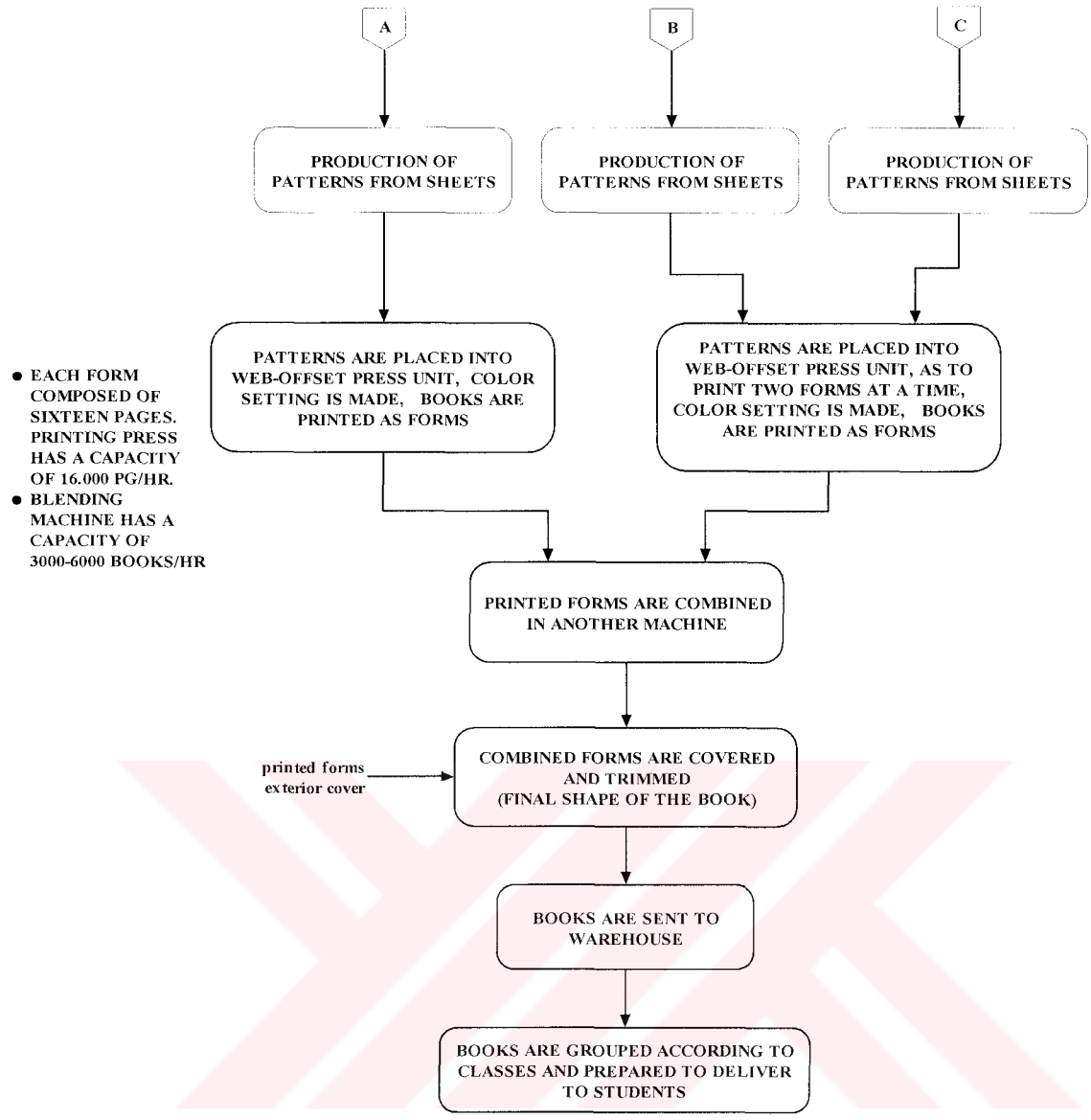


Figure 4-2 (Continued) Process Flow Chart For Course Book Printing Process

4.2.2. Audio-visual Materials

All video and audio programs required by the distance education system are produced at the Radio Television Production Center. The center, supported with editing and postproduction units, has six TV and a separate sound recording studios. Three of the TV studios have technical capacity to record in an international broadcast quality. One advantage of international broadcast quality is that it has longer life for archiving, keeping and duplicating. The other three studios are used for different purposes and when necessary they are included in program production as well. In addition to these

studios, there is one portable studio used to realize outdoor shootings. Production of audio-visual materials for the open education system of Anadolu University is the main responsibility of Radio Television Production Center. However, products of the center are not limited with this. Center produces TV programs for Ministry of Education, other governmental institutions and non-governmental institutions as well.

An experienced technical team produces TV programs, which support the printed materials in the open education system, with authors and editors of the course material. The Open Education Faculty's Educational TV programs are prepared by nearly 200 well-educated experts in their fields who are working in the Radio-TV Production Center. Most of the Production-direction department's staff have been trained in Communication Sciences Faculty, Cinema-Television and Press-Publishing Department.

Since The Open Education Faculty does not have the possibility of broadcasting, programs are broadcasted on TV4 channel of Radio and Television Corporation (TRT) through Turkey. The broadcasting of radio programs is provided by the same corporation. Prior to each academic year, the Open Education Faculty requests broadcasting time from this corporation, and the hours suitable for the demands are reserved for the Open Education Faculty broadcastings. Broadcasts are realized daily for 24 weeks in an academic year. Daytime broadcasting, which lasts 3 hours during weekday is re-broadcasted at nights. There is no repetition of the weekend broadcast on television. Videocassettes of the course programs are also on sale. Broadcasting days and hours of these programs are gathered in a broadcasting booklet and sent to the students at the beginning of the academic year. The broadcasting program is also made available on the University's web page.

For the students of Western Europe Program, ETV programs about the courses are posted to the learners in videotapes together with other materials. Thus, students are given a chance to make use of these materials in their own convenience.

Production Process of Educational TV Programs

Since the most important component of the university's open education system is the course book, as all the other components, design and production of ETV programs is synchronized with the course book. Course texts to be adapted to TV are determined by Distance Education Design Unit (DEDU). DEDU has many members, according to the problem discussed, but when the ETV program is the concern; decision is made by the author of the text, editor and potential producer-director of the program(s). Once this is determined, producer-director of the program is assigned. Producer-director has the responsibility of all the activities take place in design and production of the ETV program. That is the person who synchronizes all activities related to the production of the ETV programs.

Educational TV programs should be produced to emphasize the important points in course text, to enlarge the viewpoint on the topic, to give good examples and to strengthen the information delivered. [19] What can be done with available technical possibilities is determined by the producer-director. After this phase, scriptwriter prepares a script as a source of scenario which also serves as a ETV program's outline.

While adapting a script to the TV at Open Education Faculty one of the different program types or a mixture of them is used. These are; real images, narration, conversation, interview, dramatization and graphical-animation. Production forms applied in education programs are classified in three categories:

i. *Direct teaching programs* are the programs that the content provided in the textbook is narrated as if the program take place in a classroom. It is generally utilized for non-mathematical courses
ii. *Information-transferring programs* are the programs that the content provided in the textbook is supported by using real-world applications and examples. To promote the understanding of the content, concepts, which are not available physically, are illustrated with the help of animations in this type of programs.

iii. Reinforcing program are the programs used for courses including mathematical applications generally. In these programs mathematical applications in the content of course is illustrated step by step.

To implement the effects specified on the production forms following tools are used:

1. People

i. Instructors
ii. Announcer/Speaker
iii. Players
iv. Field experts
v. Common people

2. Visual production opportunities

i. Graphic materials (pictures, photographs, maps, tables, diagrams, cartoons, illustrations, written texts etc.)
ii. Making use of real events (documents): (places, processes, procedures)
iii. Making use of objects (real or models)
iv. Making use of archive (image archives gathered from different sources; mainly archive unit of Radio-TV Production Center)
v. 2-D animation
vi. 3-D animation and Dramatization

Program outline is the written script of production process or education program. The step after writing the program outline is the preparation of the scenario of ETV program. Scenario is a script that explains the form and flow, the content and production information of a program with the elements of image and scenario.

In Radio-TV-Production Center, a scenario unit has been formed to write educational scenarios. Since a scenarist cannot be assumed to be an expert on every

course, scenarists work together with experts on the topics, advisors and producer-directors. Educational scenarios prepared in accordance with defined program goals are checked by an expert when they are turned into shooting-scenarios and producer-director starts other preparations before the shooting starts.

One of the most important thing that director does before the shooting is planning. In this phase, staff, in accordance with the scenario, is determined. The staff, according to the program, may be presenter (reporter), TV teacher-expert, actor-actress and a person who will make a sound recording for the program. These people are interviewed on content and timing and guided to the shooting. In the applications of the Open Education Faculty, expert TV-teachers are usually utilized, especially for direct teaching programs. These experts are supplied information and guided before the shooting. If there is any dramatization on the program, actors or actresses may be rehearsed before the shooting.

The step after determining the staff is to determine the settings. Since settings are very important for a program, they are investigated and selected according to available time and finance, the aim of the program, and the transportation of technical team and equipment. For the shootings that will be held in studio, sceneries and accessories are determined, and responsible staff of the unit are contacted to produce them. Program sets (designs, sceneries) are produced in the workshops of Radio-TV Production Center.

Graphics and animations that are necessary for the scenario are demanded from the Graphic department. Graphic department provides graphic flash cards, two or three dimensional electronic graphics and animations. What is important here is to evaluate if the graphic is effective in learning or not.

During the production of educational program, the archive of the institution is also used. Radio-TV Production Center has all programs produced since the foundation of the institution, in its archive unit. The director determines which existing visual materials to be used. At the same time, if necessary, director orders some elements like a sound effect or music from the sound archive unit.

After the planning of shooting time and equipment, the director reserves the shooting team, equipment, and studio from the Production Planning and Coordination Department.

Based on the shooting plan prepared before the shooting step, production meetings are held, studio shootings or outdoor shootings are realized and sound recordings are made.

During the editing phase, producer-director and an educational expert work together. Shootings are mixed with the audio materials. The output of this phase is the ETV program ready for broadcasting. After the completion of the ETV program producer-director and expert check the program, and if there is anything wrong scientifically, it is corrected immediately. Process flow chart for the production of ETV program can be seen in Figure 4-3.

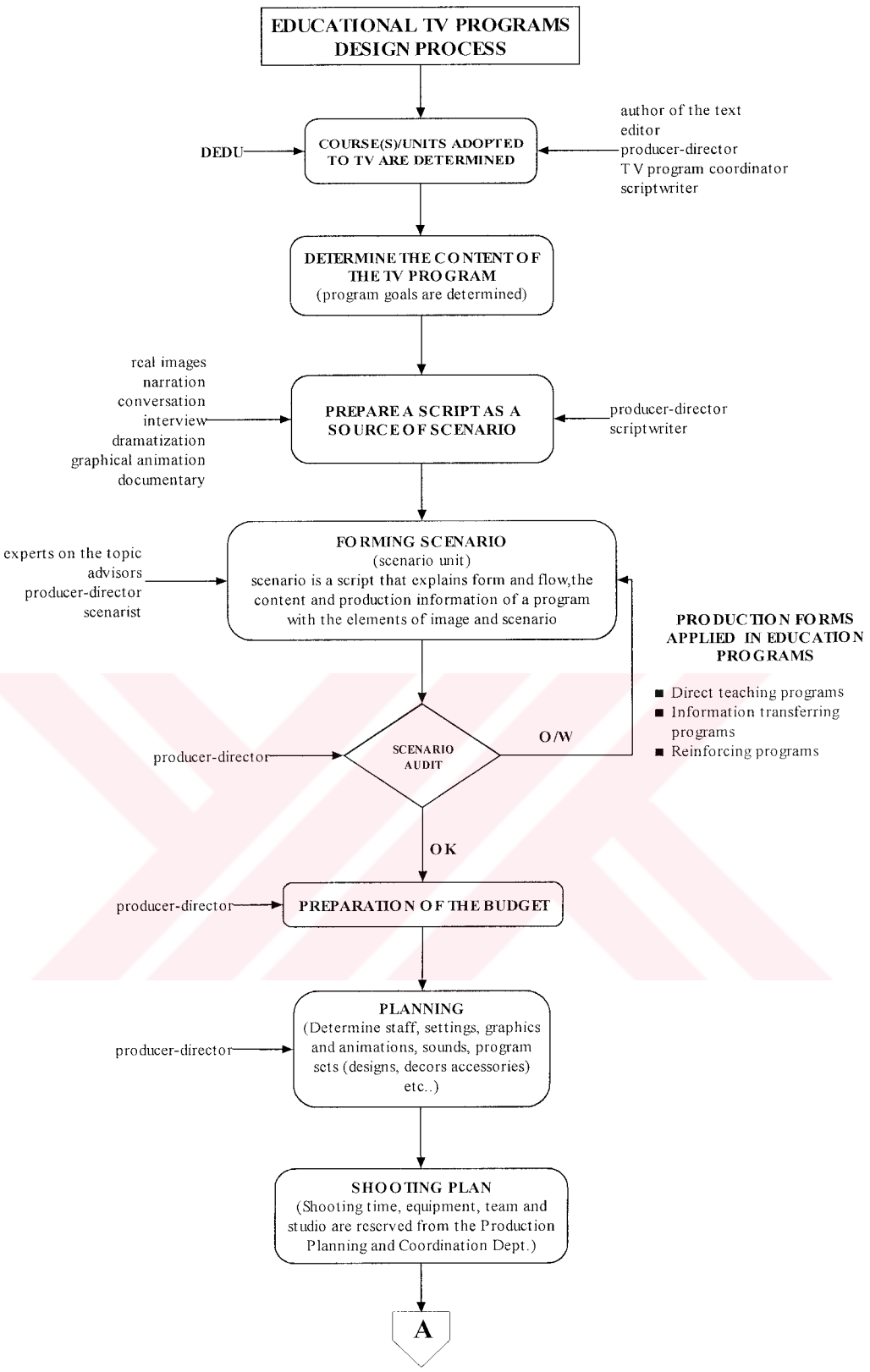


Figure 4-3 Process Flow Chart for ETV Program Production Process

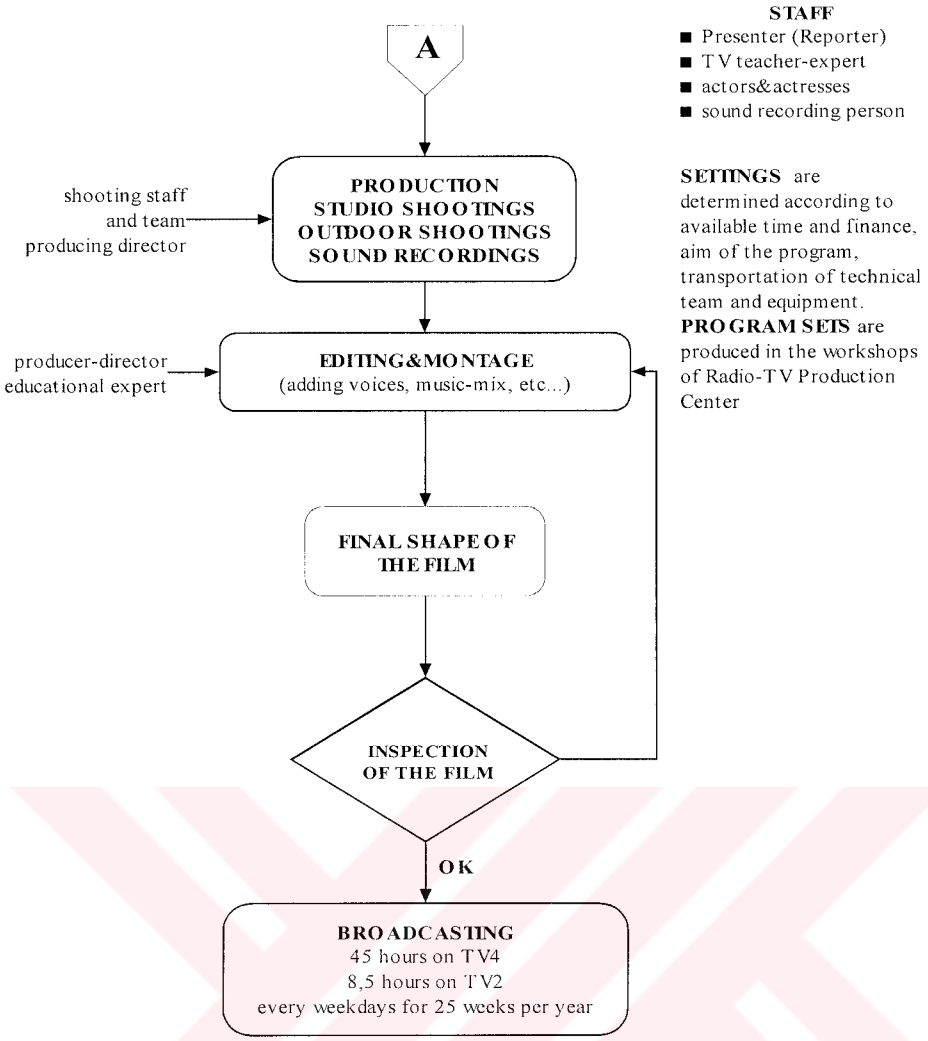


Figure 4-3 (Continued) Process Flow Chart for ETV Program Production Process

During 1999-2000 academic year, as a total of 1374 programs, which has a duration of 934 hours were broadcasted for BA and associate degree programs of the open education system of Anadolu University. Detailed figures about ETV programs broadcasted in 1999-2000 academic year provided in Table 4-1.

Table 4-1 1999-2000 Academic Year Television Programs, Information from Anadolu University, Radio and TV Production Center

	NUMBER OF PROGRAMS (TOTAL)	DURATION OF PROGRAMS (HOUR)
BA Programs		
Lecture Programs	755	514
Preparation for Exams	60	30
Preparation for Exams (Live)	30	30
Associate Degree Programs		
Lecture Programs	529	360
TOTAL	**1374**	**934**

The Ways Of Using Television at Open Education Faculty

Television at Open Education Faculty has characteristics of a global support system aiming to reach all students at the same time rather than individual one, which is dealing with each student's problems separately. It can be said that television at the Open Education Faculty is in a supplementary position for basic support services as well as for the content of the courses. TV programs serve in mainly three areas in the open education system of Anadolu University. These are support for learning, support for examinations and support for personality.

Supporting Role of Television Programs

Television programs at the Open Education Faculty give the following services for the purpose of learner support.

i. *Introductory Course Units:* Purpose of these introductory units are to introduce aim of a new course, using television in their learning period and show students the way of the study which are broadcasted at the beginning of each project.

ii. *Selected Units:* These program series are prepared with the purpose of supporting sections selected from the course syllabus. The choice of the subject matter of such program series is made by DEDU. As the result of the choice of this committee, unit sections or contents within that unit section needed to be adapted for television are selected. For this reason, the number of television program for each course is different.

iii. *Full Units:* This is a concept of televising the content of unit should be a parallel with of the books. Using television at the Open Education Faculty, programs have been produced in accordance with the number of units for each lesson of each project for years. While efforts for renovation continues, some program series, which are still current and produced with this consideration, have still been broadcasted. But it is also planned that these programs should be renovated in time.

Supporting Role of Television Programs for Exams

In teaching, television can be used interactively or one-way. In one-way teaching, by producing the programs beforehand, they can be delivered as videotapes or television broadcast. Contrary to this, interactive television strengthens the effect of teaching by allowing the participation of the audience. Live broadcast is a good way of broadcasting from the point of providing interaction. Keeping this in mind, the Open Education Faculty has started two new practices in the academic year of 1998-1999.

First, from the results of mid-term and final exams processed by the Information Process Center, 10 lessons that learners have had difficulty with were chosen. At the first stage, questions answered incorrectly for the chosen lessons were selected, and television programs, where these questions are solved by the experts, have been prepared and broadcasted. The second practice is live broadcast. In this practice, lessons decided by the Information Process Center were announced to the students before broadcasting and informed that questions could be given either by fax or telephone before or during the broadcast. Learner participation for the two-hour programs lasted five days during the weekdays was huge. The same practice was carried out for a total of 10 lessons in March and September for the academic year of 1999-2000. Live broadcasts will continue for the same period and the number of such programs is thought to be increased before final and make-up exams in the Open Education Faculty in the future. Live television broadcasts of the Open Education Faculty have been executed in the Open Education Faculty studios by means of a transponder rented from TRT.

Supporting Personality

The aim of the ten-minute program, known as "News From Anadolu University" which was added into the television programs since 1998, is to inform students and provide them with a feeling of belonging to this faculty. The program, which is broadcasted every two weeks for this purpose, is repeated throughout the two week period. The content in this program is fixed during their usual meeting agenda by the news group, which is preparing the program. The parts within the programs are as follow:

i. *News:* Besides the information directly involving students such as the academic information of the Open Education Faculty, developments, changes (in exam days, announcement of live broadcast etc.), culture-art and scientific activities scheduled at the university are also announced.

ii. *How to study?* In this part broadcasted in the academic year of 1998-1999, there was information about how the Open Education Faculty student should make use of their own educational materials as well as the important remarks for the exams.

iii. *A Portrait:* In this part of the program where an Open Education Faculty student or a student graduated from the faculty was introduced, individuals who have made use of this graduation in their work life, people who chose distance education as a second study (doctors, engineer, etc.) or those who have an interesting personality (such as being at the age of 70) or students graduated with degrees are chosen. In other word, suggestions which are encouraging and motivating the other students are reported by the student himself.

iv. *Communication Line:* In this section, frequently asked questions which come from students are answered by Open Education Faculty administrators.

Other than the programs mentioned above, there is one more type of programs. These, called as documentary programs, are three-minute short programs, with a purpose of cultural education to the distant students.

4.2.3. Academic Counseling Service

For certain courses academic support is provided via face-to-face lecturing sessions. At 55 provinces face to face lecturing is provided for various courses. These courses are instructed either by OEF staff or local university staff. At 1998-1999 academic year a total of 800 instructors were assigned duties of face-to-face instruction and counseling at 53 regions. The lectures are conducted at evening and weekends at the study centers with support from local universities' staff.

Design Process and Processing of Academic Counseling Service

For which courses Academic Counseling Service is to be offered for the students is determined by the Open Education Faculty Board of Directors in collaboration with DEDU. After the courses are selected, regions are decided according to student density, availability of academicians and place to support counseling service. In this phase, offers that come from universities are evaluated and for the regions, which do not have offer for giving the service, Open Education Faculty make offerings to universities. Then, all the universities that give Academic Counseling Service for Open Education Faculty are selected. This is the first phase of the design process of Academic Counseling Service.

In the second phase, each university selected to give academic counseling, a coordinator is assigned by the university to handle the works of service. Assignment of the coordinator is the responsibility of each university's own rector. Scheduling, assignment of rooms to the classes and determination of the tutors are all made by the coordinator. After service is started to be given, facility fees determined by the Ministry of Finance and tutor fees calculated by coordinator is paid to respective universities and tutors. Facility fee is composed of heating, electricity and clerk expenses. Tutor fees are calculated on hourly basis. Process flow chart for the Academic Counseling Service can be seen in Figure 4-4.

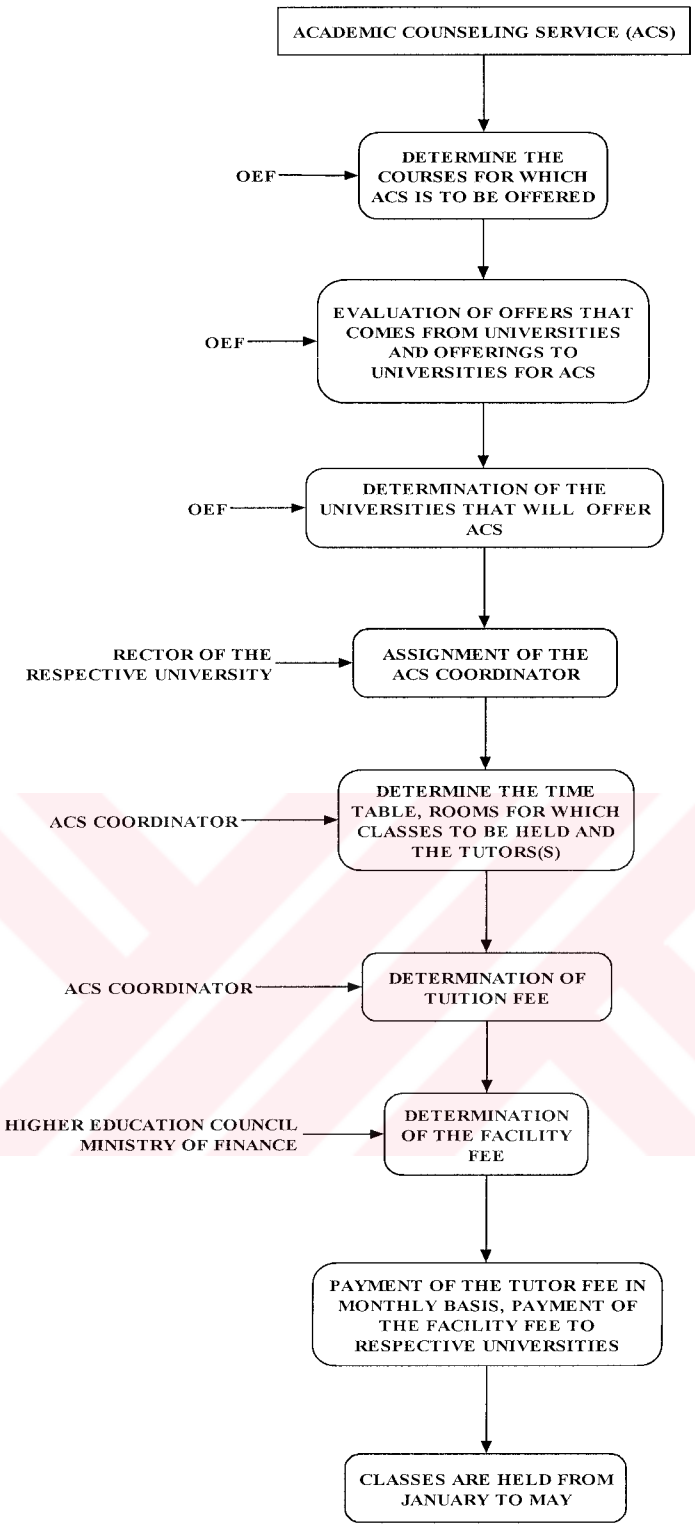


Figure 4-4 Process Flow Chart for ACS

For the students who are settled in the Turkish Republic of Northern Cyprus, Anadolu University does not give academic counseling due to the distance between the two countries. Such services are given through only teleconferencing interactively. Teleconferencing was put into practice in the academic year of 1999-2000. A total of 8 hours of advisory is given twice a week, by getting together students in the Open Education Faculty's office in Nicosia. All students there are able to have an interactive communication. Thus a synchronous technology was first started at the Open Education Faculty in this project.

4.2.4. Computer Assisted Education

Beginning from 1994, computer laboratories are established in order to provide computerized lessons and exercises to the distance learners. As of 2000, computer assisted education material is made available for 17 main courses at the computer laboratories of 14 cities.

The courseware used is the supplementary software based on drill and practice type that combines text, image and sound developed by the Computer Assisted Education Unit [7]. It is planned to increase the number of the laboratories with new courses. In line with increasing the number of laboratories, Computer Assisted Education Unit initiated a new project to make softwares available in CDs. To provide this, existing softwares are modified in order to make them compatible with new technologies and enriched with the elements of image coming from ETV programs and questions selected from Test Research Center's database.

Design and Production Process of CAE Software

Again, production decision for Computer Assisted Education Software is given by Open Education Faculty Board of Directors in collaboration with DEDU. While giving this decision following points are taken into account:

i. Number of students enrolled the course
ii. Number of departments teaching the course
iii. Applicability of Computer Assisted Education

iv. Future plans for the course
v. Demand from students
vi. Examination results

Once the course for which software is to be designed is determined, a project team is formed. Project team is composed as follows:

i. Project manager
ii. Field editor
iii. Designers
iv. Screen designers
v. Programmers

Project manager is responsible for the organization of all tasks, coordination with other units like DEDU and Test Research Center. Field editor creates the scenario, which provides a basis for the program. Preparation of scenario is the phase where educational dimension of the software is taken into account. Designers transfer scenario into computer environment by using program models. Program models are constant models that are designed to provide standard for designing units. Currently there are three types of program models:

i. Exercise based software
ii. Subject based software
iii. Foreign language software

Design phase is composed of two stages: Framework design and realization design. In framework design, parts of the files that are independent from scenario, related images and graphics, program codes relating files each other and assistant tools that can be used in every software like calculator and dictionary are determined and produced. Production of base pages and functions, font design and construction of production

masters are all works of framework design. Constant screen layout and functional buttons constitute base pages.

Realization design is the process of transferring of scenario into computer environment with the help of standards and settings constructed in framework design stage. The most time consuming job of this stage is the design of exercises and test components. Screen designers realize the splitting of designed programs to computer screen pages. Texts, graphics and animations placed in pages in an organized way. Required animations are prepared by programmers.

After the completion of design phase, field editor and the project manager examine the software. Modifications that field editor thinks needed are done as long as the technology permits.

Following the modifications, there is another decision to be made; that is whether the software is to be delivered via the Internet. If the course is to be delivered via the Internet, software passes through one more modification process to make it available via the Internet. In line with these, to make use of all multi-media technologies, software is enriched with the elements of video and audio materials, as well as questions and complete copy of book in pdf format. To collect these materials, project manager contacts with Radio-TV Production Center, Test Research Center and DEDU. In collaboration with these units, sample question parts of ETV programs, pre-prepared test questions, and other materials provided from mentioned units are embedded into the software. At the end of this process, all the materials prepared are compiled and copied in a CD-ROM. This is the final shape of the Computer Assisted Education Software. Installation instructions, technical instructions and student's guide are also prepared by the Computer Assisted Education Unit. Prepared program is tested on a small-scale target group and according to the results, the program may be needed to be revised prior to the final release for reproduction. Process flow chart for the design and production of the Computer Assisted Education Software can be seen in Figure 4-5.

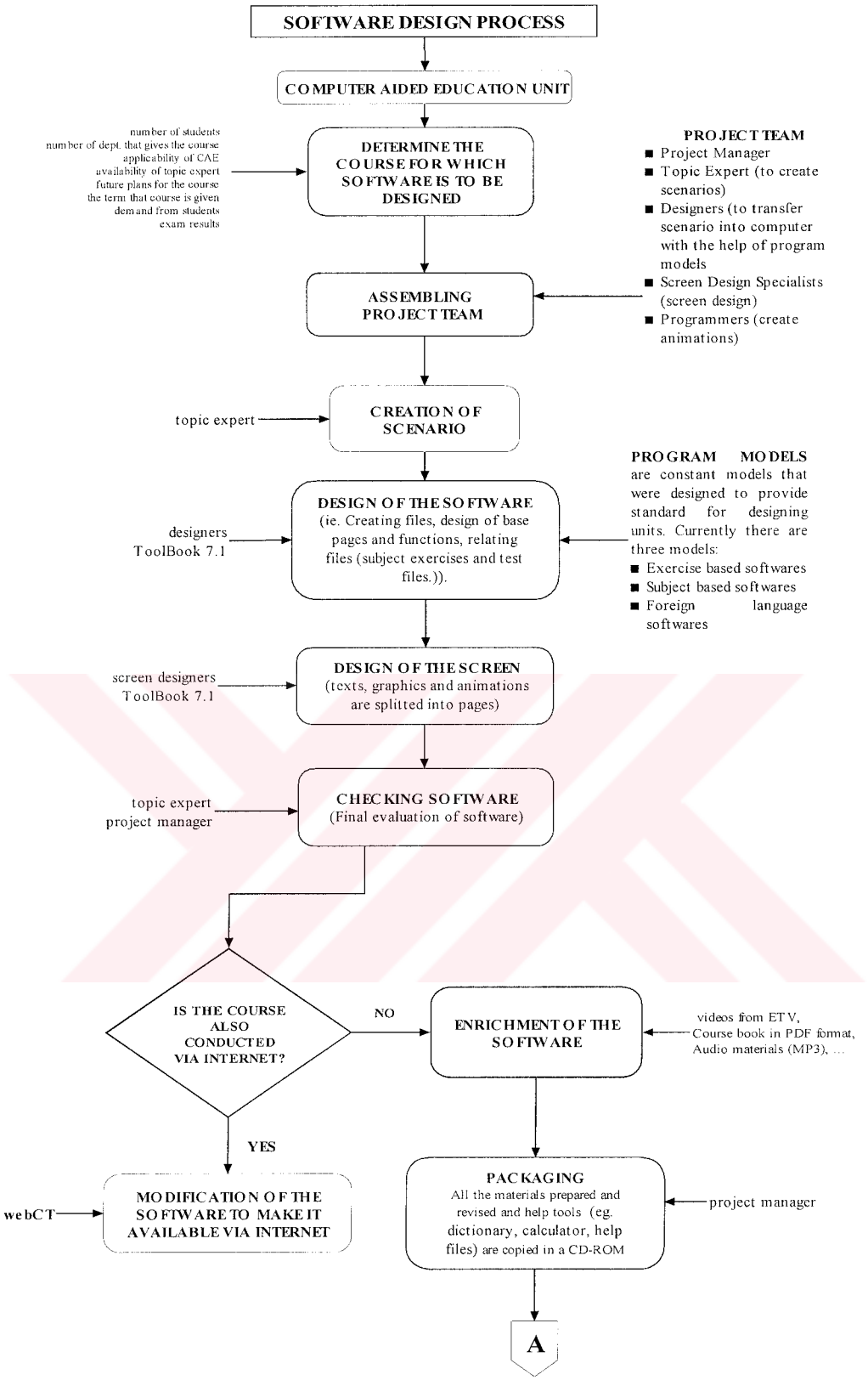


Figure 4-5 Process Flow Chart for CAE Software

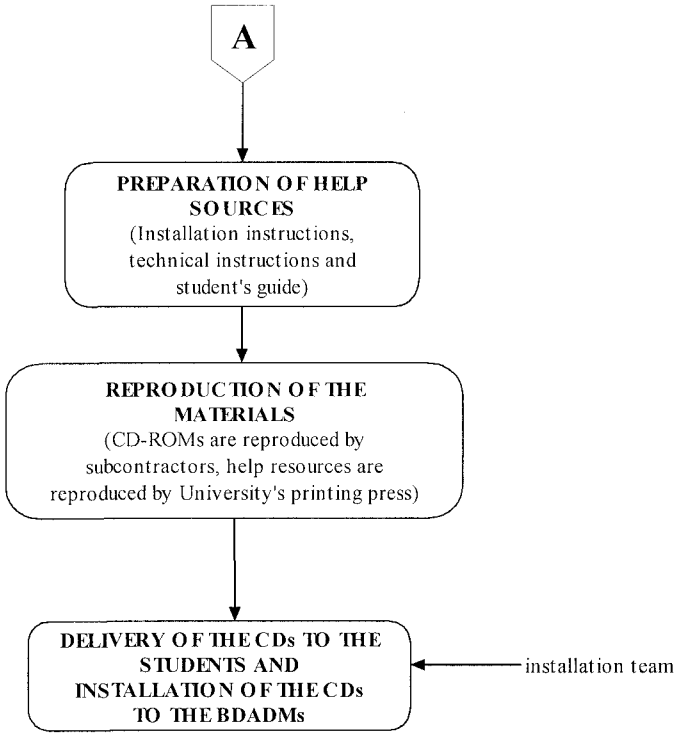


Figure 4-5 (Continued) Process Flow Chart for CAE Software

The final step is the reproduction of materials. Booklets are printed at the university's printing facilities. Reproduction of CDs however, is subcontracted to companies abroad, since neither university nor domestic companies have a reproduction capacity to meet volume. CD packages, which are composed of a CD, student guide and installation instructions, are sent to the students at the beginning of each academic year. For the computer laboratories of the university, an installation team is constructed. This team has the responsibility of installation of CDs and maintenance and upgrade works of the computer labs.

4.2.5. Assessment and Measurement Materials

Student's success is determined by multiple-choice tests. At each academic year, a mid-term and a final exam are given to the students to evaluate their performance. The weights of these tests over the final grade are 30% and 70%. An average score of 50% is required in order to "pass" a course. The students who fail are given an opportunity to revise their final test score at a final make up exam [7].

Test Research Center is responsible from the preparation and maintenance of a question data bank for the exams. Tests are prepared at this Center of Anadolu University by a joint study of authors/editors, field experts, technical consultants and scientific supervisors.

Test Preparation Process

Test preparation is a massive but routine process. First, for each exam period a deadline for the submission of questions from the author of the book is determined. Next, the author of the book is informed about criteria (no of questions, included chapters etc.) for the questions to be designed in addition to deadline. After the arrival of the questions, these are conveyed to computer medium in Test Research Center. Then technical experts question the conformity of incoming questions to the criteria, modifications –if necessary- is made. Lastly, answer keys are prepared.

Following the technical corrections, field experts make scientific redaction of the questions. Scientific redaction is followed by typesetting of questions. A technical team composed of four technical consultants examines the questions from spelling and expressional points of view. After this phase, questions are sent to academicians that have prepared the questions. Incoming questions approved as "printable" by the academicians are arranged as test booklets and sent to printing press.

For the preparation of questions, and their scientific and technical redactions, Test research center pays fixed charges per question to respective people. Process flow chart for the Test Preparation can be seen in Figure 4-6. Since examination is subcontracted, its process is not analyzed.

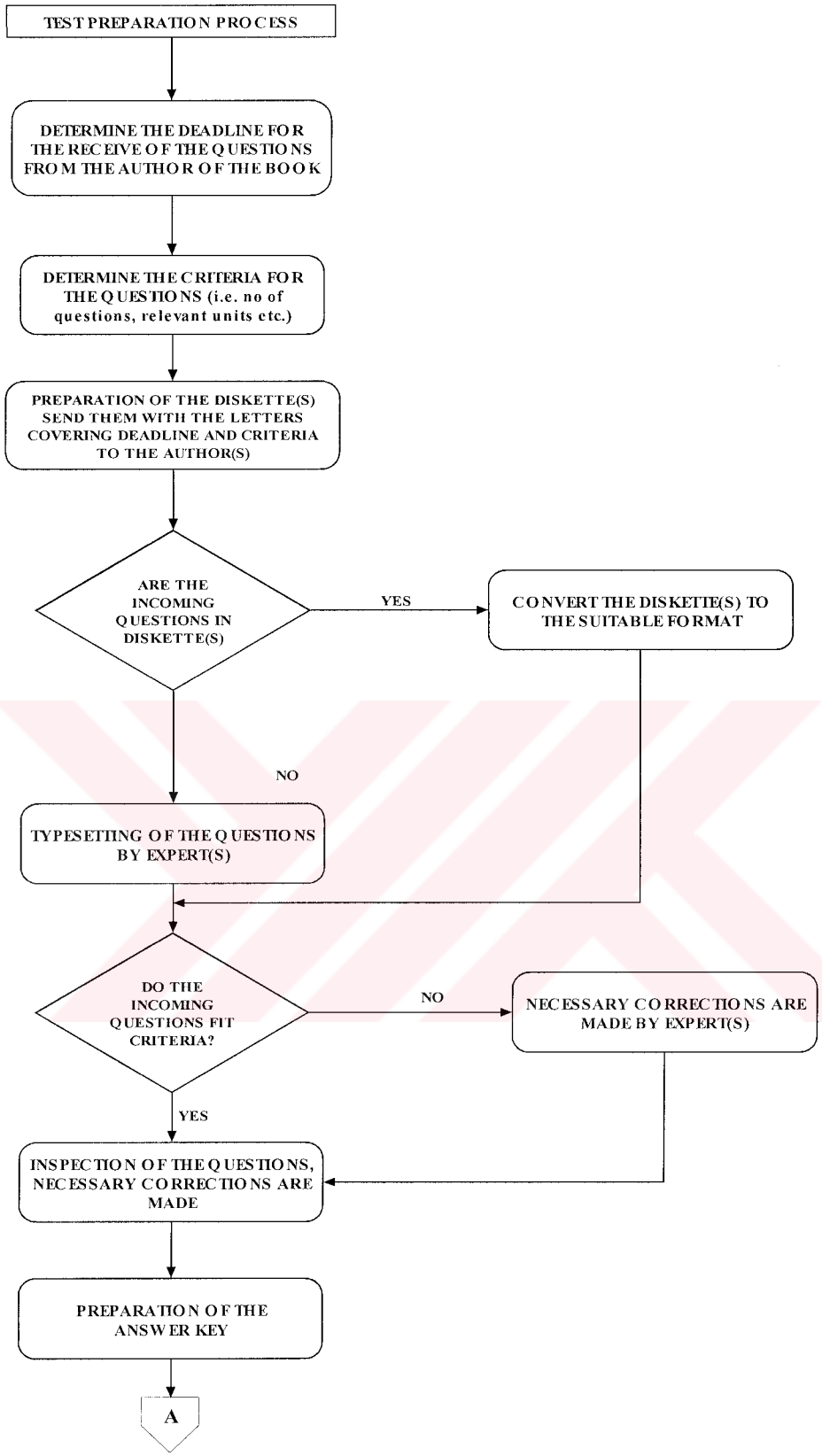


Figure 4-6 Process Flow Chart for Test Preparation and Examination Process

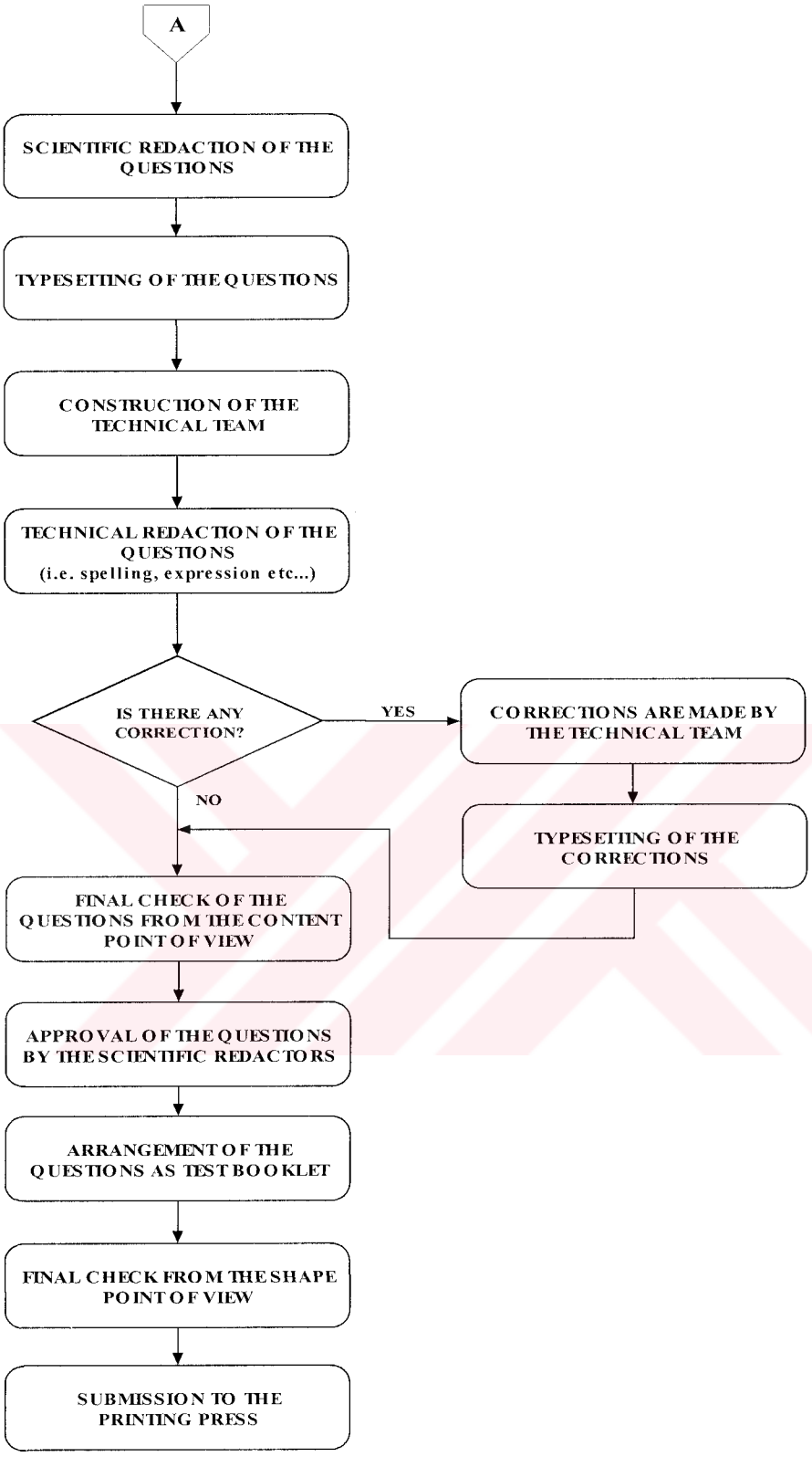


Figure 4-6 (Continued) Process Flow Chart for Test Preparation and Examination Process

Tests are printed at the Anadolu University print shop and sent to the test centers under strict security measures. Examinations are administered by the Anadolu University computer center. Printing of the tests and execution of exams are subcontracted to computer center.

CHAPTER 5

PROPOSED SYSTEM

In this chapter, the difficulties encountered in the costing of course delivery materials design and production processes are introduced. Then, costing approach for each type of material used in the delivery of distance education course is explained. The proposed database for the collection, retrieval, storage, and the manipulation of the input data for course delivery materials design and production process are explained in detail. The design process of the database and the proposed processing of the system are introduced. The proposed database is designed as a relational database model using Microsoft Access 2000® [12, 27]. Although designed conceptual data model can be applied to any commercial database software, when Access's ease of use and relatively small physical size of the data used and created are taken into account, Access offers a suitable environment for the physical design of the database.

5.1. Problems in Costing

In current situation, costs of the course delivery materials and measurement and assessment materials are calculated according to a statute. In this statute, the activities and materials to be paid for are determined. However, payments stated in the statute do not cover the costs of all objects necessary to produce materials. The statute deals with

mainly royalty payments, whereas there are many more expenditure types incurred while designing and producing course delivery materials. To calculate costs other than royalty payments there exists no systematic tool or approach. In line with these problems, the data about produced course delivery materials are not stored properly and therefore unavailable for future use.

Hence a database management system is needed to collect, manipulate, store and retrieve both the input and output of course delivery materials design and production system. The DBMS is intended to provide a systematic tool for cost calculations of the activities that take place throughout the design and production of course delivery materials. The system is to provide cost information about the ongoing projects in detail as well as overall cost figures for complete courses. In line with these, the information about employed people in the projects, their responsibilities in these projects, the length of their assignments, type of materials, machines and tools are used are also provided by the system.

Although the analyzed system is chosen as course delivery materials design process, it was not possible to include all sub-processes for the proposed system. Allocations for overheads and indirect materials are excluded since all resources used, like buildings, people and machines throughout course delivery materials design process are also used for different purposes in the university. Allocations for indirect materials and overheads require the determination of ratios of usage of these materials as opposed to overall activities using same resources, which is considered as out of the scope of this work. The proposed system, which will be explained in detail in the subsequent sections, consists of the collection, storage, retrieval and manipulation of the input data for course delivery materials design process and calculation of the direct costs for each input and depreciation part of the capital costs for the equipments directly used in the production of course delivery materials. The proposed system includes direct costs and the depreciation part of capital costs.

5.1.1. Costing Approach

The analysis of the course delivery materials design and production processes explained in Section 4.2.1 through Section 4.2.5. was intended to determine the cost centers for each and every course delivery material design and production processes. However, during the system analysis phase, it is observed that hardly any of the proposed cost centers have cost calculation efforts. Moreover, when their working styles are taken into account, it can be said that although project teams are formed by selection of personnel from the same particular department, for each design and production process; each project team works like independent from their departments. Thus, for the costing of the activities that take place during the course delivery materials design and production processes, stepwise costing approach is developed and used. In this approach, for each step of the course delivery materials design and production processes, cost objects and their drivers are determined and each step is priced separately. Then summation of the costs of the steps gives the total cost of each course delivery material.

5.2. Costing of a Distance Education Course Design

Distance education course design cost is composed of the design and the production costs of materials, which are used to deliver the course to the distant students. As mentioned in the previous sections, the course materials used in Open Education Faculty are course book, educational TV program, computer assisted education software, academic counseling service and test materials for measurement and assessment of the distant students. In the subsequent sections, cost objects, which are taken into account and their treatment methods are explained for each course delivery material used.

5.2.1. Costing of Course Book Production

Course book production process is analyzed in two stages. The first stage is the production of the master copy of the book; the second is the reproduction using the master copy.

Production of the Master Copy

As mentioned in Section 4.2.1. the production of the master copy of the book is a labor-intensive task. Hence the only cost object taken into account is the labor cost of the personnel that have a task in the process of course book design. In this process a multi-specialist team work in coordination to write texts, prepare illustrations, design graphics, process "crude" texts to make them suitable for self-learning.

Personnel, which constitute multi-specialist team, have responsibilities in their respective fields. Some of these tasks like writing the "crude" text, design of the graphics, require royalty payments. Thus, cost of the production of the master copy of the book is composed of personnel costs and the royalty payments.

Other than the personnel costs and the royalty payments, there may be other expenditures that can be traced to a particular course book design project like payments made to consultants hired for specific purposes from other universities or institutions.

When the personnel costs for university's own personnel are taken into account, allocation of all working hours of the personnel to the particular task in the course book design process cannot be assumed. Most of the personnel given a task in the course book design process are academicians; they need to allocate time for their lectures, scientific research and even managerial tasks as well.

In the statute in which the payment types and calculation criteria are specified, there is no specific approach for the calculation of the personnel costs other than royalty types. However, ABC dictates that each cost object must be priced and that price must be traced to related product or project. Given this, the salaries of the responsible personnel should be traced to tasks and hence projects proportionally from the time consumed by the task point of view. In the proposed system, in order to calculate the personnel costs, following approach used: For each personnel assigned a task in the course book design process assignment start and finish dates are recorded. Then, which proportion of the

working hours is allocated to the task assigned to his/her in the context of course book design is determined. This ratio is determined by the personnel assigned to the task. In the literature, it is suggested that for the academicians 30% of the working hours is allocated to distance education course materials design tasks at most, independent of the type of the task [13].

Royalty payments are calculated according to the standards mentioned in the statute. Summation of the personnel cost calculated according to the method stated above with the royalty payment –if exists- gives the total personnel cost incurred by the assignment of an individual personnel.

The sum of the personnel costs and the other expenditures that are traceable to specific course book design process gives the total cost of the whole course book design process.

Reproduction

Reproduction from the master copy the course book takes place in the university's printing press facilities. Printing press works like a make-to order-company. Throughout the printing process many different materials, labor and machines are used to print the course book. There are some other expenditures incurred as well during the printing process; among them there are ones, which can be directly traceable to a particular printing process, are treated as "special expenditures" and added to the cost calculations. Subcontracted jobs necessary to perform printing tasks may be classified in this domain. The rest are left out of the scope of the study.

Here in printing process of the course book labor costs are determined in the same manner as the course book design process. For each worker assigned for the tasks of particular course book printing process, assignment start and finish dates are recorded; however, depending on the volume of production, assignment of the workers may be specified in hours. For this reason the date records are kept on an hourly basis. Another

difference from the course book design process, throughout the assignment period a worker can only deal with the particular assignment only.

Since the materials that may be used throughout the printing period vary widely, there is no classification for them. For the calculation of material costs following method is to be used: For the each material that can be directly traceable to a particular printing process like paper and ink, consumed amounts are recorded. These amounts are then multiplied by their respective unit costs.

Machining costs consist of depreciation of machines and the costs that are incurred by the usage. As in the case of labor costs, machining costs are calculated on the basis of usage period of each machine. Multiplying the usage period of each machine by its unit operating cost gives the machining cost to be traced to particular printing process.

The depreciation of machines used in the printing process of the course book is assumed to be distributed linearly throughout the economic life of each machine. The depreciation amounts that are to be traced to a specific course book printing project is determined in following manner: Usage period of each machine has already kept in the system for the calculation of operating cost of each machine. These records are first converted to day units. Then its proportion in the total yearly usage time is determined. This ratio is then multiplied by the previously determined yearly depreciation amount to calculate depreciation amount traced to particular course book printing project. Sum of the depreciation amount with the operating cost gives each machine's cost for printing project.

Summation of the all cost items presented above gives the total cost of a specific course book printing process. Proposed system lets users define different design and printing processes for the same course book. Each time course book is modified or reprinted, is assumed as a new design or printing project. Hence, once the design and printing project costs are calculated, total cost of the course book can be viewed through the entire lifetime of the course book.

5.2.2. Costing of the Educational TV Program Production

All phases of ETV program production process take place at the university's Radio Television Production Center. Cost items, which are directly traceable to a particular ETV program, are determined as studio, films, sceneries and project team costs. Special expenditures classification is also used here, in order to keep record of the purchased materials, services and so on specifically for a particular ETV program. The important point about the use of special expenditures classification is that it should be used for the occasional cases that are not expected to occur frequently.

Costing of the ETV programs starts with the assignment of the producer-director, scriptwriter and the scenarists. Since most of the people dealing with pre-production activities are academicians, their costs are calculated using the method mentioned in Section 5.2.1.

As the last step of the pre-production phase, shooting staff (players, TV teacher and/or reporter) and shooting team (cameraman, and other staff responsible for the shooting) are assigned, studio is reserved and settings (sceneries, graphics and animations) are determined.

For the handling of the costs incurred by the shooting staff the method explained in Section 5.2.1. is used, since most of them are again academicians. The personnel, who compose shooting team, however are not academicians; their costs are handled in same manner as of the workers of the printing press.

Shootings and post-production activities take place at the university's studios. Studio costs and their respective depreciation costs are again calculated on the basis of usage time of each studio. Summation of depreciation costs and costs incurred directly from the usage of studios constitute total studio cost in the proposed system.

Program sets (sceneries, and accessories) are produced in the workshops of the university. They are then charged price as the program sets from the Radio TV Production Center. These sets are to be used more than one time; hence their costs are distributed equally among the ETV programs in which the same program sets are used.

Since graphic flash cards and animations are used rarely in ETV programs, their costs are classified as special expenditures.

Lastly, costs incurred by films used in the production of ETV programs are treated same as the material costs used in course book printing explained in section 5.2.1. However, there are other costs attached to films' unit costs. These are development and duplicating costs of the film. Development and duplicating of the films are done in the studios, during post-production phase. Studio costs for the development and duplicating of the films are calculated in the same manner as the calculation of costs of studio for shooting. However, there are some consumables for the development of the films. Since these costs are directly related with the amount of the film used, their unit costs per unit film can be determined. These unit costs are then multiplied by the amount of the film used. Summation of the development costs with the films' own costs gives the total film cost.

Once costs are determined for each category mentioned above, summation of them gives the total cost of an ETV program. Since a course may have more than one ETV program for its different chapters, total ETV program costs simply consists of the summation of the ETV program costs that are related with that specific course.

5.2.3. Costing of CAE Software Design and Production

Design and the production of the computer assisted education software is under the responsibility of the Computer Assisted Education Unit. Computer Assisted Education Unit is well equipped in terms of development software and hardware necessary to design and produce the computer assisted education software. During the design and production process, cost items can be classified as hardware costs, development software

costs and the personnel costs. As in the case of other course delivery materials, materials and services obtained by outsourcing are classified as "special expenditures".

Once a computer assisted education software is decided to be produced, first thing to be done is the assembling of the project team. Project team has many members, like academicians from both inside the Computer Assisted Education Unit, as well as from the other departments of the university, technicians of the Computer Assisted Education Unit, and even hired programmers working on hourly basis. If the workforce that are given a task in the context of the design and production process of the computer assisted education software are the members of the university, their personnel costs are calculated on the basis of previously defined methods in Section 5.2.1. Costs of the other personnel are classified as special expenditures.

Since both hardware and development software used to design and produce computer assisted education software are special-purpose tools, unlike the preparation of other materials, their costs are taken into account.

For the costs of the hardware used in particular computer assisted education design and production process, calculation method is same as the studio costs calculation in ETV program production or calculation of the machining costs for the printing process. Records about the assignment start and finish dates are kept, then by using the usage period of each hardware usage costs and depreciation amounts consumed by a specific activity are calculated.

The costs incurred by the usage of development software are composed of depreciation amounts that are to be traced to activities. Again, the most important point here is the accurate record keeping about the assignment of the software.

The costs of the materials used in the enrichment of the prepared software like animations prepared by the Faculty of Fine Arts, visual materials obtained from the Radio TV Production Center and so on are treated as special expenditures.

The last step in the cost calculation of the computer assisted education software is the summation of all costs classified in different categories. But the total cost of the prepared computer assisted education software is not traced to one course. Up to know, all prepared computer assisted education softwares are designed in a way that they can support more than one course. So the total cost of a computer assisted education software is distributed equally to all courses that uses the software.

5.2.4. Costing of Academic Counseling Service

Records about the information of the Academic Counseling Service are kept on the basis of university and course. That is; for each face-to-face tuition given in a university has a unique record. Thus, each course for which Academic Counseling Service is given has the number of face-to-face sessions equal to number of regions in a specific academic year.

Cost items of the Academic Counseling Service are the facility fee and the tuition fee. Both of these cost items are calculated by the universities that provide the service. Once the records about each face-to-face tuition is created, only their cost records are updated during the academic year. Tuition fee is paid on monthly basis, whereas facility fee is paid in two installments. Tuition fees are directly traced to its related Academic Counseling Service, whereas facility fee is distributed equally among the services given by the same university.

In order to calculate the total cost of the Academic Counseling Service for a particular course in an academic year, the only need is to sum up the costs of all Academic Counseling Services given in different universities.

5.2.5. Costing of Test Preparation and Examination

In the test preparation and examination, there are again two cost items: Costs of test preparation and the execution costs of the examination. The records of the test preparation are separated from examination information, each of which are kept as

separate entities. Thus, for each test preparation there is a separate record. There are three different test preparation records for each course; these relate to midterm, final and make-up tests in an academic year. Like test records, there are three examination records for each academic year; namely midterm, final and make-up exam records.

Tests are prepared by the authors of the respective course books under the counseling of the Test Research Center. There are three different payments made by the Test Research Center. These are the payments for preparation of the questions, the payments for the technical redaction of the questions and the payments for the scientific redactions of the questions. Payments are made per question.

Execution of the examinations is subcontracted to university's Computer Center in order to overcome difficulties caused by bureaucracy. Computer Center calculates execution cost of each examination held. This cost is distributed equally over the courses that have questions in the exam.

5.3. Systems Design

Considering the analysis of each course material design process and their costing approaches, a DBMS is developed. In the subsequent sections, phases of the database design are presented.

5.3.1. Database Design

Throughout the process of database design, the steps mentioned in Chapter 2 are taken into consideration. The design process is performed in six steps as the enterprise modeling, conceptual data modeling, logical database design, physical database design, database implementation and database maintenance. However, the process is not completed since as pointed out in Section 2.4.6., last step, database maintenance continues through the lifetime of the database.

Enterprise Modeling

Database development process starts with the enterprise modeling step. In this step database systems that Open Education Faculty needs are determined. Among the various database alternatives, an information system that collects, stores and retrieves cost information about the design processes of course delivery materials are chosen. Until the design of this database, there is no complete picture of costs of design activities in Open Education Faculty. From this point of view, it is thought that such an information system would be very helpful in terms of determining the costs of each course component as well as make comparisons between distance and traditional education systems both applied in Anadolu University.

Conceptual Data Modeling

After the selection of database to be designed, in order to determine the components of the database a comprehensive analysis is accomplished in Chapter 4. The results of this analysis are as follows:

i. Database requirements for the course delivery materials cost information system are determined.

ii. Data requirements for all the processes take place in costing of course design are determined. In the Table 5-1, data included in the database is presented as a "Department – Data Context Matrix".

iii. As well as data requirements, functional requirements of the database are also determined in this step. Functional requirements are, 1. All the data created and used must be maintained in a way to provide thorough data security preventing losses and offer benefit for future use. 2. Efficiency and simplicity of the data must be provided to prevent redundant data storage. 3. In order to permit transactions (adding, deletion, editing, changing) to be made easily, data manipulation tools must be provided. 4. Data that comes from different resources must be interrelated to allow the user to view all the information that she wants like course information (comes from Open Education Faculty Board of

Directors) and ETV programs (comes from Distance Education Design Unit) that belong to that specific course

Table 5-1 Department Data Context Matrix

DATA	DEPARTMENTS												
	Distance Education Design Unit	Radio TV Production Center	Computer Assisted Education Unit	Test Research Center	Open Education Faculty Board Of Directors	Purchasing Department	Vice Dean (1)	Printing Press	Vice Dean (2)	Vice Dean (3)	Computer Center	Personnel Department	Vice Dean (4)
New Course Info	U	U	U	U	C/U	U	U	U	U	U	U		U
ETV Program Info	C/U	U	U										
Course Book Design Info	C/U	C/U	U	U									
CAE Software Info	C/U		C/U										
Test Preparation Info		U	U	C/U				U					
Examination Info	U			C/U							C		
ACS Info	U				C/U		U			C/U			
Course Book Printing Info	U							C/U	C				
Material Info		U	U			C		U					U
Material Consumption Info	U	C/U	C/U	C/U		U		C/U					
Equipment Usage Info	U	C/U	C/U					C/U					
Personnel Assignment Info	C/U	C/U	C/U		U			C/U					
University Info	U									U			
Personnel Info	U	U	U					U					
Tutor Info										U			

U: USE C: CREATE

Logical Database Design

Logical database design is accomplished in two stages. First, the conceptual data model defined in section 5.1.1. is transformed into standard relation notation. In this stage, entities, which can be seen in Appendix C, are described. Then, a detailed review of the transactions, displays, and queries thought to be supported by the database are made. This stage is especially important to verify exactly what data are to be maintained in the database and the nature of those data as needed for each transaction.

During logical database design, along with the needs determined in conceptual data model, attributes of the entities are determined also. After the completion of this, all relations are reviewed from the point of view of normalization process. The first form of the logical database included some many-to-many relationships, which violate data integrity and prevent to construct well-structured data specifications. Using the rules of normalization process, these many-to-many relationships were removed.

The output of the logical database design process is the Entity-Relationship diagrams for the proposed database. These diagrams can be thought as a complete picture of the database that is independent of a DBMS for managing these data. Entity-Relationship diagrams can be seen in Appendix B

Physical Database Design and Creation

During this phase, the organization of database in computer storage is decided and the physical structure of the DBMS is defined [10]. However, this step is not applicable for this study since the DBMS, Microsoft Access 2000 used in this study already has these specifications defined in it.

Database Implementation

In database implementation phase, entities with their attributes are defined as tables, and the queries are structured to offer functional requirements of the database. Then, in order to provide user-friendly interface a form based environment is designed. By using

this interface users can view and enter all the required data easily. All these activities are accomplished by using Microsoft Access 2000.

In line with these activities, all database documentation is finalized and a user manual is prepared. User manual can be seen in Appendix E. Menu structure of the proposed DBMS can be seen in Appendix D.

Database Maintenance

Database Maintenance phase lasts throughout the life of the database. This phase has already begun however; it does not come to an end. In order to meet changing user needs (functional requirements) and to correct errors in database design; characteristics of the structure of the database is modified as needed.

5.4. How The Proposed System Works?

Since all activities that take place during course delivery materials design process are coordinated by the Distance Education Design Unit, under the supervision of project managers for each course delivery material, this unit is chosen to be the administrator for this database. Each project manager has the responsibility of all the activities concerning their materials, but coordination of these efforts are made by Distance Education Design Unit. So the most suitable place for the database is within the Distance Education Design Unit.

In order to make transactions available to different departments like printing press and Test Research Center, database needs to be stored in a shared directory in Distance Education Design Unit.

As the Higher Education Council approves the curriculum of a new distance education program or existing distance education program including new course(s), Distance Education Design Unit creates a new record for the course using "Add New Course" button on the start-up menu. If the new course belongs to a new department,

department must be defined in the database prior to the definition of the new course. Then Distance Education Design Unit contacts possible authors of the book, which is the main delivery medium for the distant students. Once the authors are selected and other personnel is assigned for the course book design their assignments are defined in database.

After the production of model unit of the course book, a meeting is held in DEDU, with the participation of the manager of Computer Assisted Education Unit, a producer-director from Radio TV Production Center, and the manager of the Test Research Center. In this meeting, which delivery media are to be used in line with the course book is determined. According to the decisions made in the meeting, each unit manager organizes his department to meet the responsibilities given to his department. Personnel are assigned, equipments are allocated, and material requirements are determined separately in each unit. Their records in the database are also created by the project managers.

After the completion of models other than course book DEDU holds another meeting to discuss course delivery materials to integrate with each other by the participation of all project managers responsible for the design and production of course delivery materials for the ongoing course design process. During this meeting, standards for all delivery materials are set. For further stages of the design and production processes of each media, these standards are taken into consideration. In order to keep in contact with project managers, DEDU arranges monthly meetings.

Once design process of the course book is completed, master copy of the book is sent to printing press to initiate printing of the book with the information of how many copies are to be produced. Same logic also works in the printing process of the distance education course book. Printing press manager put into order this job considering facility's existing workload. Then he creates records about resources used during the production process like materials, personnel, machines.

All materials and equipments used during the design and production process of the course delivery materials must be defined prior to the assignments and allocations as in the case of personnel assignments. Records about the materials and equipments are provided by the purchasing department of the university; whereas personnel records are provided by the personnel department of the university.

After the completion of the course delivery materials, they are tested on a small-scale target group. According to the experimentation results derived from the implementation of course delivery materials on a small-scale target group DEDU decides whether academic counseling service is needed or not. If they conclude that such a service is needed, DEDU contacts with the vice dean responsible for the arrangement of academic counseling services throughout the country.

The number of copies to be produced of each course book is also determined by DEDU in coordination with the vice dean responsible for the course book design and production. This is especially important for the course books since highest volume of reproduction is in course books. Related records are also generated by DEDU. Since reproduction of the CDs that include computer assisted education software is made by subcontractors, this process is not taken into consideration in the database.

Test preparation and examination is the last activity that takes place in the course materials design process. This process happens after the course is started to be offered. Organization of this process is handled by Test Research Center in coordination with university's computer center and under the supervision of DEDU. Test Research Center prepares the questions, computer center executes the examination. Records about the preparation of the questions are created by the Test Research Center; the only record about the execution of the examination, execution cost is created by computer center.

Processing of the proposed system mentioned above requires security measures in order to provide data consistency within itself. These security measures also help to prevent unauthorized personnel from making changes, deletions and updates in the

database. It also helps to keep confident special information like personnel affairs. To construct security measures, some security levels are defined. Here is the definition of security levels:

i. First Level: The users who are in the first security level can access to all tables, queries and forms only to read the records. It is defined for the management.
ii. Second Level is defined for DEDU personnel. They can reach all tables, queries and records at least to view the records. However, they can only add and delete records for the tables defined under their responsibility.
iii. Third Level is defined for project managers. They have the right to access tables, queries and forms for the entities defined as their responsibility. They can add and delete records for these tables.
iv. Fourth Level is defined for the personnel department. They have the right to access only personnel table and related forms. They can add and delete personnel records, as well as modifying them.
v. Fifth Level is defined for the purchasing department. They have the right to access material and equipment related tables and forms. They have full control on these data.
vi. Sixth Level is defined for the remaining personnel who can access all records except cost information.

5.5. Application of the Proposed System

In this section, application of the proposed system to the CAE software design and production process is presented. For the application, the software designed to support Ataturk's Principles and History of Revolution course is chosen since it is the last software that is designed and produced in Computer Assisted Education Unit. The design and production processes of the software last about two months. The software includes interactive learning tools, course book in PDF format, exercises, some parts of

the educational TV programs produced for the course. The software is planned to be delivered to the distant students in the beginning of 2001-2002 academic year.

During the system analysis phase, it is determined that main cost drivers of the CAE software are personnel, hardware and software. Additionally, special expenditures classification is used to handle the costs of the objects that cannot be classified in any other group mentioned above. In the subsequent sections, cost drivers and how they are traced to the design and production processes are presented.

5.5.1. Personnel Costs

Throughout the design and production processes as a total of 17 people has assigned with the tasks of the project. Four of them are outside the university; they were hired on hourly basis to accomplish realization of the production scenario. The rest of the personnel are the university personnel, except one of them they are all academicians.

For the university personnel, 22 personnel-assignment matches are observed. 13 of these assignments require royalty payments. Five of the university personnel have one task; seven of them have two different tasks, whereas one personnel has three assignments.

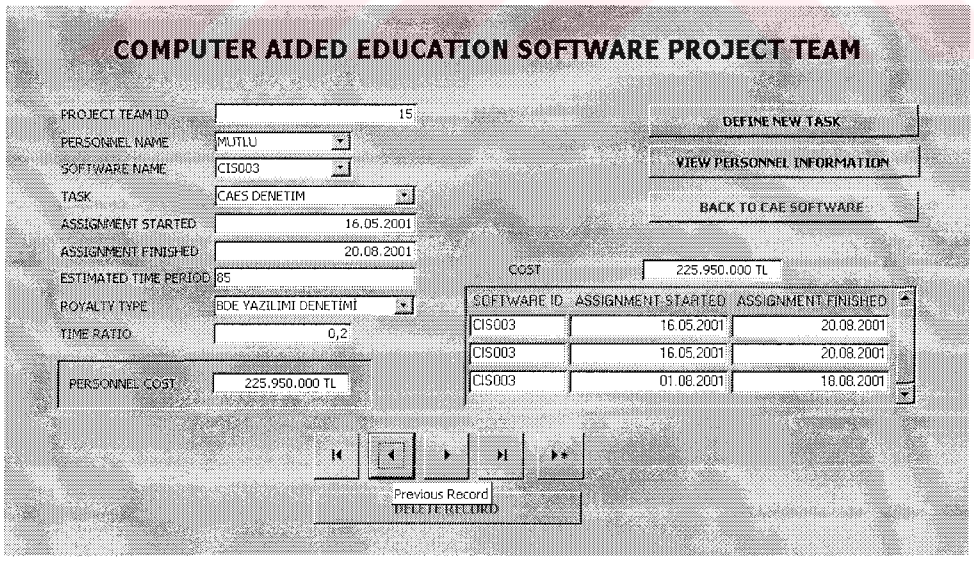


Figure 5-1 Example Personnel Assignment Record

As can be seen from the Figure 5-1, for each assignment there are another record in the system. At the lower-left-hand of the figure, personnel cost represents total cost of this task; that is royalty payment plus cost incurred by the allocation of working hours to the task. Time ratio defines what proportion of the working hours allocated to this task throughout the assignment period. At the right-hand-side of the figure we understand that this person has two more assignments in the project.

Summation of the all assignments' costs gives the total personnel cost of the project.

5.5.2. Hardware Costs

Hardware costs composed of operating costs of the hardware plus depreciation traced to particular assignment on the basis of assignment period. For this particular CAE software project three different personal computers are used for different purposes. These are transformation of production scenario into computer program, transformation of ETV programs to computer environment and creation of computer screens. For each hardware, there are records about the assignment periods.

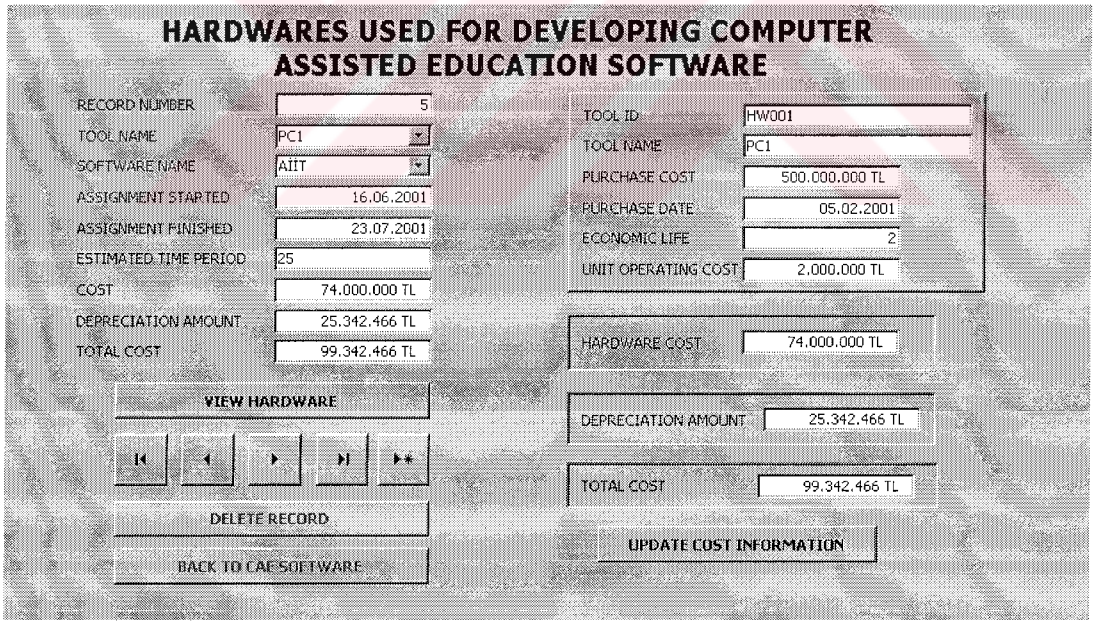


Figure 5-2 Example Hardware Assignment Record

For each assignment, hardware operating cost and depreciation incurred are calculated separately. Information about the operating cost and depreciation of an example hardware assignment can be seen at the lower-right-hand side of the Figure 5-2.

5.5.3. Software Costs

It is clear that no hardware can be used without software. Assignment period of software is same as the assignment period of hardware used within. Costs of the software used composed of simply depreciation of them traced to particular project.

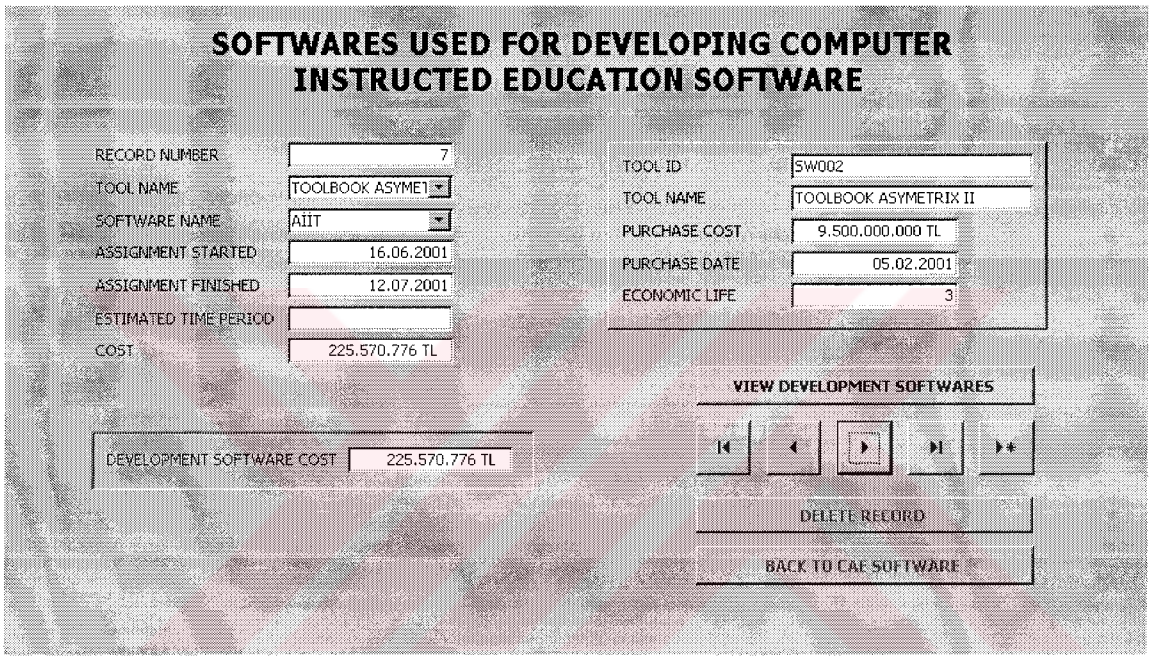


Figure 5-3 Example Software Assignment Record

The record in Figure 5-3 is about the Asymetrix ToolBook II software used to transform production scenario to computer program. "Development Software Cost" figure at the lower-left-hand side of the Figure 5-3 represents the depreciation amount calculated for the 26 days, that is the assignment period of the software for this project.

5.5.4. Special Expenditures

Under the classification of special expenditures there are three different payments for this particular project. These are fees paid to hired programmers, course book's charge and charges for the ETV programs.

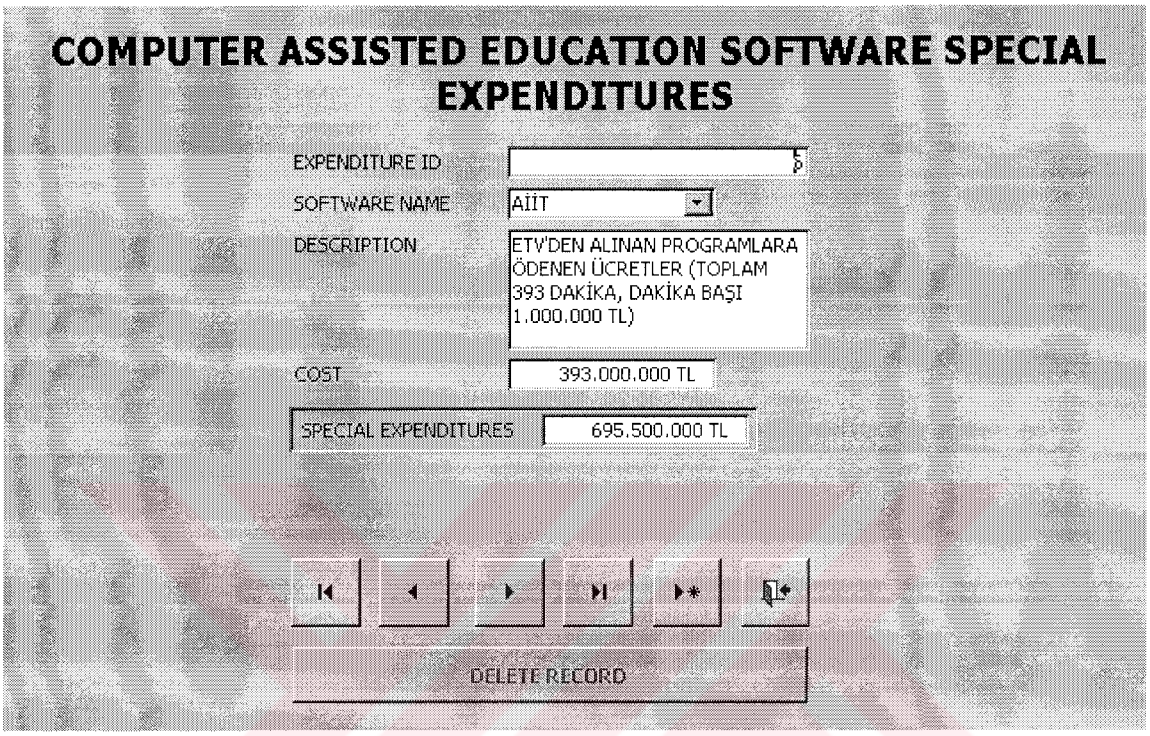


Figure 5-4 Example Record for Special Expenditures

In the Figure 5-4, cost of the ETV programs demanded from the Educational TV Production Center is represented. As can be seen from the figure, cost of the ETV programs 393 million TL; one million TL per minute of ETV program. Below the cost figure, special expenditures figure shows the total cost of special expenditures made for the project.

5.5.5. Total Cost

Once all cost objects' incurred costs are calculated by using the system, Total cost of the software can be viewed. In order to see this information, user should simply click the "View Cost Information" button on the form represented in the Figure 5-5

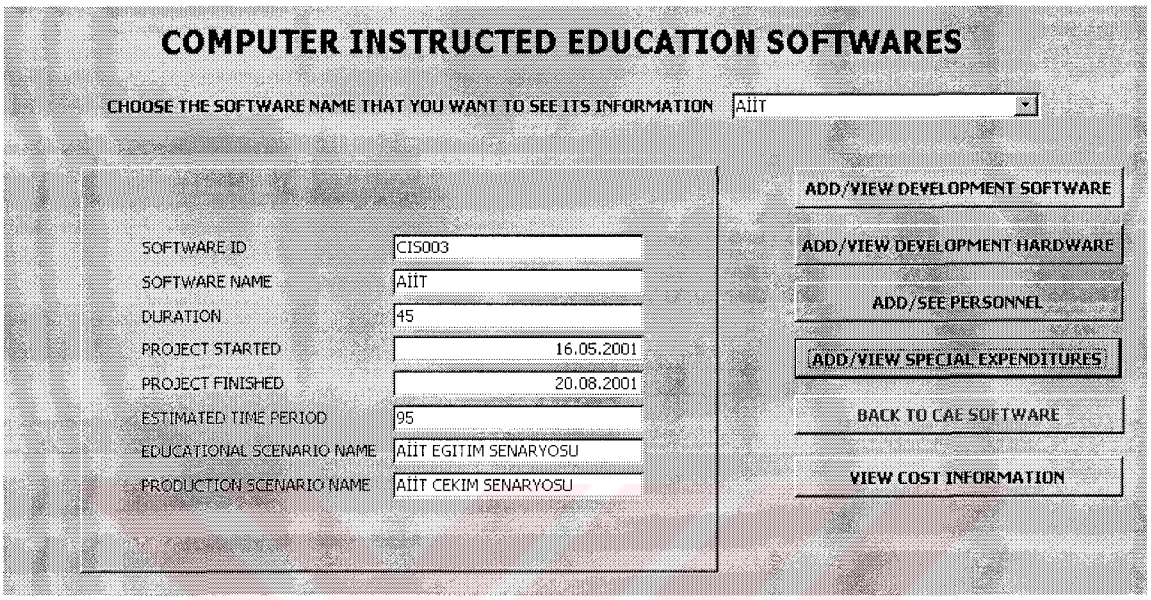


Figure 5-5 Computer Instructed Education Software Form

Once the "View Cost Information" button is clicked, the form which represents total cost of each classification opens. The form which includes cost figures is represented in Figure 5-6.

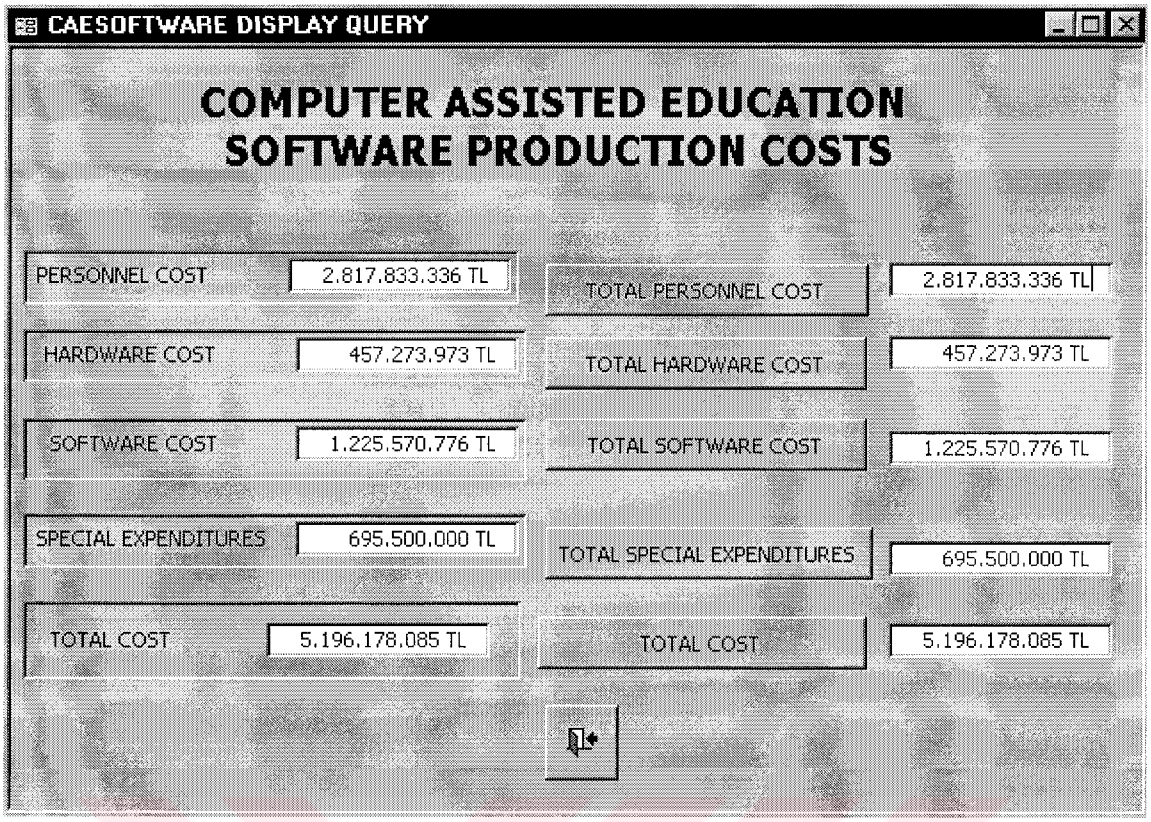


Figure 5-6 Cost Figures of the Ataturk's Principles and History of Revolution Course's Software

As can be seen from the figure, total cost of the design and production processes of the software is about 5,2 billion TL.

5.6. Calculation of the Costs with the Current Approach

In this section, in order to make comparison of the proposed system with the existing costing approach, calculation of the costs of design and production activities are made by using existing costing approach. To accomplish this, again proposed system is utilized however, only cost objects that are used by the current system are to be taken into account. That is, only royalty payments and costs of hired personnel are calculated. This can be done simply setting personnel's wages to zero and removing software, hardware and special expenditures except for the hired personnel.

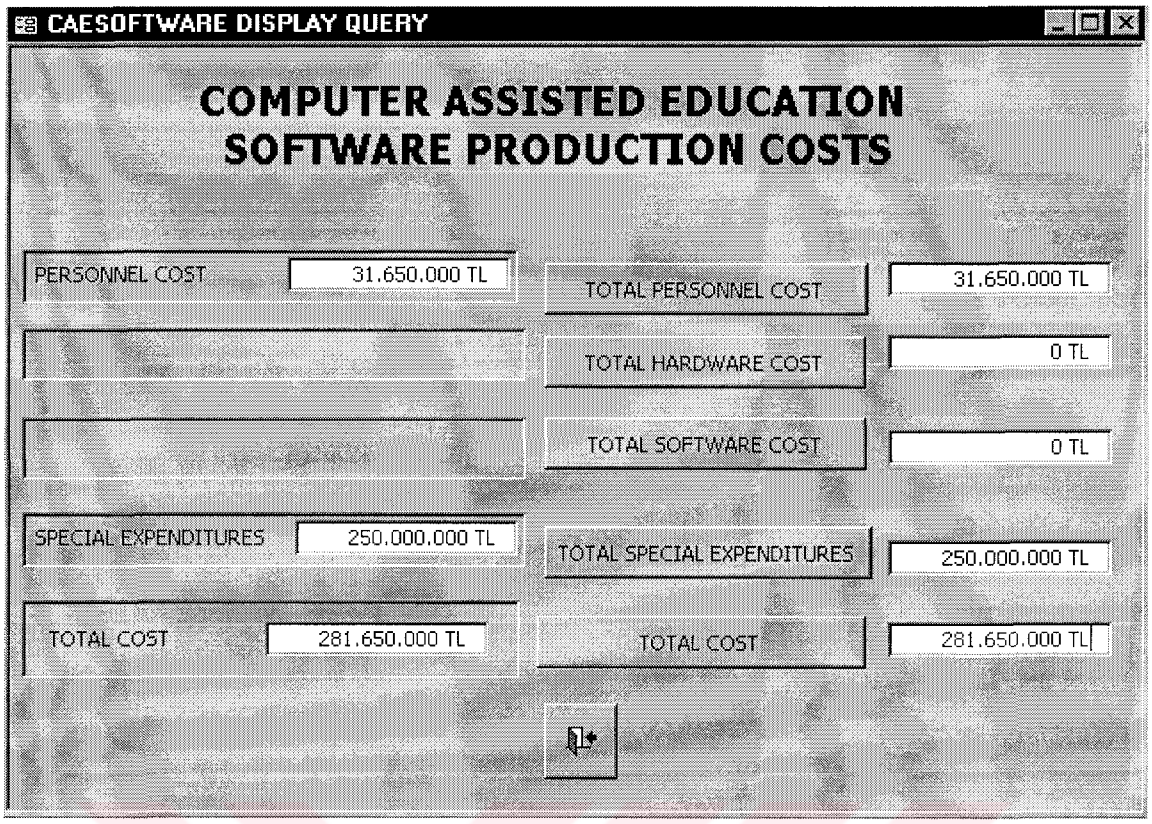


Figure 5-7 Total Cost of the Software by Using Current Costing Approach

When the costing of the project is made by using current costing approach, calculated cost figures cover only a small proportion of the costs of the design and production activities. By using current system, cost of the project is calculated as 281 million TL.

5.7 Results

From the results of the two costing approaches it can be said that since proposed system covers all the direct costs incurred during the design and production processes of the project, its results more accurate. Proposed system also provides information about the origin of the costs. Although current costing approach is used within the proposed system, the actual application of the current system does not have records in computerized environment. To sum up, proposed system offers three distinct features. The first one is that it provides more accurate cost information than the current system

since it covers all direct costs. The second is that by using the proposed system, decision-makers can also be informed about the origin of the costs. Last feature of the proposed system is that since information are kept in a computerized environment; access to needed information is easier.

To calculate the production and design costs of the project with the current system, cost data of the proposed system is modified. This gives an idea about the capabilities of the proposed system about responding what-if scenarios. The user can question many different situations by modifying values of the parameters that exist in the proposed system

CHAPTER 6

CONCLUSION AND FUTURE WORK

Distance education systems have been gaining popularity among many of the universities in Turkey in recent years. The success of a distance education system depends on the quality of delivery materials used. Course delivery materials should be designed and produced in a way that the users, distant students, perceive those materials as a whole complementing each other and they must offer a perfect study environment to distant students. Hence course delivery materials design process has a special position among all of the other activities necessary to conduct distance education. This process needs to be defined well and should be done in a systematic approach, which takes into account its structure.

The distance education systems continue to promise education opportunities in the future for Turkey. Since the number of people to be educated is very big, it is expected that there are no revolutionary changes in the delivery media. However, existing materials could be improved with the help of state of the art technologies.

There are not so many things to be done with the course book. It preserves its importance as a delivery media. However, interaction of the course book with the other media may be improved. In line with this, newly developed technologies may be applied in the design of the printed materials to improve the success of self-learning.

The use of television as a supportive educational tool at the Open Education Faculty will continue in the coming years. Especially with the studies started by the DEDU, it has been aimed at using television more effectively and meeting the expectations of the students by planning the television together with the other materials. In the coming years, besides broadcasts of pre-prepared educational TV programs, live television broadcast and teleconferencing are expected to continue growing. Thus TV as an educational media will maintain its importance for the open education system of Anadolu University. Another improvement opportunity is provided by the potential of digital TV broadcasting technology. Using this, students could be given the opportunity of interaction, as well as the opportunity of watching the ETV program which they think they need.

Improvement efforts for the computer assisted education software have been initiated in the last few years. Initially these softwares were intended to be offered to the students at computer centers built in several regions. As the access of the students to the computers and the Internet improved recent years, these softwares are started to be made available on both the Internet and the CD-ROMs.

As the delivery of the ETV programs and the computer assisted education softwares are improved, it can be said that the need for the face-to-face sessions is started to be diminishing. But, for the students living in the regions that are economically less developed and suffering from the lack of technologies like digital TV and the Internet, Academic Counseling Service will maintain its importance.

For the measurement and assessment of the success of the students, multiple choice examination system can be thought as the only alternative when number of students are taken into consideration.

During course delivery materials design and production, enormous amount of data are used and created by different units of the university. However, these data are not

collected and stored in a systematic way; moreover, for most of the activities take place during design and production processes of course delivery materials, there is no recording system for the data generated. This situation leads to miscalculation of course design costs, misleading the cost reflections of the whole distance education system. Having this, comparisons of the costs of distance education system with of traditional education systems cannot be assumed as real and true comparisons. It also prevents managers from making thorough analysis of the distance education system, and evaluation of distant programs with respect to each other. It is also important to know how much it costs to design a distance education course as design and implementation efforts for distance education systems are increasing in many educational institutions.

Considering these, distance education course design process is analyzed in this thesis. It is observed that although most of the units responsible from course delivery materials design and production activities have defined their processes for their own sake, there is no effort for integrating them into each other in spite of that the results are thought to be components of a whole course materials system. Some of the data used and created throughout the processes are stored by their respective responsible, however; the rest is not and even stored data are subject to losses very easily. Even each design process has its own properties; they can share same aspects from methodical point of view. Thus collecting the data about the activities that take place in design and production processes of course delivery materials represent a value for future design and production processes.

Hence, it is thought that the primary necessity for a database management system is collection of all the data used and created in a centralized manner and determination of the cost elements of all activities in the processes. Costing of these activities is assumed to be the responsibility of relevant units by means of cost data about the resources provided by purchase department and personnel department. However, costing figures used throughout the thesis are all hypothetic values since Open Education Faculty considers actual cost figures strictly confidential and they did not want to share their actual cost figures. In spite of costing being in the scope of the study, the actual cost

figures will be entered into the system after the database is started to be used as a closed system at the Open Education Faculty.

As a result, "Distance Education Course Design Database" for collecting, storing, maintaining and manipulating the cost elements' data related to course delivery materials design process is constructed within this thesis. It provides accuracy on data collection, storage and manipulation. This database also provides benefit from past experience and historical data, which has a special importance for designing materials, used and/or created on previous design processes. Another advantage of the database is the improvements in the processing of the current system in terms of time by preventing delays due to manual handling of the documents and quality by preventing data losses on previous similar design projects. The database is thought to be placed in a shared directory on the network under the supervision of Distance Education Design Unit since this unit has the responsibility of coordination of all design and production activities. Shared database enables users from different units to easily reach, retrieve or enter the required data. Since it is placed in a shared directory, security measures are designed to prevent the database from unauthorized accesses or changes on data.

The designed DBMS can serve for three different managerial decision levels. The first one is upper management; they can utilize the system for answering what-if scenarios like "what happens if three more educational TV programs are prepared for a course" or "how much extra cost is incurred if we use of better quality of paper in printing books" or "given the cost information of the existing courses, how much would it cost if we start to offer a new program?" and many like. The DBMS can also be queried for the usage rates of the machines and equipment, which is valuable information for the new investment decisions. Middle-level management can use the DBMS as a control tool for costing the activities that take place throughout the design and production processes of the course delivery materials. Middle level management; especially when for a new project, construction of a project team is needed, can use the DBMS as a guide to determine the personnel, since the DBMS also provides information about the tasks of each personnel assigned previously. And lastly, low-level

management can use the DBMS for keeping records about the assignments of the personnel, usage of equipments and consumption of materials. The DBMS also makes easier cost calculations, determination of depreciation amounts and tracking the depreciation of equipments

As mentioned in the Section 5.1.1, the designed system should not be considered as complete. It establishes a framework for structuring the elements of costing, although it only takes into account direct costs. From this point of view, one enhancement opportunity comes to the scene. In line with the other activities performed in units that are also responsible from accomplishing course delivery materials design and production processes, a module for distributing the indirect costs can be plugged into the database. However, this requires detailed analysis of all responsibilities of each unit and determination of rules for allocation of indirect costs.

The most widely used comparison between distance education systems and the traditional education system is the one based on cost per student. The present database provides cost figures for whole cost as well as its components but not cost per student. Adding a new module that calculates cost per student make the analysts' job easier while comparing these two educational systems.

The system receives cost data about the personnel and the equipments and materials from the personnel and purchase departments respectively. This situation increases the workload of the personnel working in these departments. However, the integration of existing accounting system with the database can overcome this problem and increase the performance and the accuracy of the database.

As a conclusion, "Distance Education Course Design Database" is built in order to support the structuring of the cost elements and costing them in a computerized environment. In the meantime, it provides a reliable tool for the Open Education Faculty to refer and store previously used and created data.

REFERENCES

[1] Daniel, J.S. *Mega-Universities and Knowledge Media Technology-Strategies for Higher Education*, London, Kogan Page Limited 1998.

[2] Murphy, K. *Enhancing Interaction in Turkish Distance Education*, 1st International Distance Education Symposium, Turkey, November 13-15, Ankara 1996.

[3] Odabasi, F. and Kaya, Z. *"Distance Education in Turkey: Past, Present and Future"*, The Journal of Distance Education published by the Turkish Distance Education Foundation, Winter, 62-68; 1998.

[4] TUBITAK-BILTEN *Feasibility Analysis of Nation-Wide Distance Education Alternatives,* Kocaoglan et al (Ed), Ankara (unpublished project report) 1997.

[5] Elliot, G. and Starkings, S. *Business Information Technology, Systems, Theory and Practice* Addison Wesley Longman Limited 1998.

[6] Laudon, K.C. and Laudon, J.P. *Essentials of Management Information Systems Organization and Technology in the Networked Enterprise* Prentice Hall International (UK) Limited, London 2001.

[7] OZKUL, A.E. *Anadolu University Distance Education System, From Emergence to 21st Century* The Turkish Online Journal of Distance Education, TOJDE, January 2001, Volume: 2 Number: 1 <http://tojde.anadolu.edu.tr>

[8] Haag, S. Cummings, M Dawkins, J. *Management Information Systems for the Information Age 1st Ed.* Irwin/McGraw-Hill, Boston 1998.

[9] Gordon, S.R. Gordon, J.R. *Information Systems, A Management Approach* The Dryden Press, Harcourt Brace College Publishers, Fort Worth 1995.

[10] McFadden, F.R. Hoffer, J.A. Prescott, M.B. *Modern Database Management Fifth Edition;* Addison Wesley World Student Series, Massachusetts 1999.

[11] Tezsezen, Şebnem, *Designing an Information Subsystem for Managing Bid Preparation Process* (Master Thesis) Industrial Engineering Department, METU, Ankara, June 2000.

[12] Uysal Mithat, *Access 2000 ile Veri Tabanı Yönetimi;* Beta Basım Yayım Dağıtım A.Ş., Istanbul 2000.

[13] Rumble, G., *The Costs and the Economics of Open and Distance Learning;* Kogan Page Limited, London 1997

[14] McIsaac, M.S., Gunawardena, C.N. *Distance Education.* <http://seamonkey.ed.asu.edu/~mcisaac/dechapter/index.html> 1996.

[15] Verduin, J.R., Jr., and T.A. Clark, *Distance Education: The Foundations of Effective Practice*. Jossey-Bass, San Francisco, 1991.

[16] Willis, B. editor, *Distance Education: Strategies and Tools* Englewood Cliffs, N.J.: Educational Technology Publications, 1994.

[17] Rao, K. Koteswara. *"Course Material Distribution: Dr B. R. Ambedkar Open University's Experience." In Dr. B. R. Ambedkar Open University, Distance Education: An Interface—JA Commemorative Volume of Research Articles to Mark the Inauguration of the New Campus of Dr. B. R. Ambedkar Open University.* Jubilee Hills, Hyderabad, 1994.

[18] Holmberg, B. *Theory and Practice of Distance Education 2nd ed.,* Routledge Series in Distance Education, 1995.

[19] Demiray, E. et al *Distance Education And Educational TV Producing Process: The Role Of Educational TV Programs As Being One Of The Educational Components In Distance Education Systems And Production Process Of Educational TV Programs In Open Education Faculty Anadolu University-Turkey* TOJDE January 2000 Volume: 1 Number: 1 <http://tojde.anadolu.edu.tr>

[20] Sağlık, M., Öztürk, S. *Television As An Educational Technology: Using Television At Open Education Faculty,* Anadolu University TOJDE January 2001 Volume: 2 Number: 1 <http://tojde.anadolu.edu.tr>

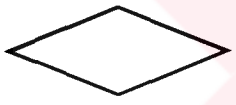
[21] Mutlu, M.E. *BDE Ders Yazilimi Tasarimi Istatistik Dersi Ornegi* BDE Birimi Calisma Raporu, Anadolu University, 1992

[22] Steven R., *Access database design & programming.* 1st ed. O'Reilly, Cambridge 1997.

APPENDIX A

ENTITY RELATIONSHIP DIAGRAMS

In this Appendix, Entity-Relationship diagrams are presented for the proposed database. The legend for these diagrams is as follows:

SYMBOL	MEANING
	Entity Type
	Relationship
	Attribute
	Primary attribute
	Foreign Attribute

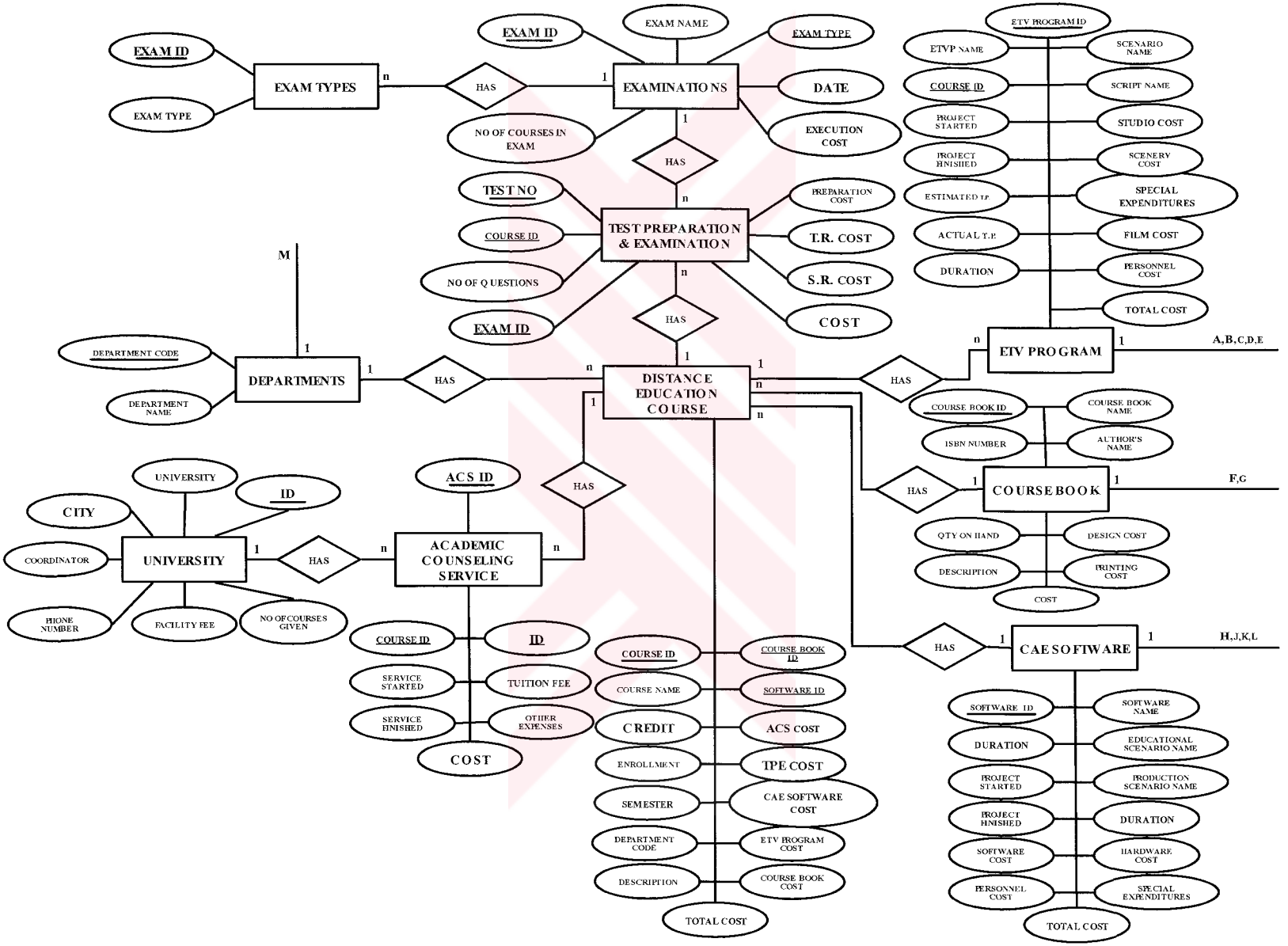


Figure A-1 Distance Education Course Design Database Management System E-R Diagram

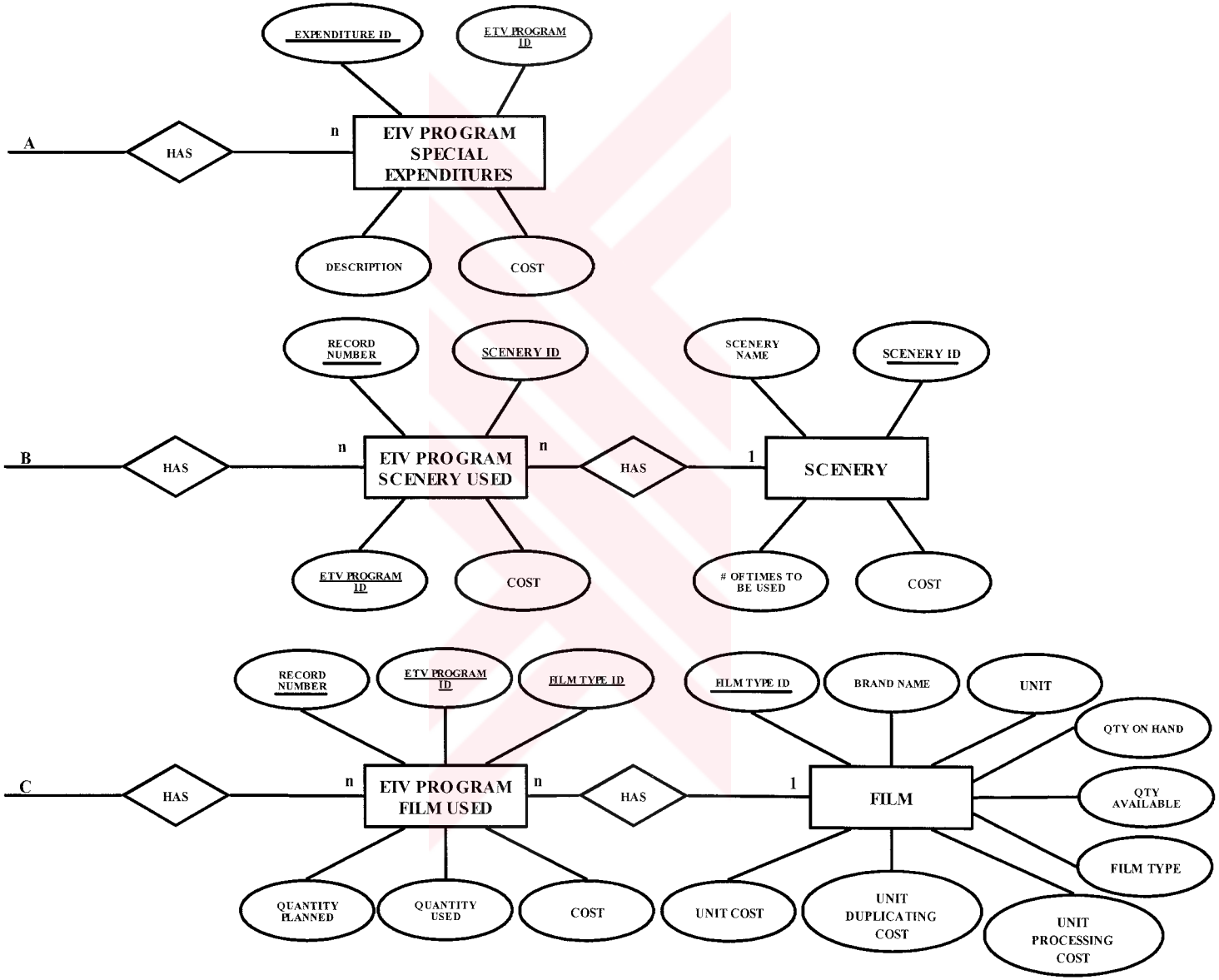


Figure A-1 (Continued) Distance Education Course Design Database Management System E-R Diagram

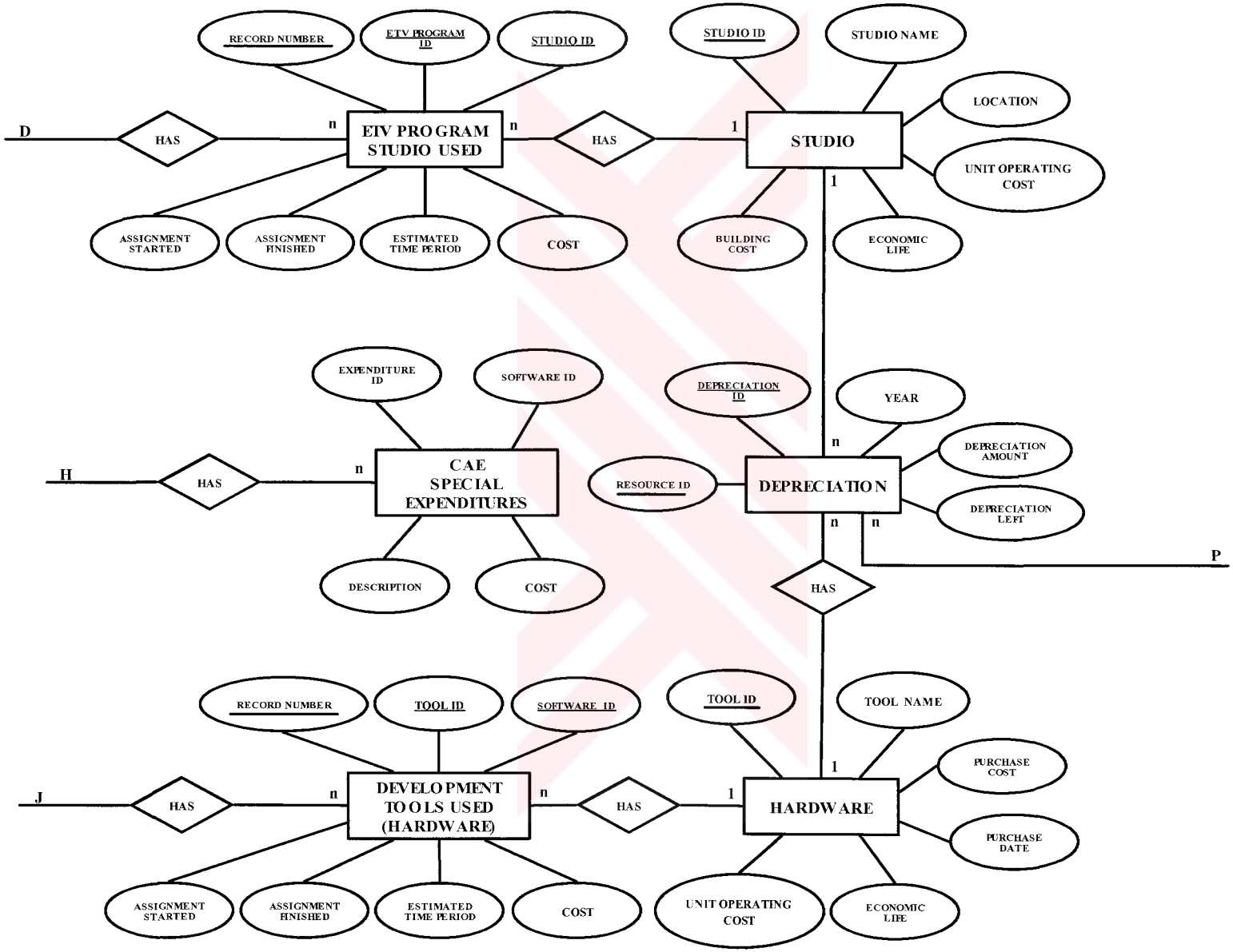


Figure A-1 (Continued) Distance Education Course Design Database Management System E-R Diagram

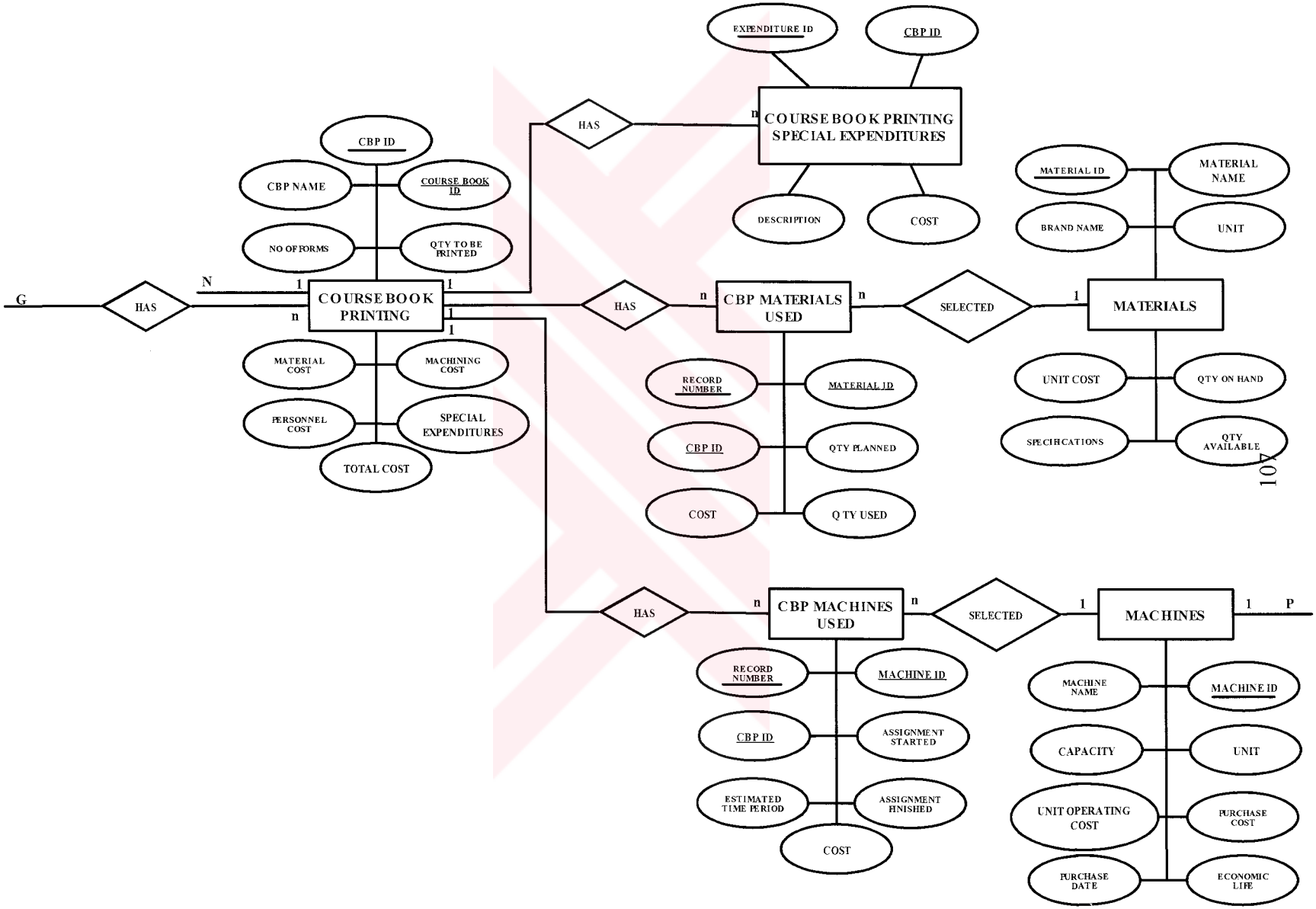


Figure A-1 (Continued) Distance Education Course Design Database Management System E-R Diagram

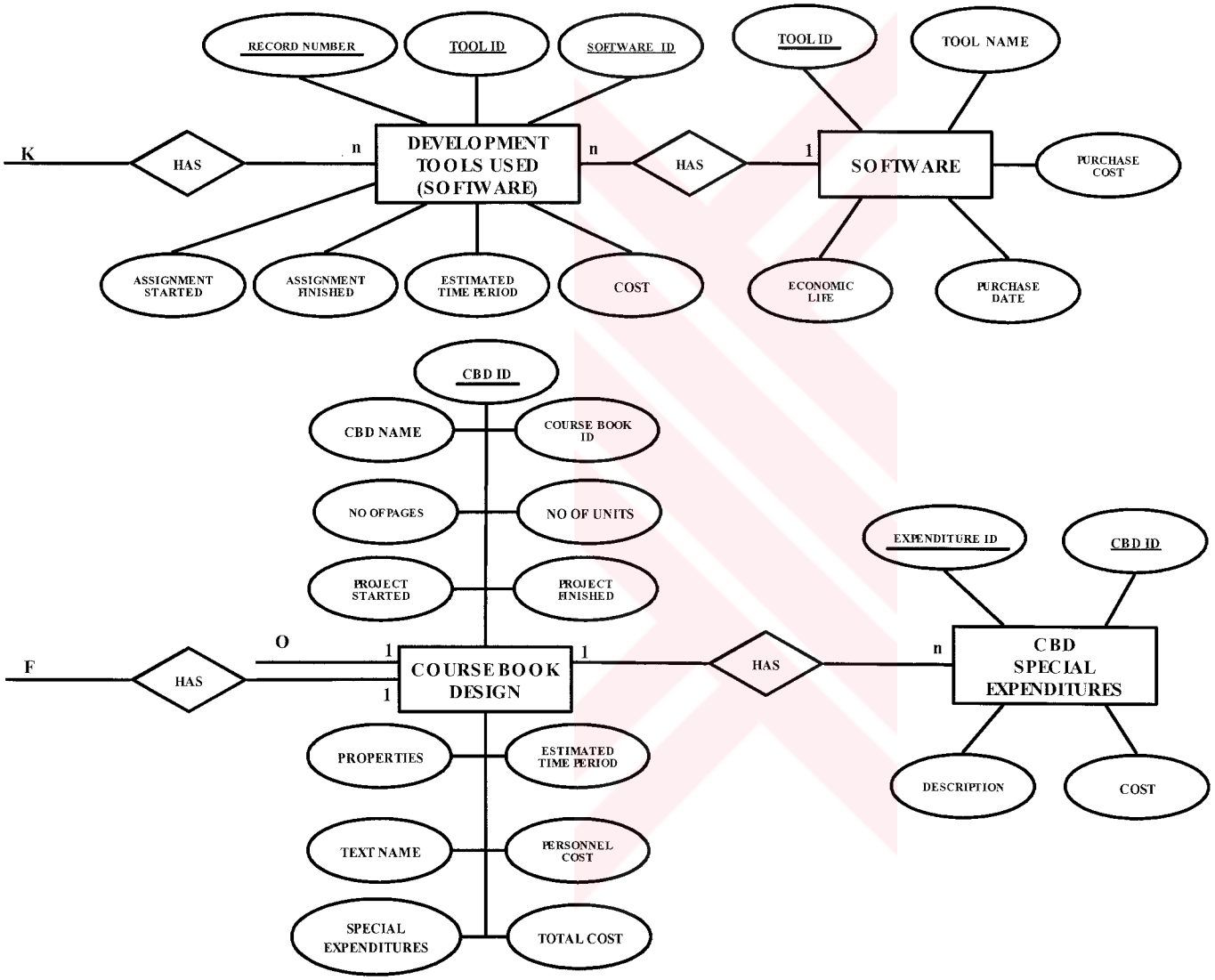


Figure A-1 (Continued) Distance Education Course Design Database Management System E-R Diagram

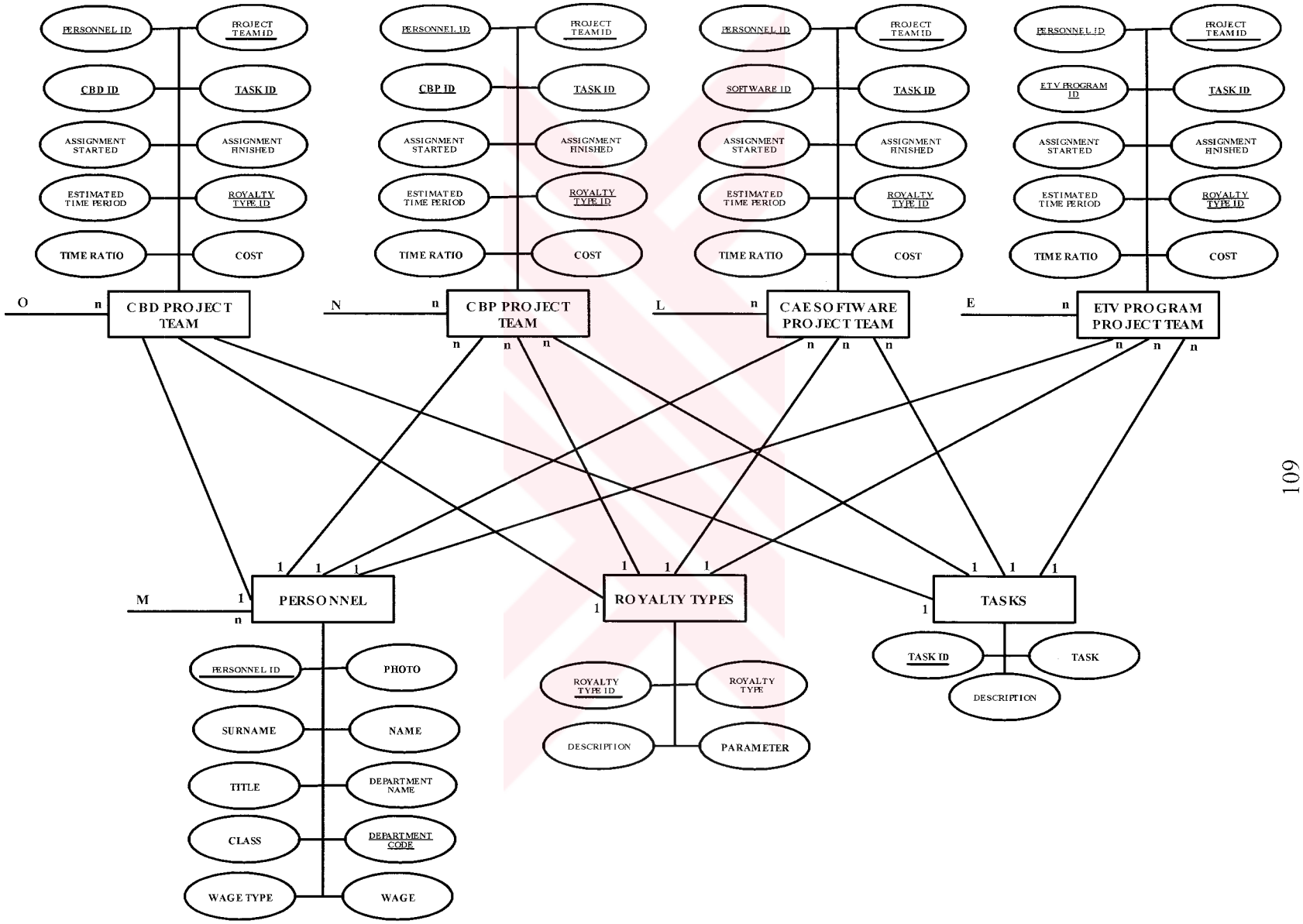


Figure A-1 (Continued) Distance Education Course Design Database Management System E-R Diagram

APPENDIX B

ENTITIES AND THEIR DEFINITIONS

In this Appendix, Entities and their definitions are presented for the proposed database.

Table B-1 Entities and their Descriptions

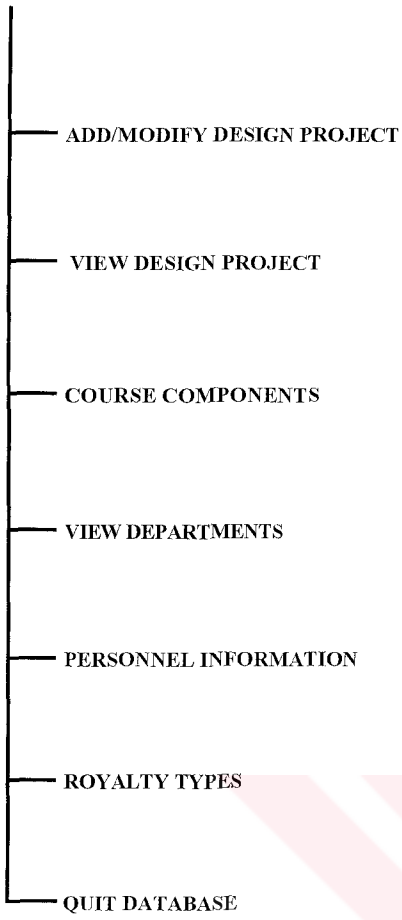
ENTITY NAMES	ENTITY DESCRIPTIONS
ACS	Provides academic counseling service information
CAE Software	Provides Computer Assisted Education Software information
CAE Special Expenditures	Provides information of costs made for CAE Software and cannot be classified in any other table
CAES Project Team	Interrelates Computer Assisted Education Software projects with personnel
CBD Project Team	Interrelates course book design with personnel
CBD Special Expenditures	Provides information of costs made for course book design and cannot be classified in any other table
CBP Machines Used	Interrelates course book printing with machines
CBP Materials Used	Interrelates course book printing with materials
CBP Project Team	Interrelates course book printing with personnel
CBP Special Expenditures	Provides information of costs made for course book printing and cannot be classified in any other table
Course Book	Provides course book information
Course Book Design	Provides course book design information
Course Book Printing	Provides course book printing information
Departments	Provides department information
Depreciation	Provides depreciation information
Development Tools Used HW	Interrelates CAE Software with hardware
Development Tools Used SW	Interrelates CAE Software with software
Distance Education Course	Provides distance education course information
ETV Program_Film Used	Interrelates ETV_Program with film
ETV Program_Scenery Used	Interrelates ETV_Program with scenery
ETV Program_Studio Used	Interrelates ETV_Program with studio
ETV Special Expenditures	Provides information of costs made for ETV_Program and cannot be classified in any other table
ETVProject Team	Interrelates ETV_Program with personnel
ETV_Program	Provides ETV program information
Examinations	Provides examination information
Exam Types	Provides examination type information
Film	Provides film information
Hardware	Provides hardware information
Machines	Provides machine information
Materials	Provides material information
Personnel	Provides personnel information
Royalty Types	Provides royalty type information
Scenery	Provides scenery information
Software	Provides software information
Studio	Provides studio information
Tasks	Provides task information
Test Preparation&Examination	Provides test preparation&examination information
University	Provides university information

APPENDIX C

MENU STRUCTURE OF THE DISTANCE EDUCATION COURSE DESIGN DATABASE

In this Appendix, the menu structure of the proposed "Distance Education Course Design Database" is presented.

DISTANCE EDUCATION COURSE DESIGN DATABASE



ADD/MODIFY DESIGN PROJECT

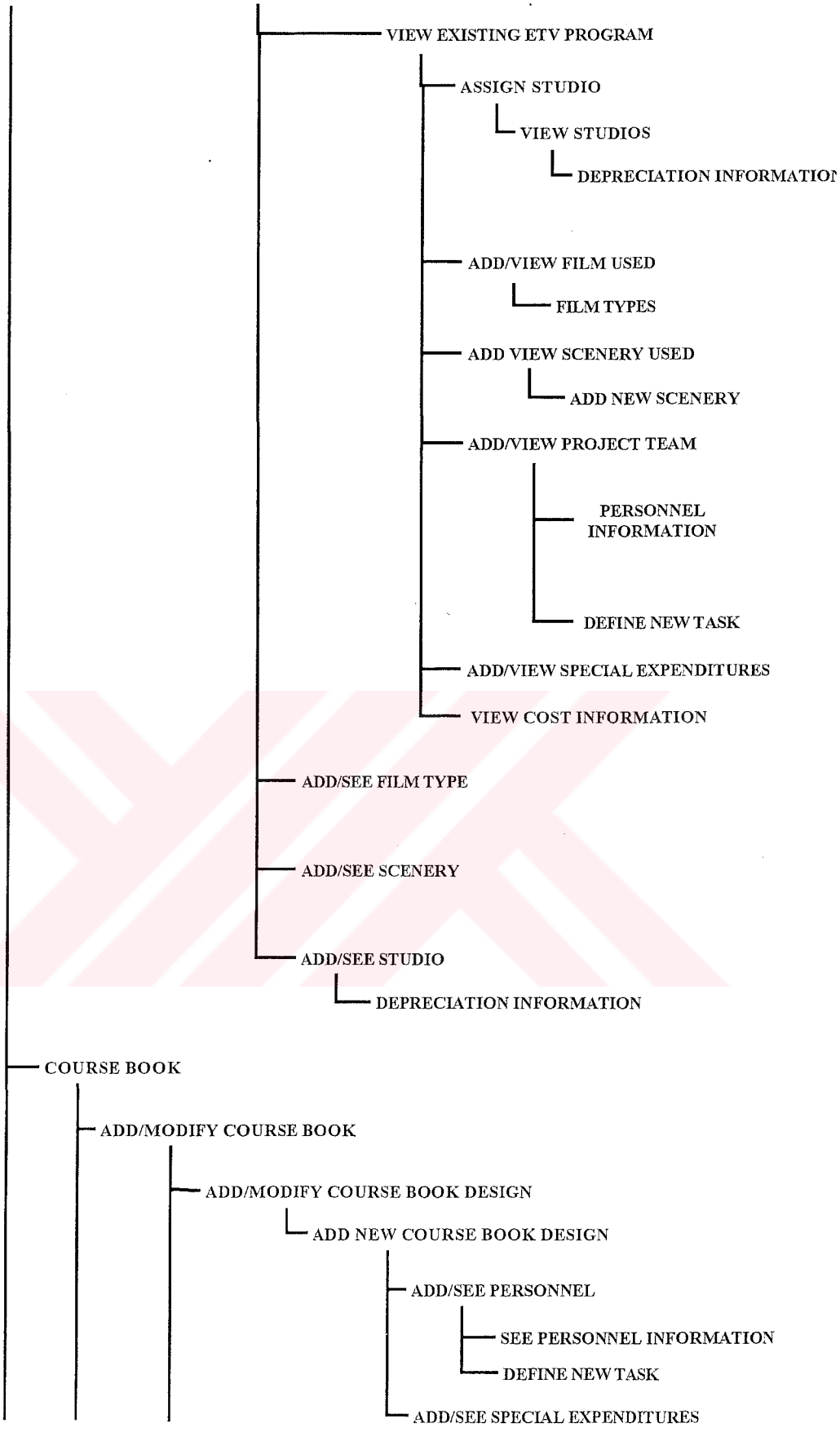
- VIEW DEPARTMENTS

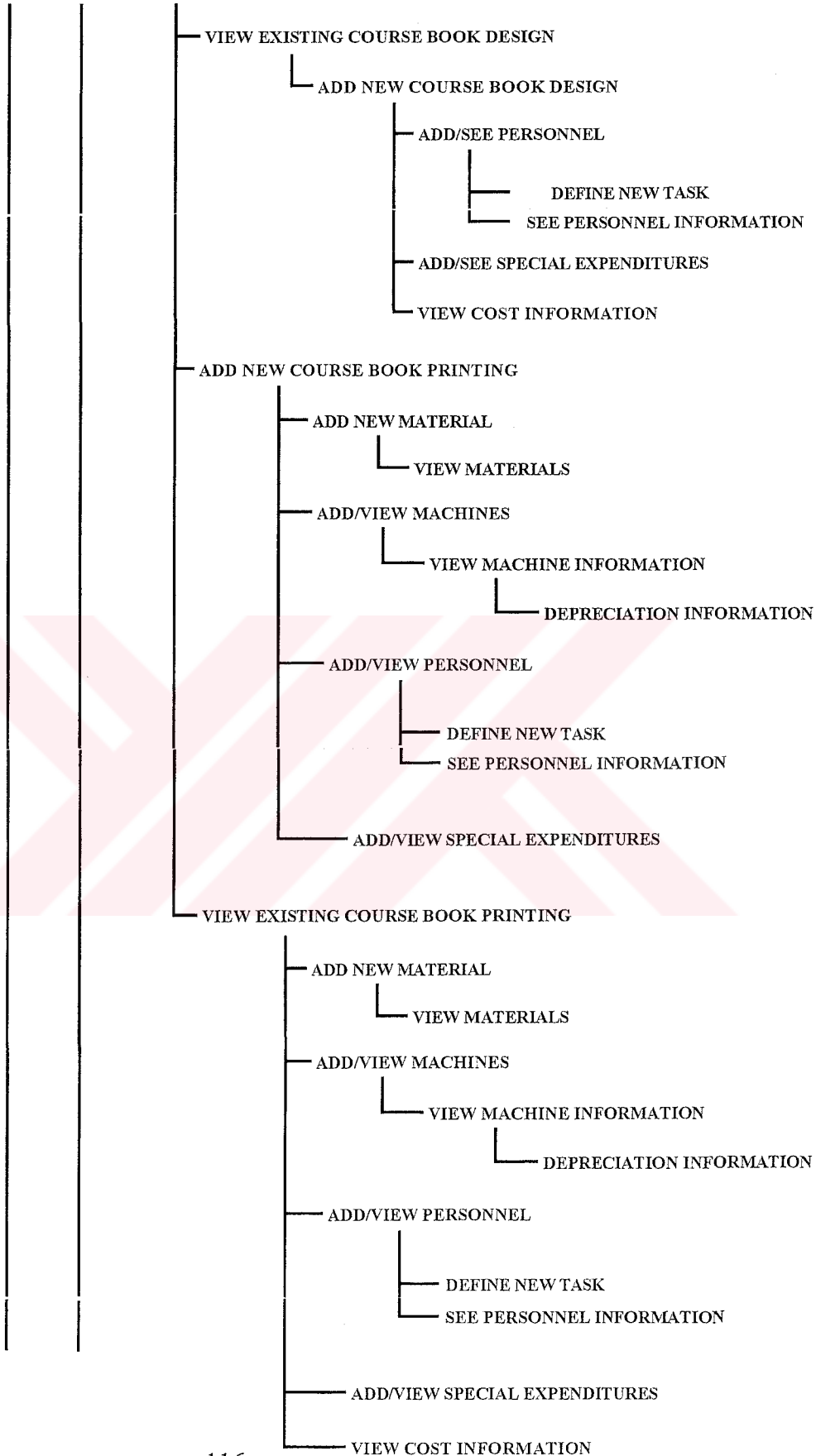
VIEW DESIGN PROJECT

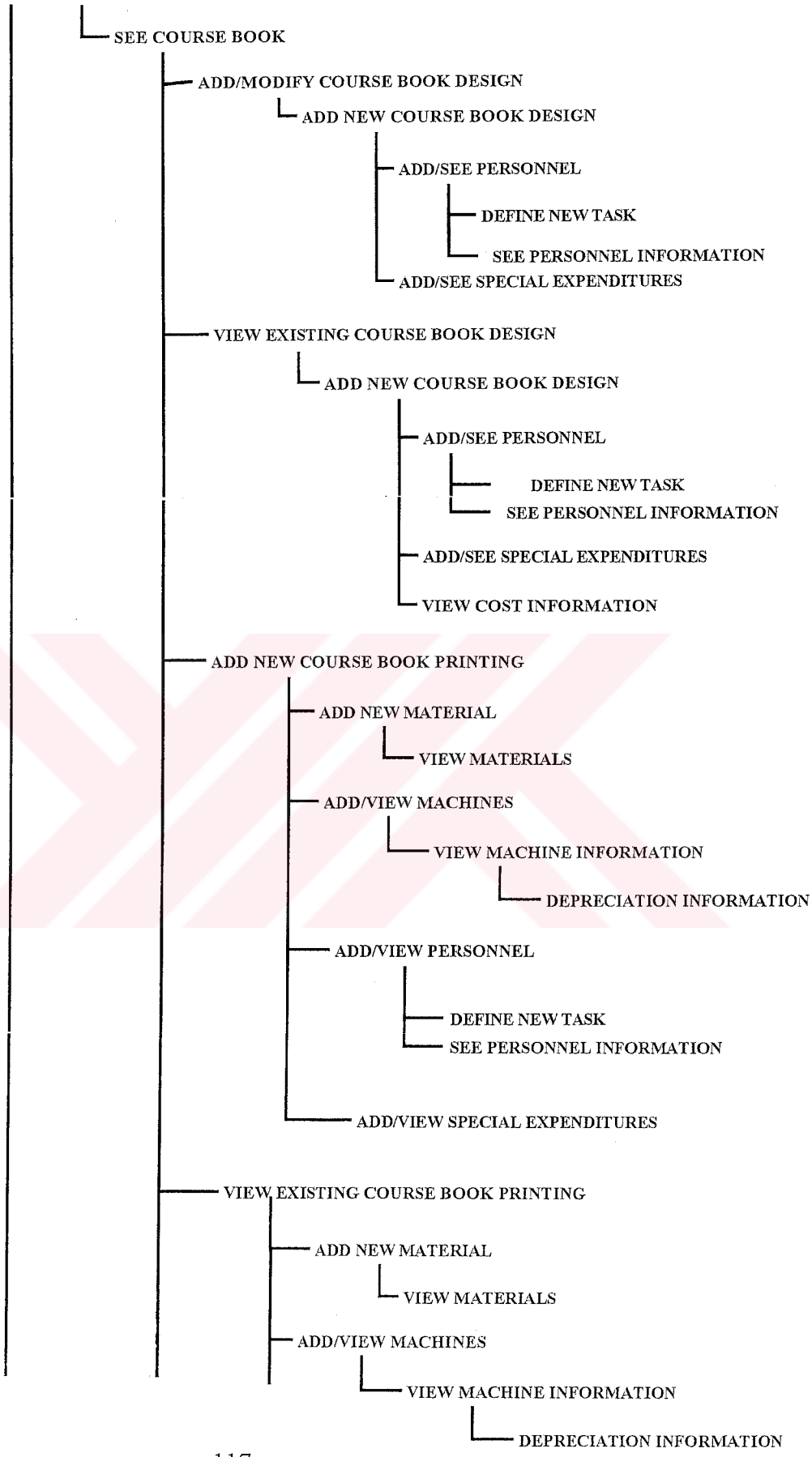
- VIEW DEPARTMENTS
- VIEW COST INFORMATION

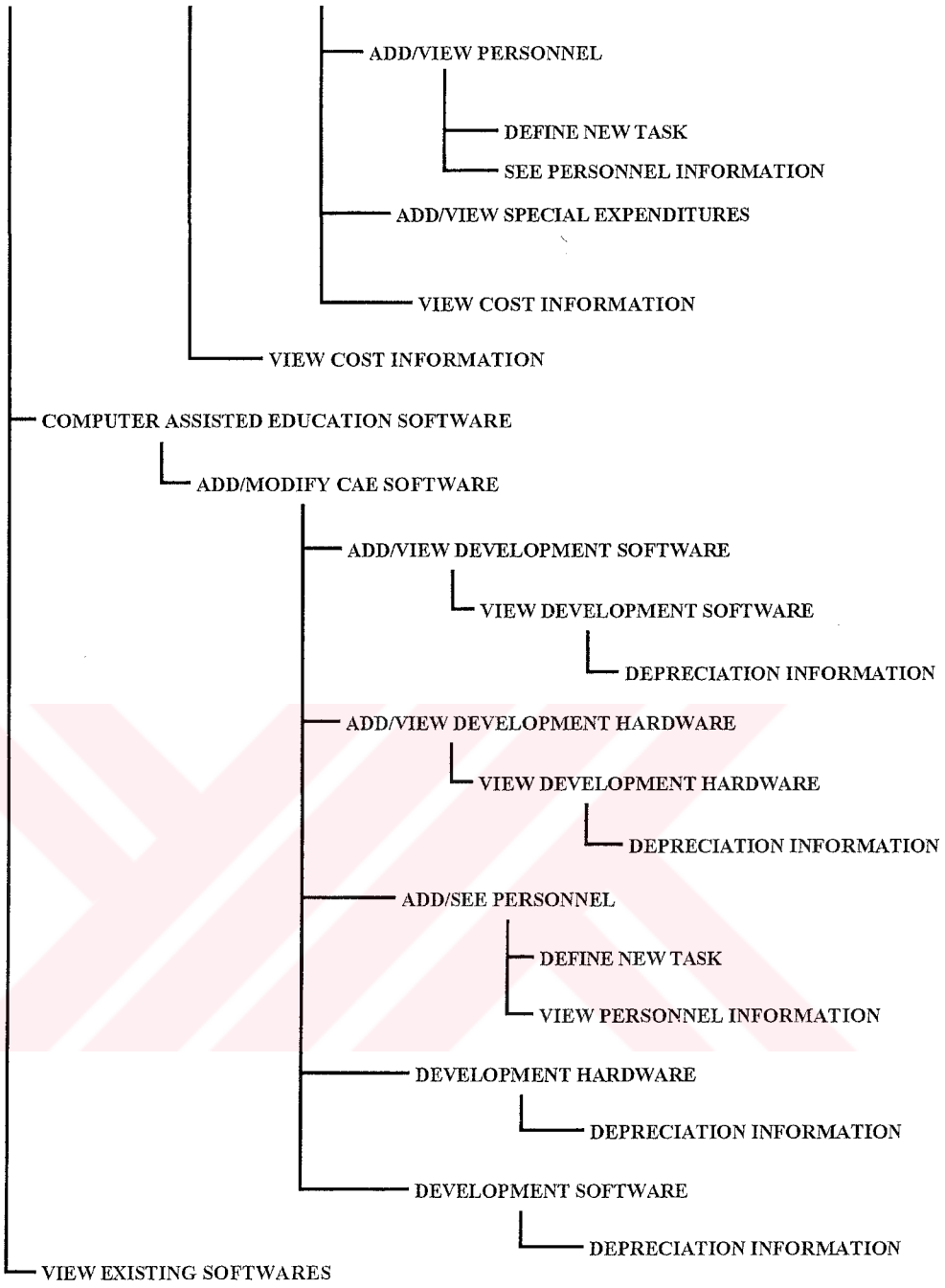
COURSE COMPONENTS

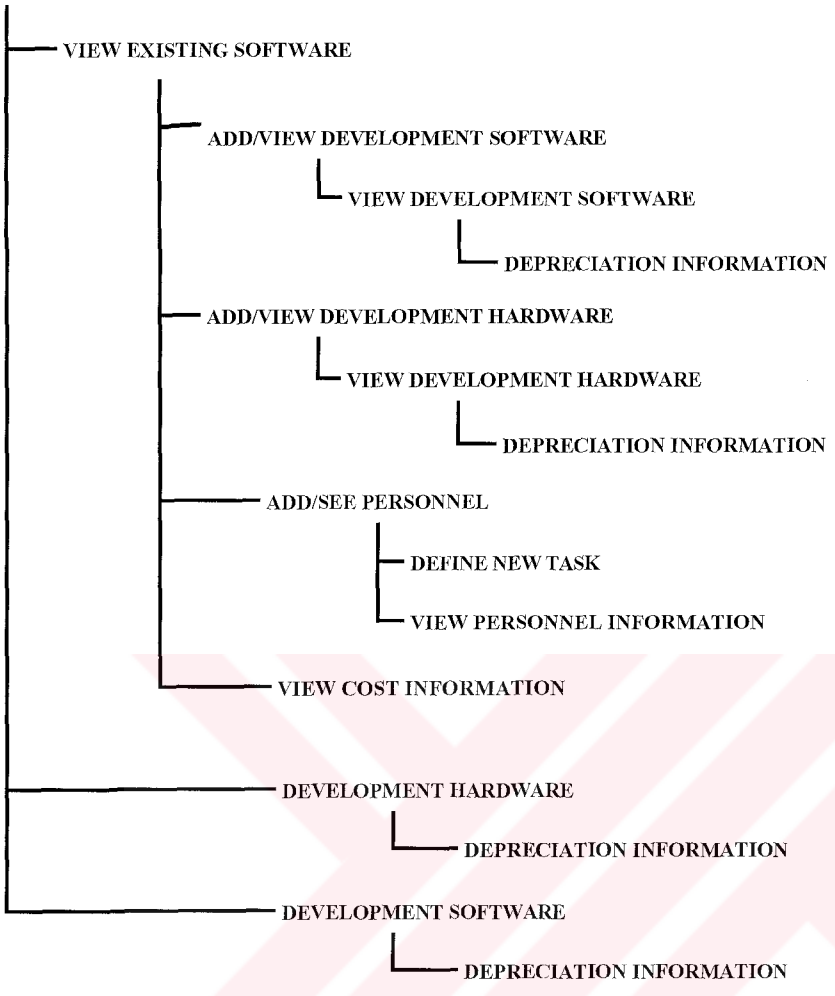
- ACADEMIC COUNSELING SERVICE
  - UNIVERSITIES
- EDUCATIONAL TV PROGRAM
  - ADD/MODIFY ETV PROGRAM
    - ASSIGN STUDIO
      - VIEW STUDIOS
        - DEPRECIATION INFORMATION
    - ADD/VIEW FILM USED
      - FILM TYPES
    - ADD VIEW SCENERY USED
      - ADD NEW SCENERY
    - ADD/VIEW PROJECT TEAM
      - PERSONNEL INFORMATION
      - DEFINE NEW TASK
    - ADD/VIEW SPECIAL EXPENDITURES

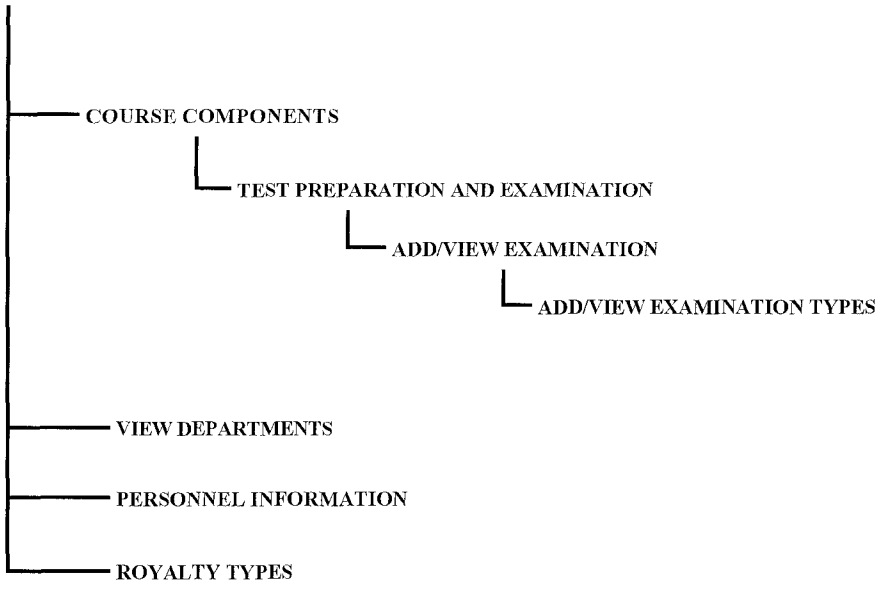

VIEW EXISTING ETV PROGRAM
ASSIGN STUDIO
VIEW STUDIOS
DEPRECIATION INFORMATIOI
ADD/VIEW FILM USED
FILM TYPES
ADD VIEW SCENERY USED
ADD NEW SCENERY
ADD/VIEW PROJECT TEAM
PERSONNEL INFORMATION
DEFINE NEW TASK
ADD/VIEW SPECIAL EXPENDITURES
VIEW COST INFORMATION
ADD/SEE FILM TYPE
ADD/SEE SCENERY
ADD/SEE STUDIO
DEPRECIATION INFORMATION
COURSE BOOK
ADD/MODIFY COURSE BOOK
ADD/MODIFY COURSE BOOK DESIGN
ADD NEW COURSE BOOK DESIGN
ADD/SEE PERSONNEL
SEE PERSONNEL INFORMATION
DEFINE NEW TASK
ADD/SEE SPECIAL EXPENDITURES


VIEW EXISTING COURSE BOOK DESIGN
ADD NEW COURSE BOOK DESIGN
ADD/SEE PERSONNEL
DEFINE NEW TASK
SEE PERSONNEL INFORMATION
ADD/SEE SPECIAL EXPENDITURES
VIEW COST INFORMATION
ADD NEW COURSE BOOK PRINTING
ADD NEW MATERIAL
VIEW MATERIALS
ADD/VIEW MACHINES
VIEW MACHINE INFORMATION
DEPRECIATION INFORMATION
ADD/VIEW PERSONNEL
DEFINE NEW TASK
SEE PERSONNEL INFORMATION
ADD/VIEW SPECIAL EXPENDITURES
VIEW EXISTING COURSE BOOK PRINTING
ADD NEW MATERIAL
VIEW MATERIALS
ADD/VIEW MACHINES
VIEW MACHINE INFORMATION
DEPRECIATION INFORMATION
ADD/VIEW PERSONNEL
DEFINE NEW TASK
SEE PERSONNEL INFORMATION
ADD/VIEW SPECIAL EXPENDITURES
VIEW COST INFORMATION


SEE COURSE BOOK
ADD/MODIFY COURSE BOOK DESIGN
ADD NEW COURSE BOOK DESIGN
ADD/SEE PERSONNEL
DEFINE NEW TASK
SEE PERSONNEL INFORMATION
ADD/SEE SPECIAL EXPENDITURES
VIEW EXISTING COURSE BOOK DESIGN
ADD NEW COURSE BOOK DESIGN
ADD/SEE PERSONNEL
DEFINE NEW TASK
SEE PERSONNEL INFORMATION
ADD/SEE SPECIAL EXPENDITURES
VIEW COST INFORMATION
ADD NEW COURSE BOOK PRINTING
ADD NEW MATERIAL
VIEW MATERIALS
ADD/VIEW MACHINES
VIEW MACHINE INFORMATION
DEPRECIATION INFORMATION
ADD/VIEW PERSONNEL
DEFINE NEW TASK
SEE PERSONNEL INFORMATION
ADD/VIEW SPECIAL EXPENDITURES
VIEW EXISTING COURSE BOOK PRINTING
ADD NEW MATERIAL
VIEW MATERIALS
ADD/VIEW MACHINES
VIEW MACHINE INFORMATION
DEPRECIATION INFORMATION


ADD/VIEW PERSONNEL
DEFINE NEW TASK
SEE PERSONNEL INFORMATION
ADD/VIEW SPECIAL EXPENDITURES
VIEW COST INFORMATION
VIEW COST INFORMATION
COMPUTER ASSISTED EDUCATION SOFTWARE
ADD/MODIFY CAE SOFTWARE
ADD/VIEW DEVELOPMENT SOFTWARE
VIEW DEVELOPMENT SOFTWARE
DEPRECIATION INFORMATION
ADD/VIEW DEVELOPMENT HARDWARE
VIEW DEVELOPMENT HARDWARE
DEPRECIATION INFORMATION
ADD/SEE PERSONNEL
DEFINE NEW TASK
VIEW PERSONNEL INFORMATION
DEVELOPMENT HARDWARE
DEPRECIATION INFORMATION
DEVELOPMENT SOFTWARE
DEPRECIATION INFORMATION
VIEW EXISTING SOFTWARES


VIEW EXISTING SOFTWARE
ADD/VIEW DEVELOPMENT SOFTWARE
VIEW DEVELOPMENT SOFTWARE
DEPRECIATION INFORMATION
ADD/VIEW DEVELOPMENT HARDWARE
VIEW DEVELOPMENT HARDWARE
DEPRECIATION INFORMATION
ADD/SEE PERSONNEL
DEFINE NEW TASK
VIEW PERSONNEL INFORMATION
VIEW COST INFORMATION
DEVELOPMENT HARDWARE
DEPRECIATION INFORMATION
DEVELOPMENT SOFTWARE
DEPRECIATION INFORMATION


COURSE COMPONENTS
TEST PREPARATION AND EXAMINATION
ADD/VIEW EXAMINATION
ADD/VIEW EXAMINATION TYPES
VIEW DEPARTMENTS
PERSONNEL INFORMATION
ROYALTY TYPES

APPENDIX D

USER MANUAL

In this Appendix, the user manual is presented for the people who are interested in the processing of the "Distance Education Course Design Database"

DISTANCE EDUCATION COURSE DESIGN DATABASE
USER MANUAL

Created by: Haluk Yapıcıoğlu

Date: 07/03/2001

TABLE OF CONTENTS

1. Introduction

This manual presents the information on the processing of the "Distance Education Course Design Database" and provides the user with the required information to maintain the database.

2. Minimum System Requirements

The minimum system requirements can be classified as hardware and software requirements.

The hardware requirements shall be listed as follows:

- Pentium II 233 MHz or higher,
- 64 MB RAM or higher,
- 2,1 GB hard disk or higher,
- Ethernet card,
- 800*600 pixel color screen

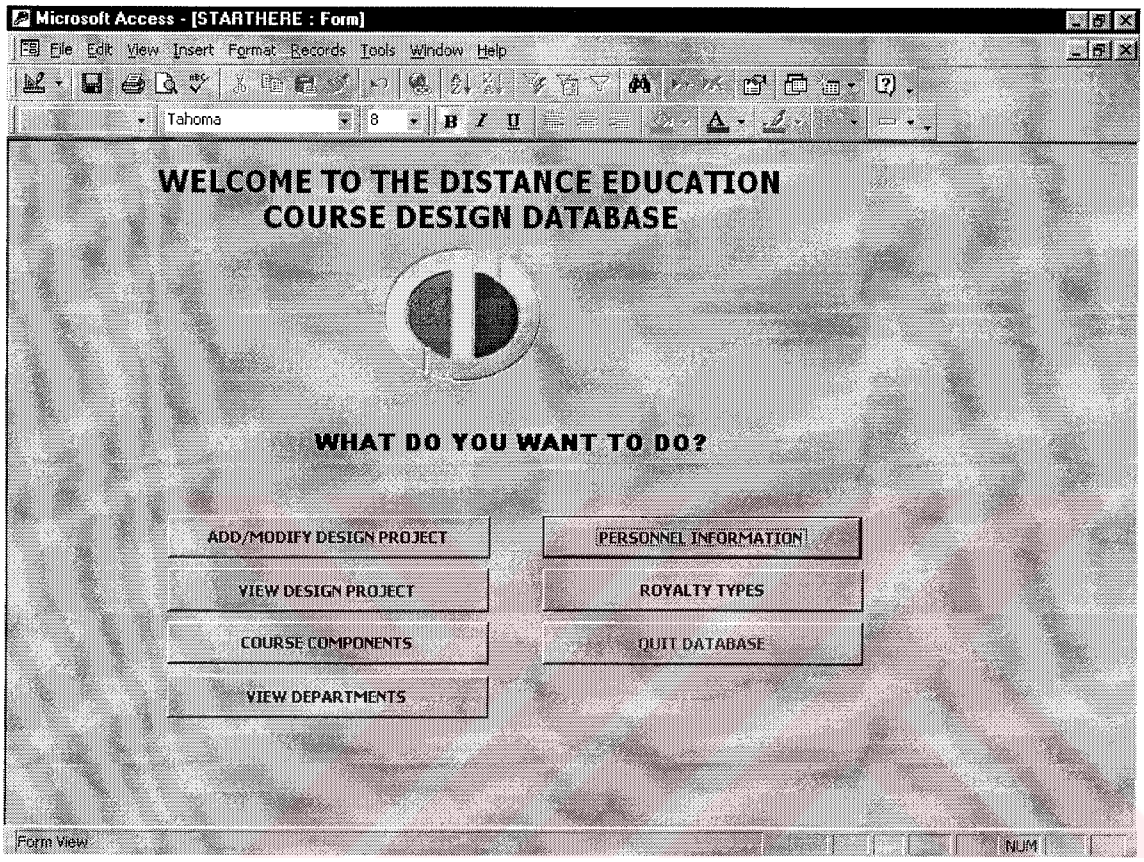
The software requirements shall be listed as follows:

- Windows 98, Windows NT Server/ Workstation or Windows 2000,
- Microsoft Office 200 with Service Pack 2 (including Access 2000 with full version and Excel 2000

3. Processing of the Database

3.1. Opening Database

The database is opening with the following start-up menu;



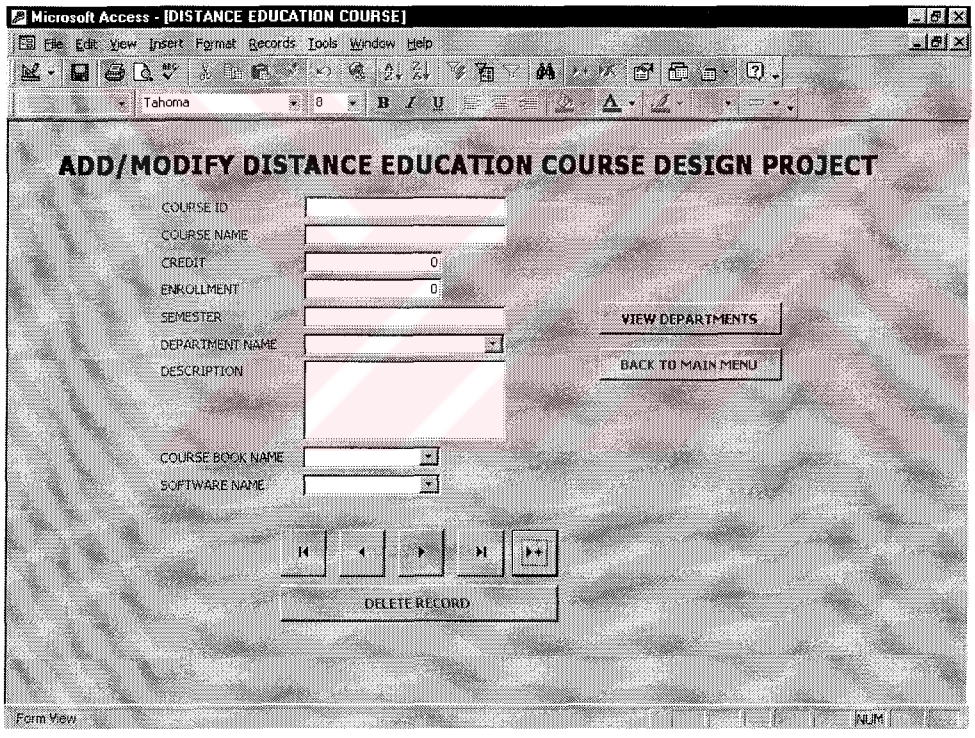
PICTURE 1

The user has six main options as follows: create new design project, see information on a specific project, see information on certain course component, see the departments of Open Education Faculty, see information on personnel, and see information on royalty types. Other than those, user can quit the database by clicking "Quit Database" command button.

3.2. Add/Modify Design Project

Once the user clicks on the command button for "Add/Modify Design Project" option on the start-up menu, the following form opens. This form includes all the fields necessary to define a new course design project. All the fields in this form is required and to be filled out carefully. Since course book and computer instructed education software could be used more than one course, these components should be defined previously and be chosen from lists provided.

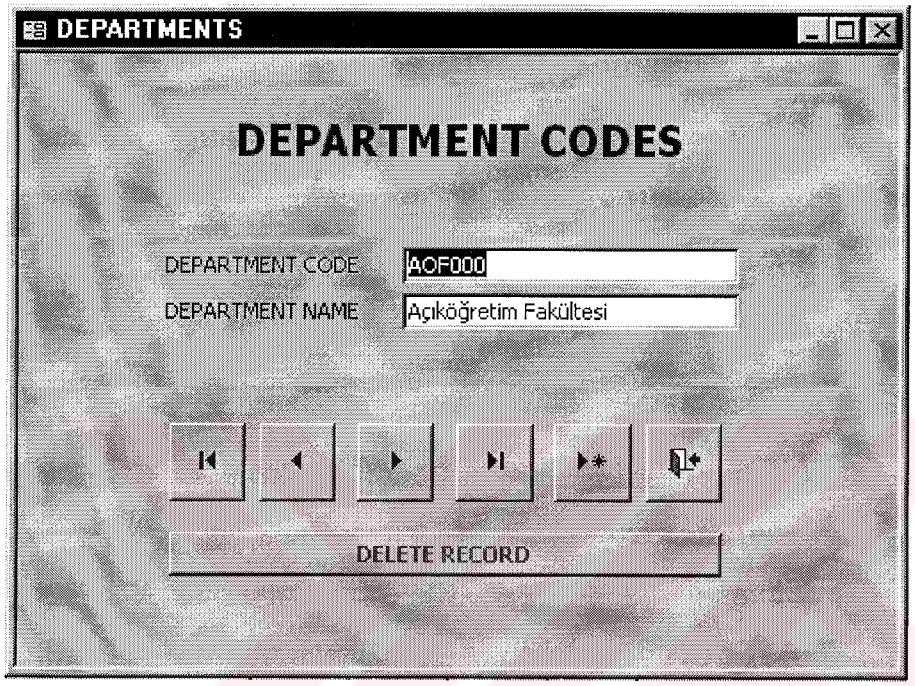
For the modifications of the existing projects same form should be used. User could use the navigation buttons to bring the information of the design project that she wants to make modifications.



PICTURE 2

3.2.1. View Departments

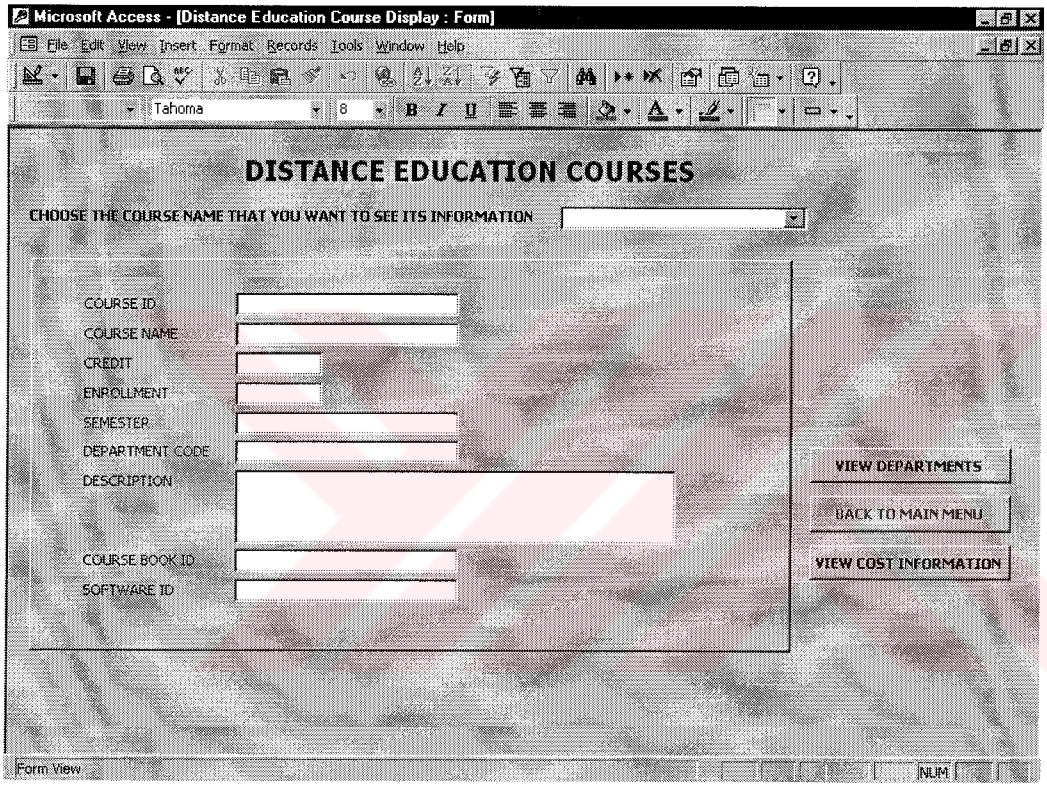
As the "view departments" button is clicked following form opens. In this form department names and their respective codes can be viewed.



PICTURE 3

3.3. View Design Project

As the "view design project" option is selected from the start-up menu, following form opens. In this form, user can select the course name that she wants to see its information from the combo box. Once the selection is made, the information about the project can be seen in the subform.

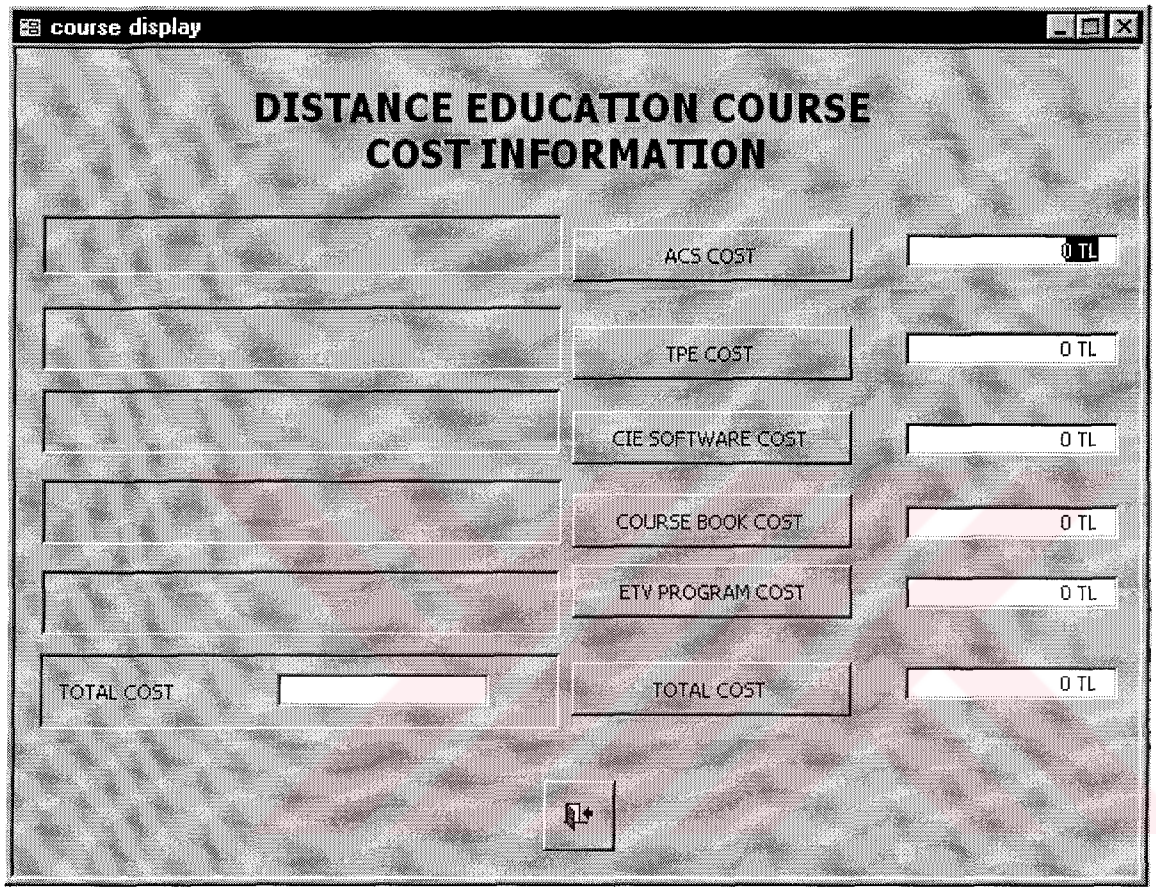


PICTURE 4

On this form, by clicking one of the three command buttons, the user can either see department information that the course belongs to, or see cost information of the selected course design project. Department Information form is presented previously.

3.3.1. View Cost Information

Cost information of a particular project can be viewed by clicking the "View Cost Information" button on previously presented form.



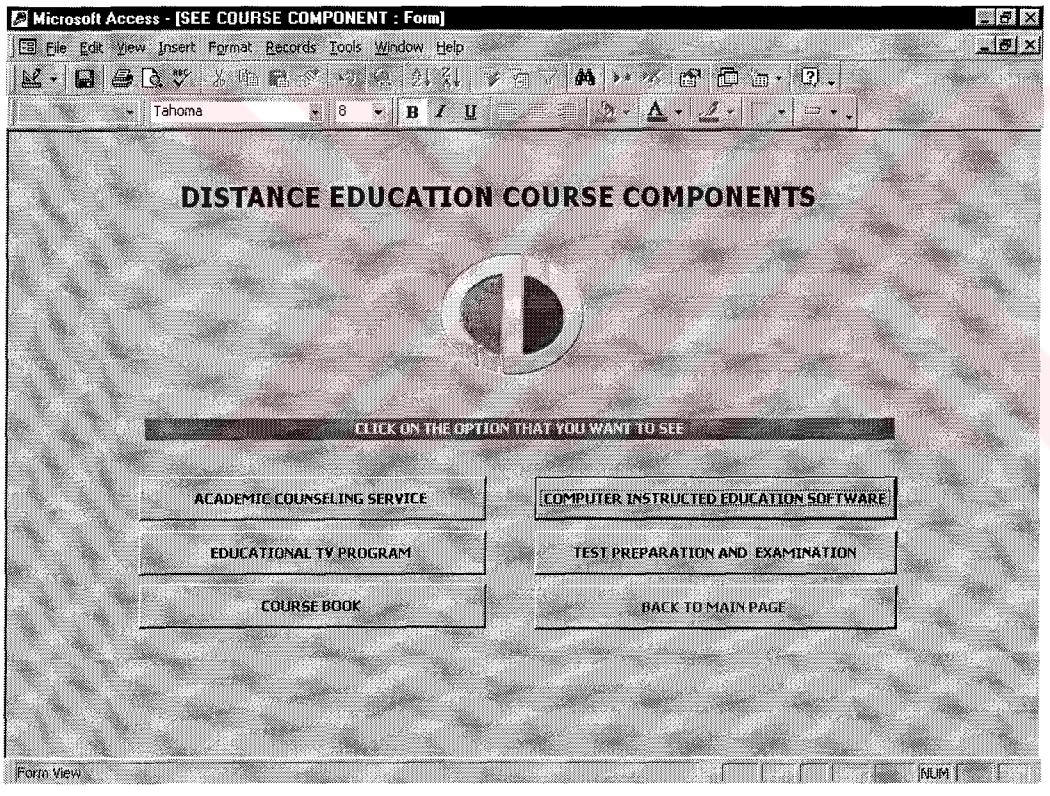
PICTURE 5

This form can be used for two options: Either cost information is viewed or cost information is updated. Obviously, some of the course components could be missed for some courses. For example every course do not have Educational TV Program necessarily. If a particular cost information can be viewed on the left-hand side of the

form, the user can update the cost information of the course design project by clicking the related button placed at the bottom of the form.

3.4. Course Components

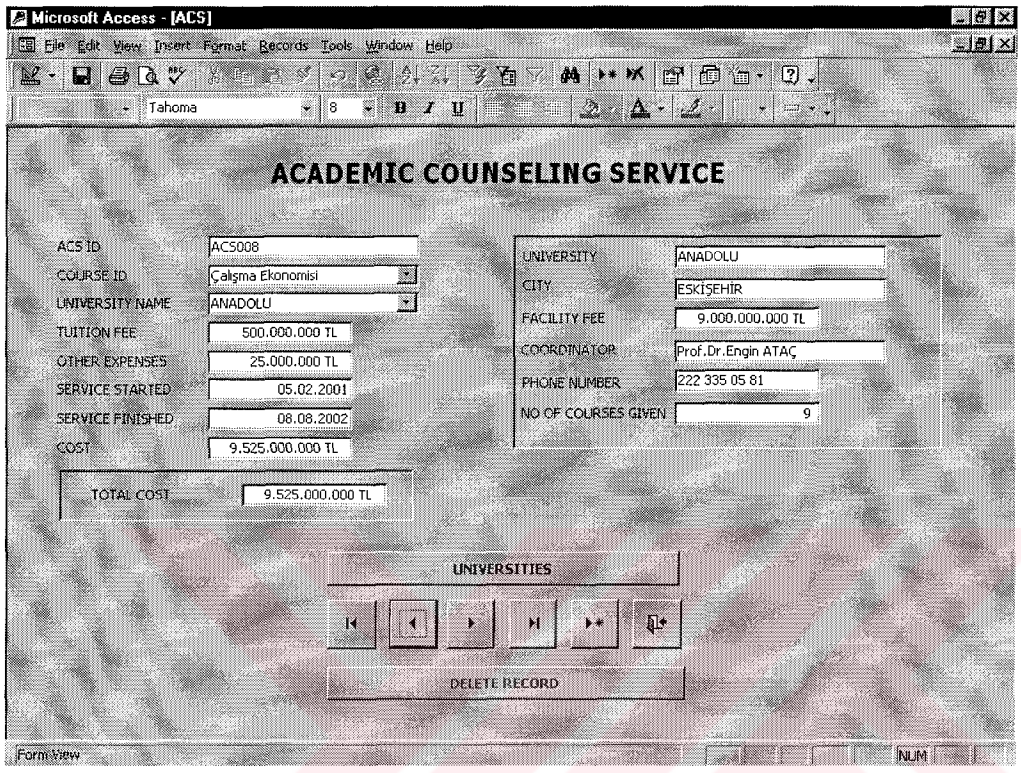
Once the "course components" button is clicked, following form opens. In this form, the user has five main options that composed of Distance Education Course Components. The options are as follows: Academic Counseling Service, Educational TV Program, Course Book, Computer Instructed Education Software and lastly Test Preparation and Examination. Other than those, the user can go back to start-up menu by clicking "Back to Main Page" button.



PICTURE 6

3.4.1. Academic Counseling Service

Academic Counseling Service form is presented below:



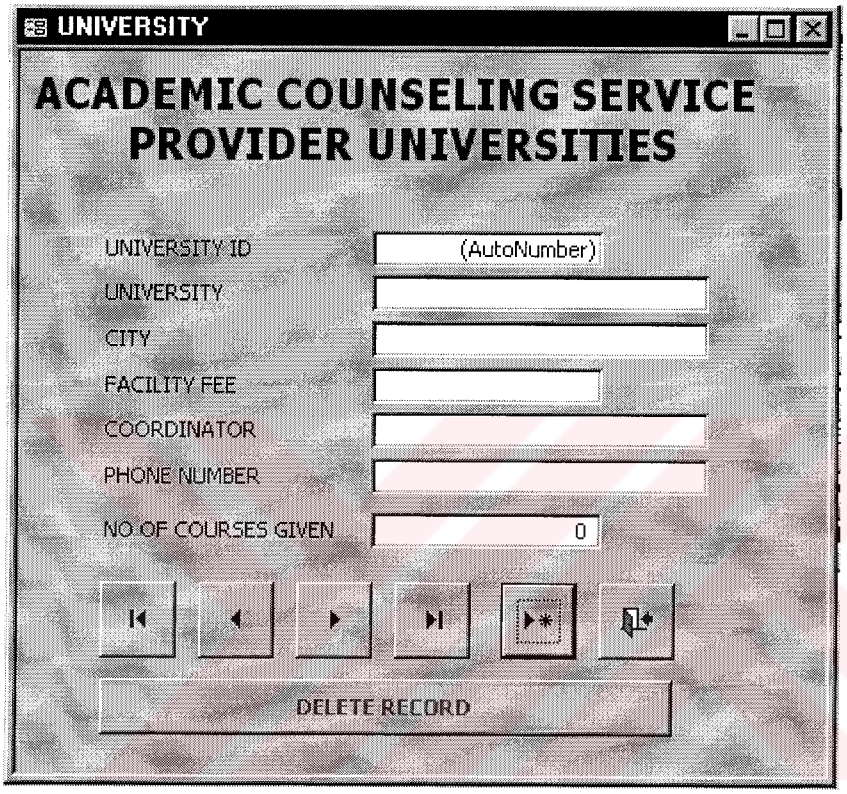
PICTURE 7

On the left-hand side of the form, information of the particular Academic Counseling Service (ACS) is presented. Using this form could make adding new ACS information as well as modifications on the existing records. Next to them, information of the service provider university is presented. To assign particular ACS to a university, university information have to be defined previously .At the bottom of the form, navigation, record and form buttons are placed.

Using "universities" button the user could reach the records of the ACS provider universities.

3.4.1.1. Universities

Universities form is presented below:

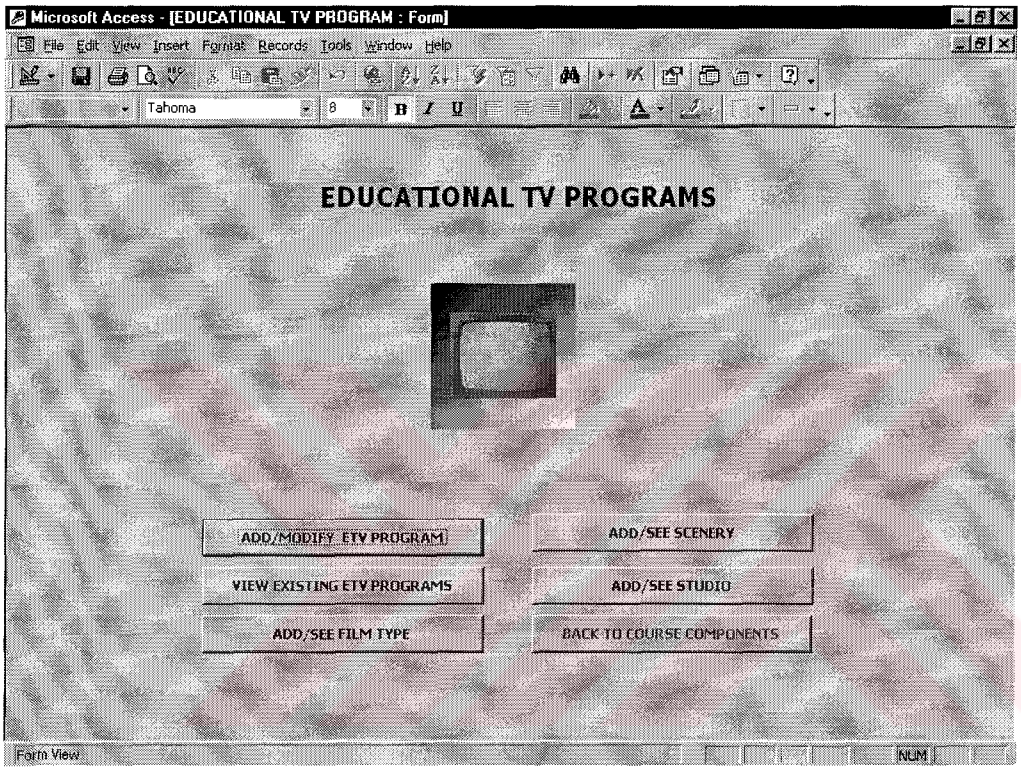


PICTURE 8

By using this form, each and every university that provides ACS service should be defined. Then the user selects the university from combo box placed at the previously presented form.

3.4.2. Educational TV Program

When the user wants to make a transaction about Educational TV Programs (ETV), she should click "Educational TV Programs" button from Course Components form. Then the following form opens.

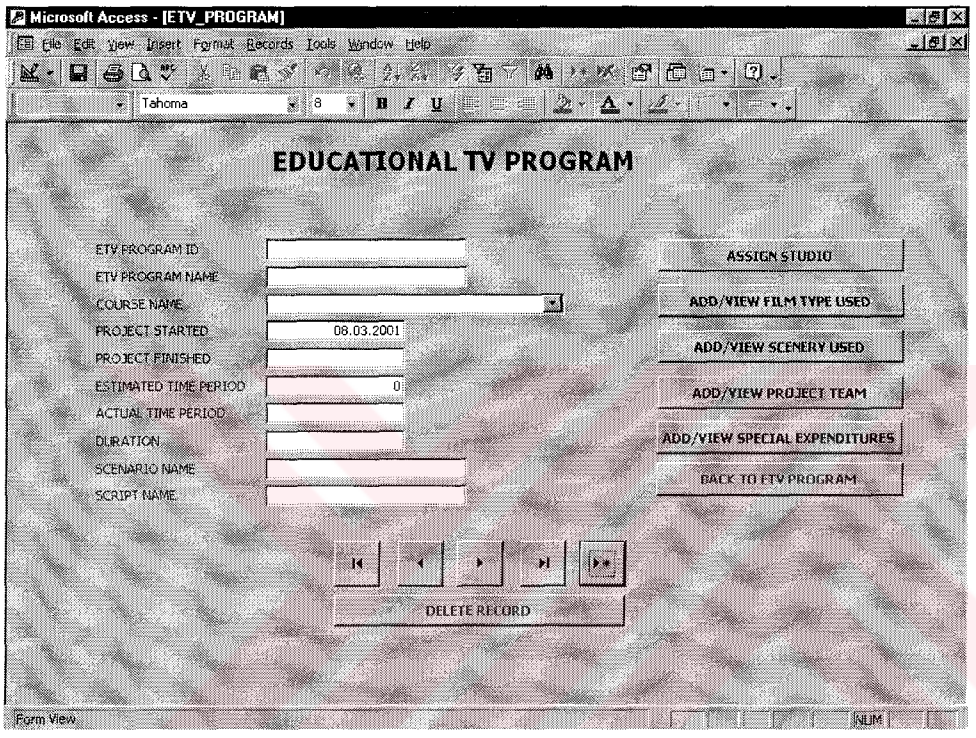


PICTURE 9

The user has five main options in this form. She can add or modify information about ETV, view existing ones or add/view information about film types, sceneries and studios. How to use each option are explained subsequent sections.

3.4.2.1. Add/Modify ETV Program

When the user wants to add new ETV or modify existing one, the user should click the "add/modify ETV program" button on the previously presented form. Then the following form opens.

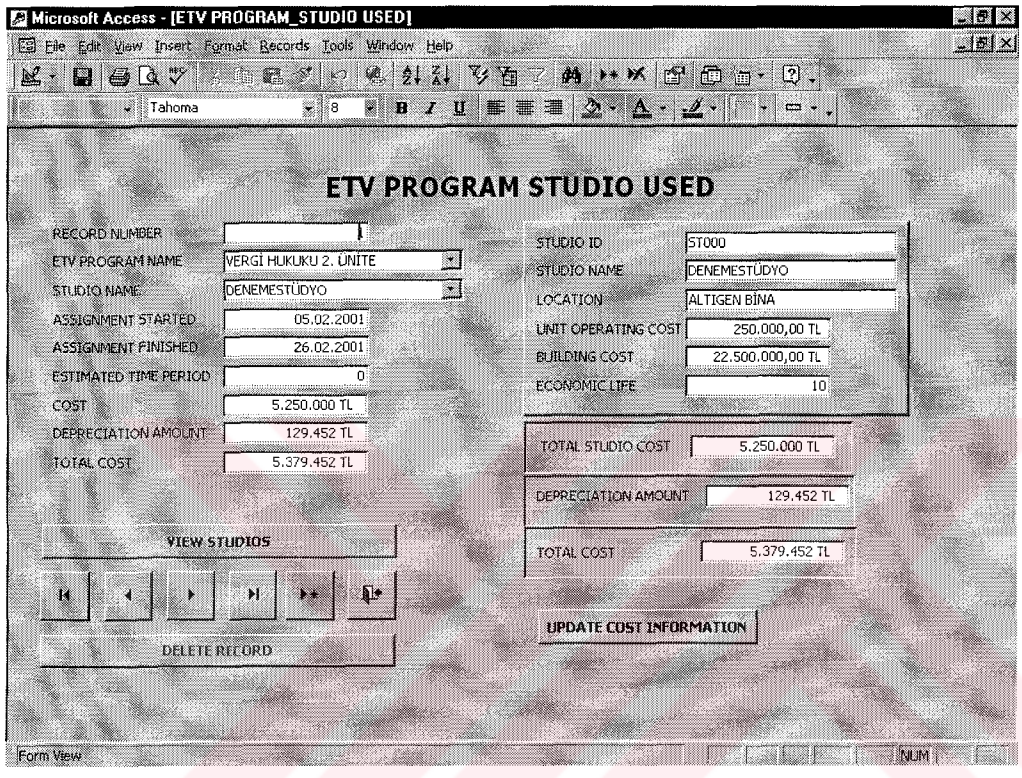


PICTURE 10

In this form, ETV Program ID, ETV Program Name and Course Name fields have to be filled out. All the other fields provide detail information about an ETV program and optional. Once the information is provided, the user can assign studio, personnel or add/view film types, sceneries or special expenditures for particular project.

3.4.2.1.1. Assign Studio

In order to assign studio for a particular ETV program, both ETV program and the studio have to be defined previously. In addition, assignment start and finish dates must be provided to calculate cost information.



PICTURE 11

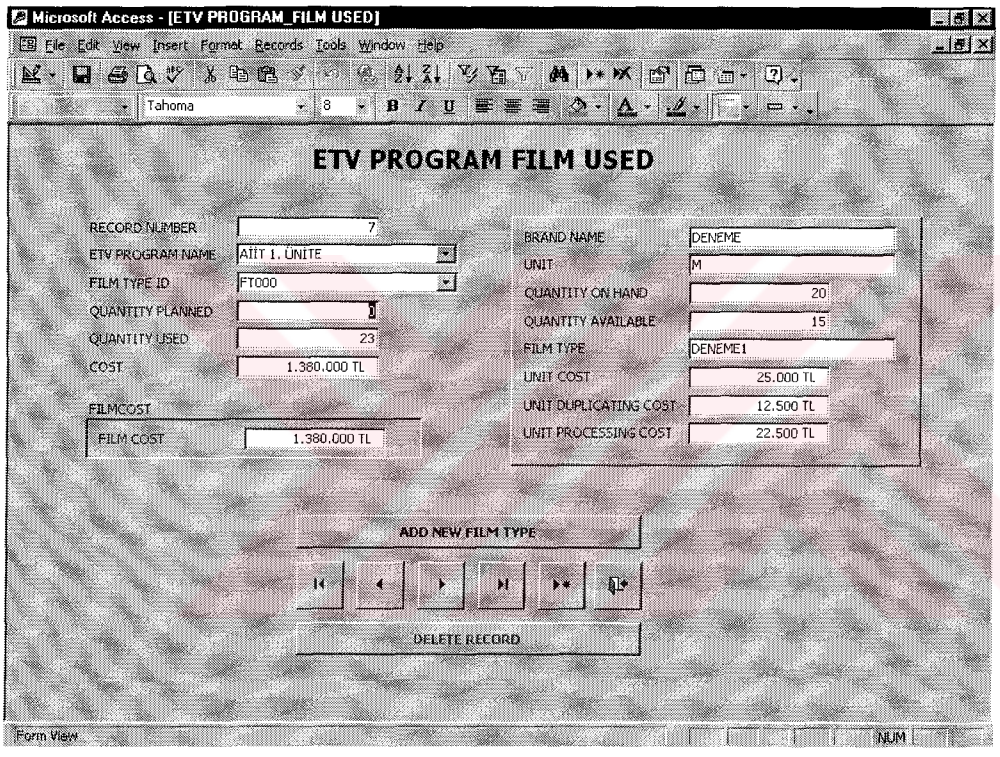
On the left-hand side of the form, assignment information is viewed. On the right-hand side of the form, information about the assigned studio can be viewed. At the bottom of it, three sub-forms are placed. These forms return the cost information about selected

record. After each transaction about assignment of studios, the user must click on the "update cost information" button to renew cost information on the database.

By clicking "view studios" button, the user opens "studios" form. Usage of this form is explained in section 3.4.2.5.

3.4.2.1.2. Add/View Film Types Used

The user can supply the information of which ETV program uses which film types in which amounts by using following form.



PICTURE 12

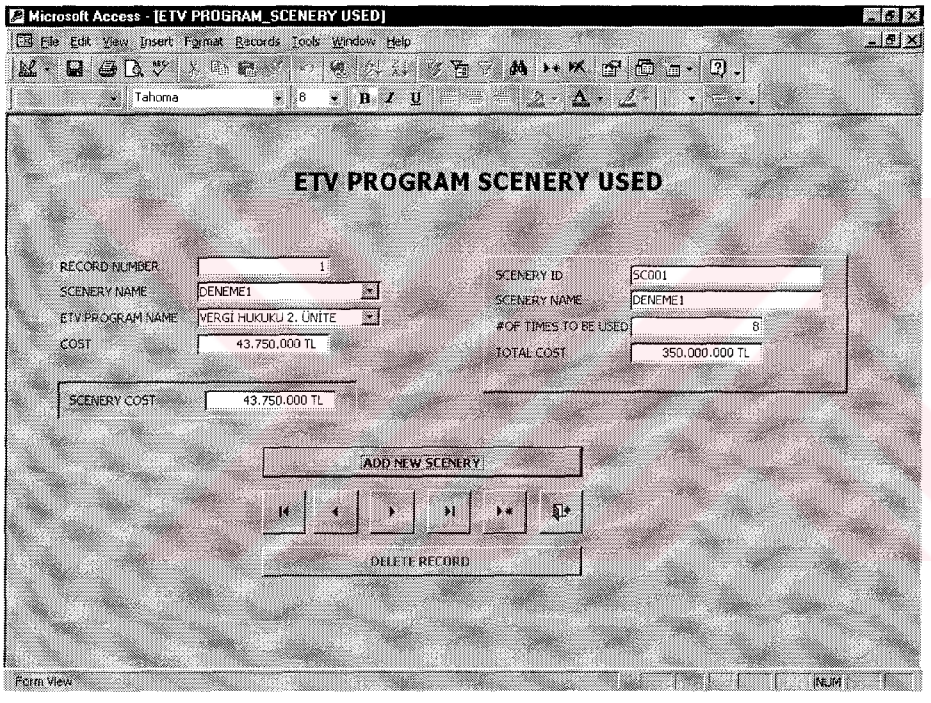
As in studio assignments, ETV program and film information must be defined prior to assignment of the films to ETV programs. On the left-hand side of the form, the fields ETV Program name, Film Type ID and Quantity Used have to be filled out. When

"quantity used" field is changed, the cost of film is calculated and the "cost" field is updated automatically.

Once the film type is selected from the combo box, on the right-hand side of the form the information about the selected film is presented. By clicking "add new film type" button, the user opens "film types" form. Usage of this form is explained in section 3.4.2.3.

3.4.2.1.3. Add/View Scenery Used

In order to determine which scenery used in which ETV program the user should use the following form.



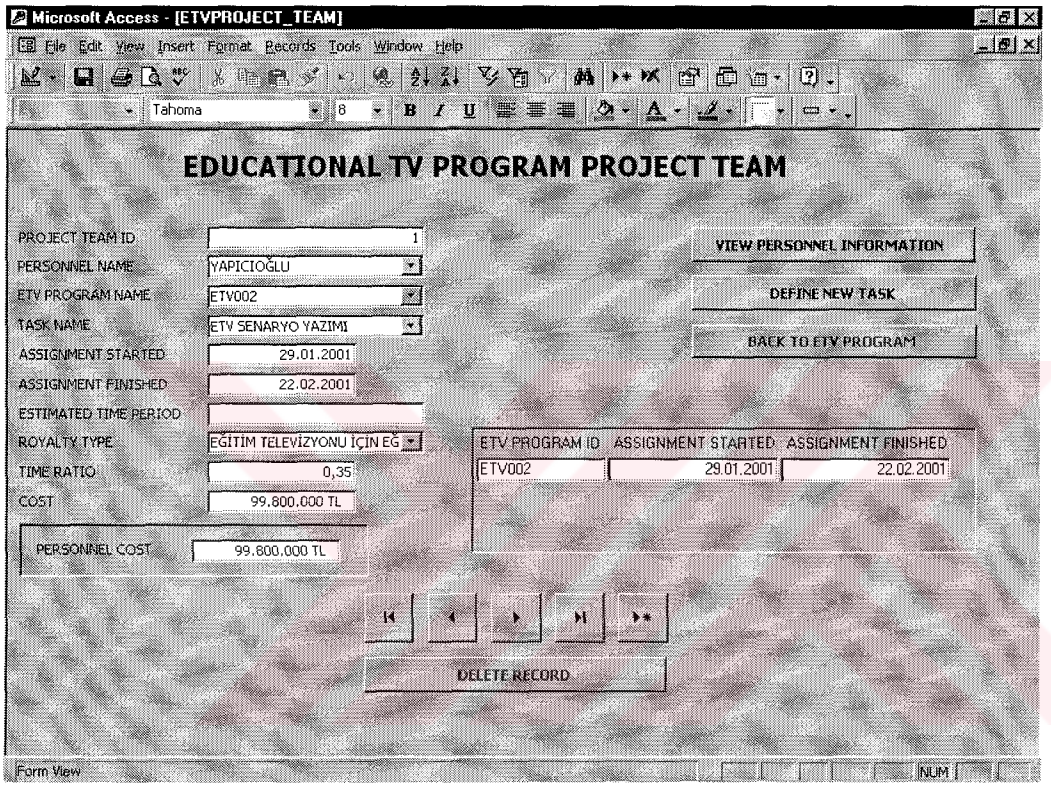
PICTURE 13

This form is also used in same manner with 3.4.1.2.1 and 3.4.1.2.2. The fields scenery name and ETV program name have to be filled. Once scenery name is selected, on the

right hand side of the form the information of the selected scenery can be viewed. After the selection of the ETV program name, scenery cost is calculated and "cost" field is updated automatically.

3.4.2.1.4. Add/View Project Team

In order to assign employees to particular ETV program project, following form is used.



PICTURE 14

On this form, personnel, task, royalty type and ETV program name are selected from lists. In addition to them, assignment start and finish dates must be provided to calculate personnel costs. Time ratio is used to provide the information that what proportion of the eight-hours workday of the personnel allocated to this particular task. As the time ratio

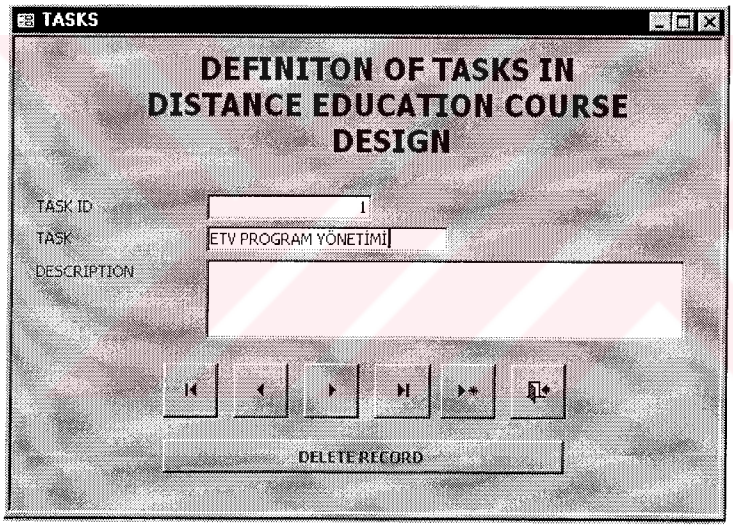
field is changed, personnel cost is calculated and the cost field is updated.

On the right-bottom side of the form, all the assignments of the selected personnel can be viewed.

Other than those defined above, the user two more options on that form. These are view personnel information and define new task. The user can either view personnel information or define new task by clicking their respective buttons. Personnel information form is presented in section 3.6.

3.4.2.1.4.1. Define New Task

As well as define new task, changes in the existing tasks' properties are made using following form.

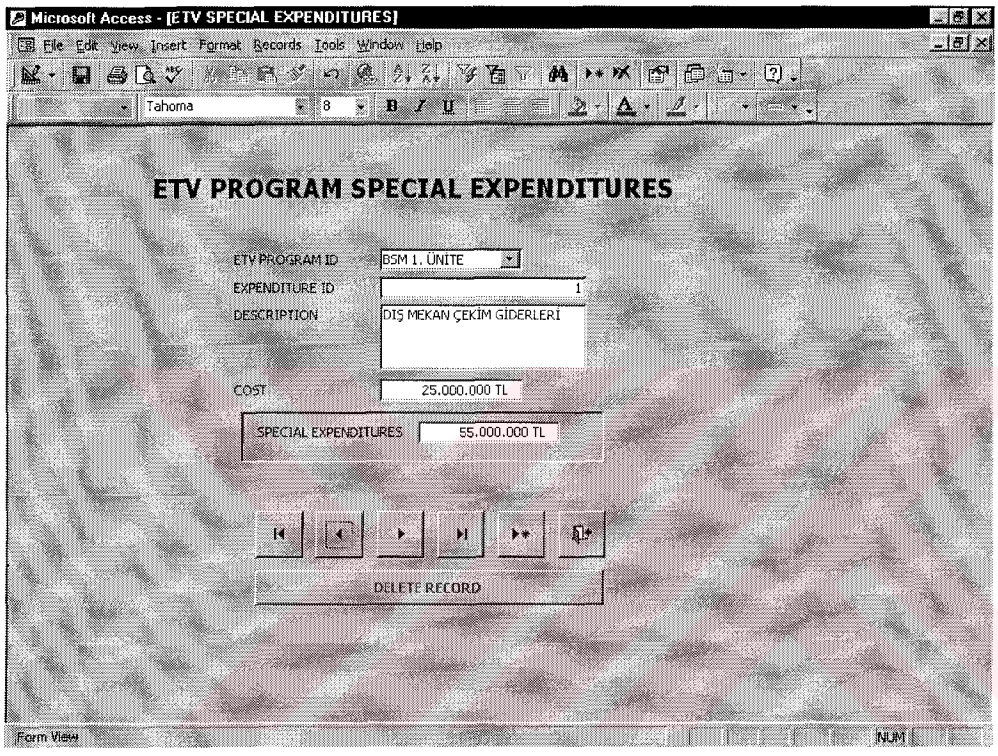


PICTURE 15

In this form, what the user to do is just to provide a name and definition for a task.

3.4.2.1.5. Add/View Special Expenditures

All the costs that cannot be classified in one of the categories explained before classified as special expenditures. For example; outdoor shootings' costs, rented materials' costs etc… These kinds of costs are taken into account by using following form.

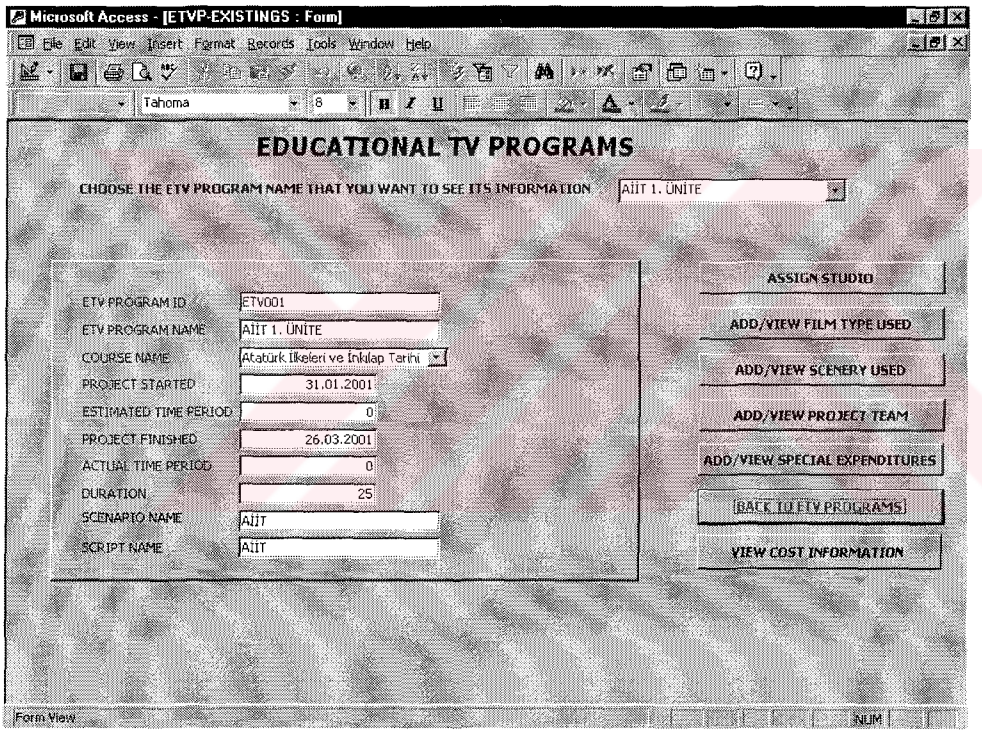


PICTURE 16

Once again, the user just select ETV program name and provide description and cost information for each cost incurred.

3.4.2.2. View Existing ETV Programs

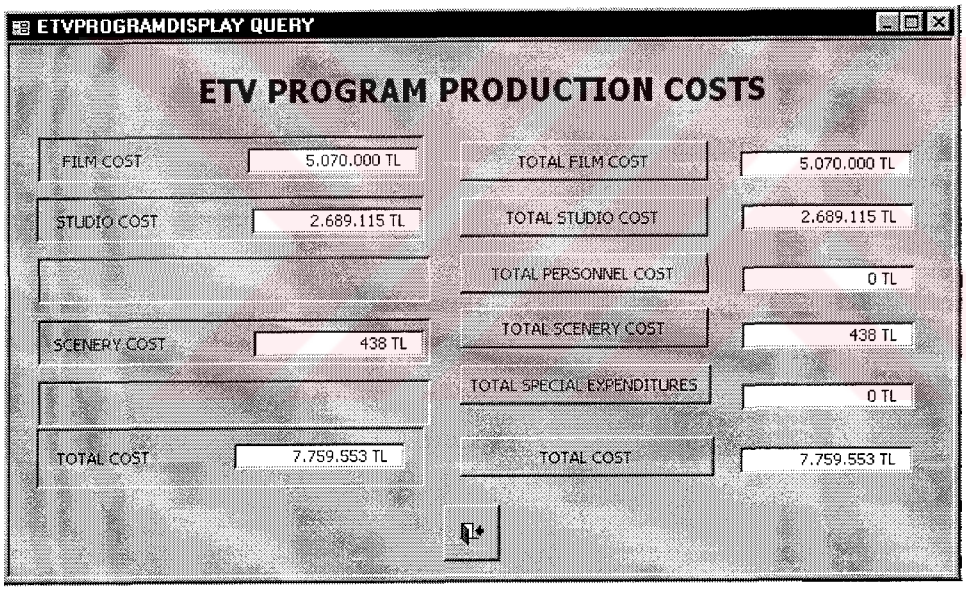
Once information about new ETV program project is provided using "Add/Modify ETV Program" form, the user can make all the other transactions by using "View Existing ETV Programs" form. In addition to options provided in the "Add/Modify ETV Program" form, the user one more option in "View Existing ETV Programs" form. That is, user can view cost information of a particular ETV program project as a whole picture by clicking "View Cost Information" button. In order to see an existing project's information, the user selects its name from the list.



PICTURE 17

3.4.2.2.1. View Cost Information

By clicking View Cost Information form, the user reaches the cost information of an ETV program project selected in "View Existing ETV Programs" form. In this form, each category of cost incurring in ETV program project is viewed as query results. Next to each query result placed at the left hand side of the form, there are buttons to update cost information in the database. If a particular query result can be viewed, then the user updates the cost information by clicking the related button. After each transaction made in either studio assignments, film types used, scenery used, personnel assignments or special expenditures; user have to open "View Cost Information" form in order for changes to take effect.



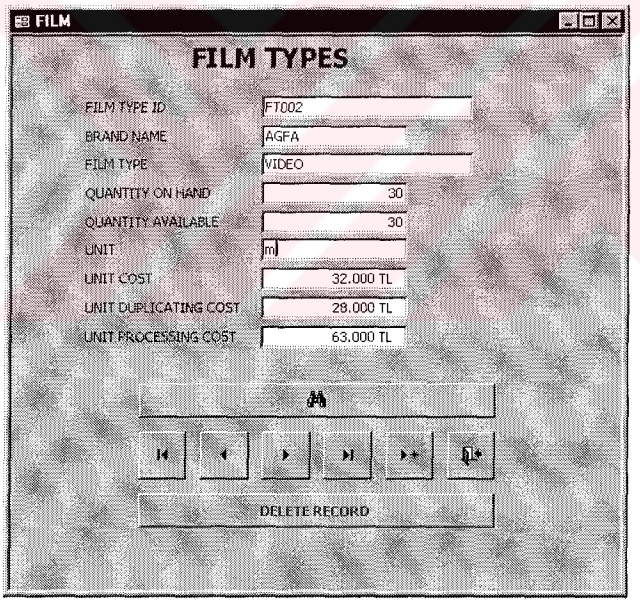
PICTURE 18

3.4.2.3. Add/See Film Type

In order to keep up to date film information, the user should use "Add/See Film Type" form. By using this form, all the information necessary to define particular film type can be viewed and defined. All the fields in this form are required.

In order to add new film type, the user has to go to the very end of the record set. Using navigation button "  " can do this.

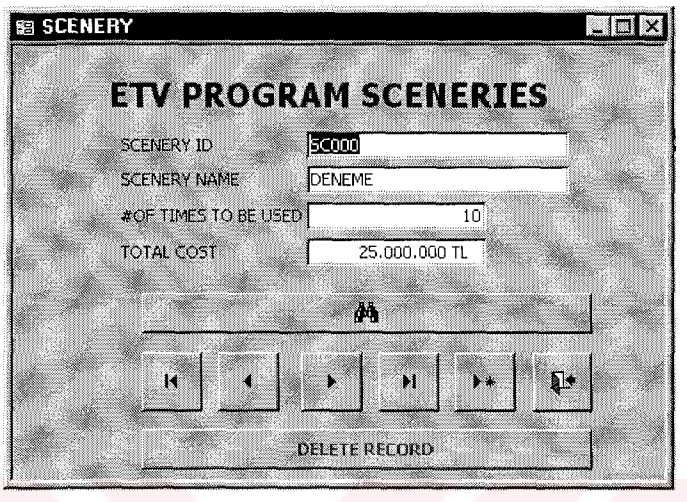
If the user wants to make changes in existing records, she can reach the desired record in two ways: One of them is to use navigation buttons. The other is to use the button that has binocular picture on it. By clicking the button, an interface that asking for Film Type ID appears. Entering the Film Type ID, the user can easily reach the desired record. Film Types form is represented in PICTURE 19.



PICTURE 19

3.4.2.4. Add/See Scenery

The form used for adding new sceneries and to see existing ones are presented in PICTURE 20

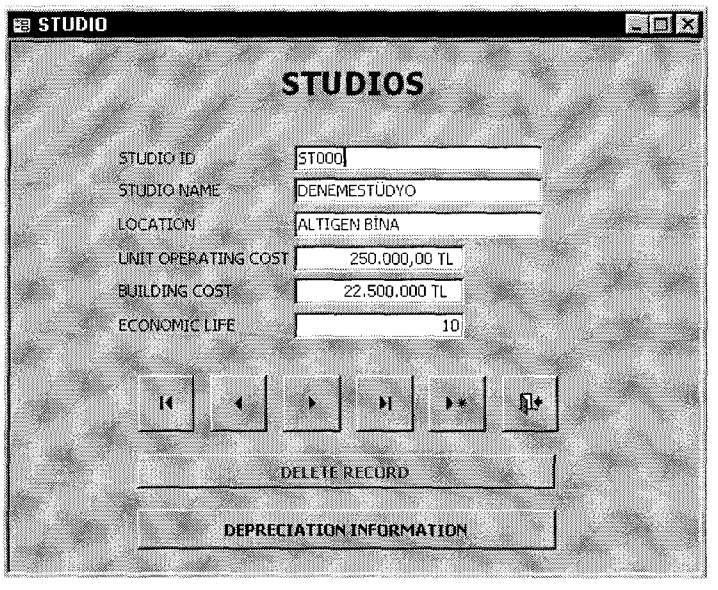


PICTURE 20

The use of the Scenery form is same as the Film Types form. Again, all the fields in this form are required. User should go to the very end of the record set in order to add new scenery information. To view existing scenery information user can make use of either navigation buttons or the button with binocular picture.

3.4.2.5. Add/See Studio

The form used for adding new studio and to see existing ones are presented in PICTURE 21.



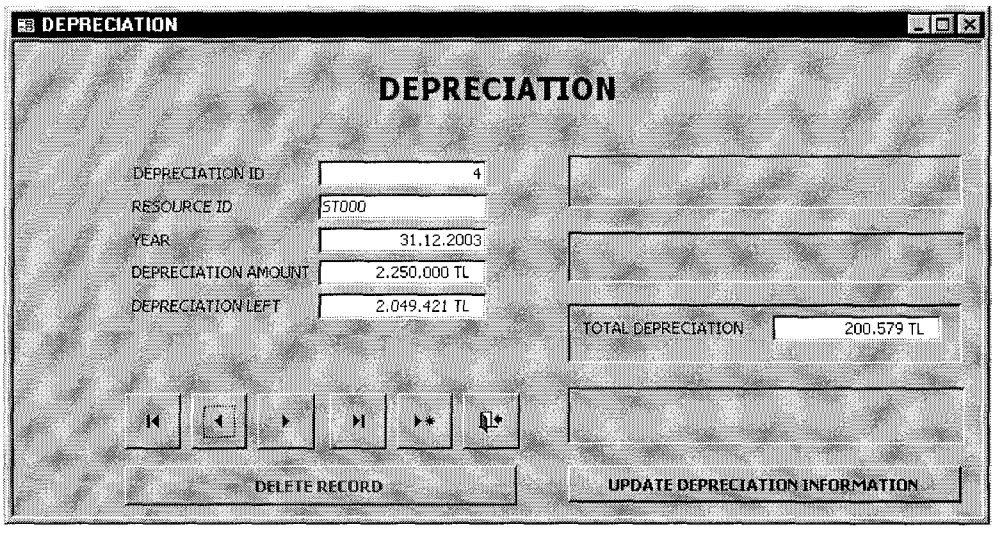
PICTURE 21

The use of the Studio form is same as the Film Types form. Again, all the fields in this form are required. User should go to the very end of the record set in order to add new scenery information. To view existing scenery information user can make use of either navigation buttons or the button with binocular picture.

One difference of the studio form from the scenery and film types is that studio has depreciation. User can reach the depreciation information of particular machine, tool etc… by clicking the depreciation information button.

3.4.2.5.1. Depreciation

Depreciation form is opens with the depreciation information of the studio that is selected in studio form. Form is represented in PICTURE 22.

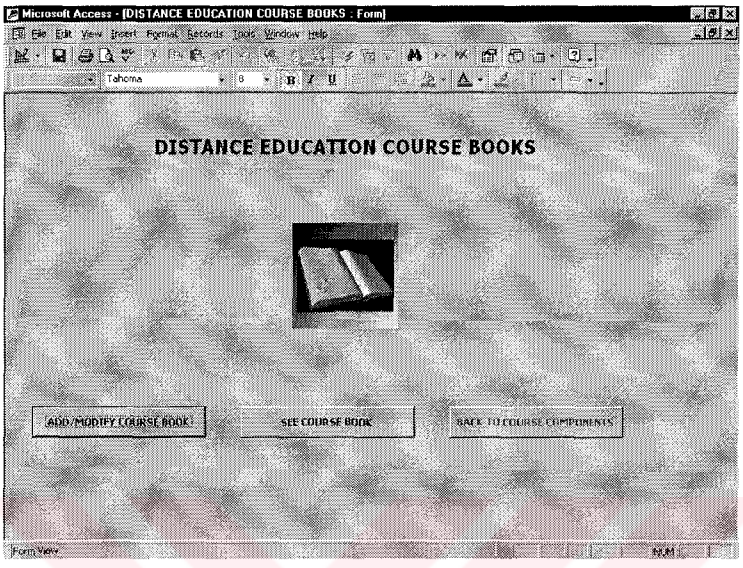


PICTURE 22

At the right hand-side of the form query results from different tables are represented. Since this form connected to the form where depreciation button placed, only the query that Resource ID match with ID in the query can be seen at a time. When the user click "update depreciation information" button, the value of "Depreciation Left" field is updated. If total depreciation value of the query is greater than the value in the "Depreciation Amount Field", database go to the last depreciation record related to the query and set its depreciation value to depreciation left. Afterwards, database automatically set "Depreciation Left" value to zero.

3.4.3. Distance Education Course Books

When "Course Books" button is clicked on the "Course Components" form, following form opens.



PICTURE 23

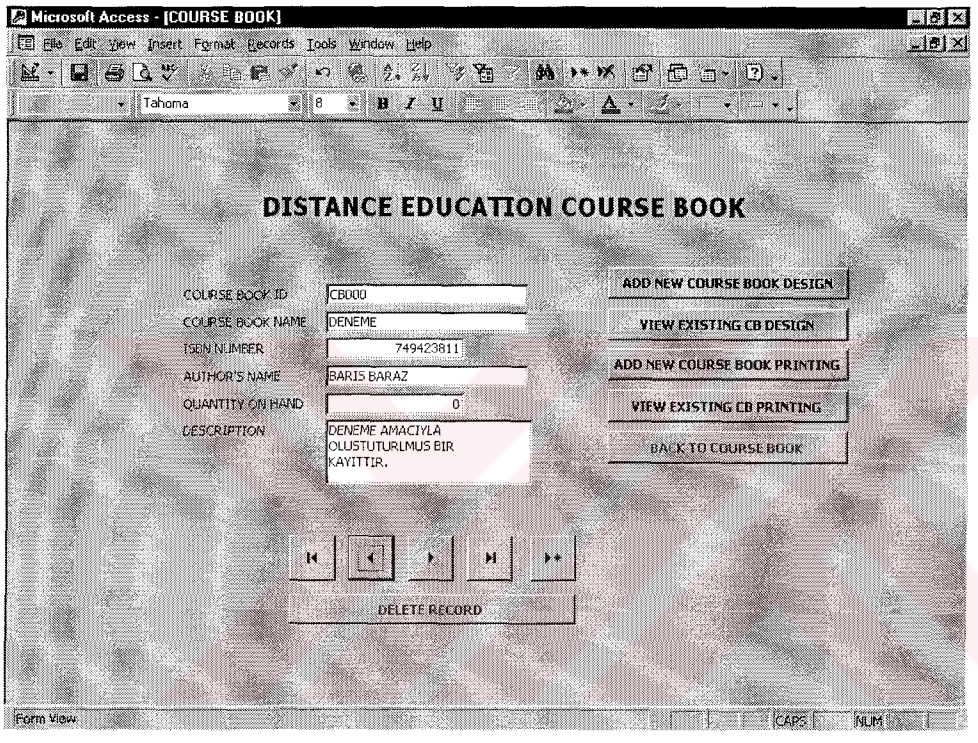
In this form, the user has two options: She can either add a new course book or modify existing ones; or see information of existing course books. Other than those, user can go back to course components.

3.4.3.1. Add/Modify Course Book

Course book production is split into two stages: one of them is course book design; the other is course book printing. Course book design process starts from the determination of the need for new course book and ends with the production of master copy. Printing process is starts with take delivery of the master copy to Printing Press and ends with production of batches. Because of this, after providing information for particular course book, the user should also provide information for both design and printing stages.

To add a new course book, following form in picture 24 is used. The user must go at the very end of the record to add new course book information to database.

A course book can have more than one design process and printing process. Each edition of course book is treated as another design process. Also, a course book can be printed several times without making any changes in its contents. Each printing is again treated as another printing process.

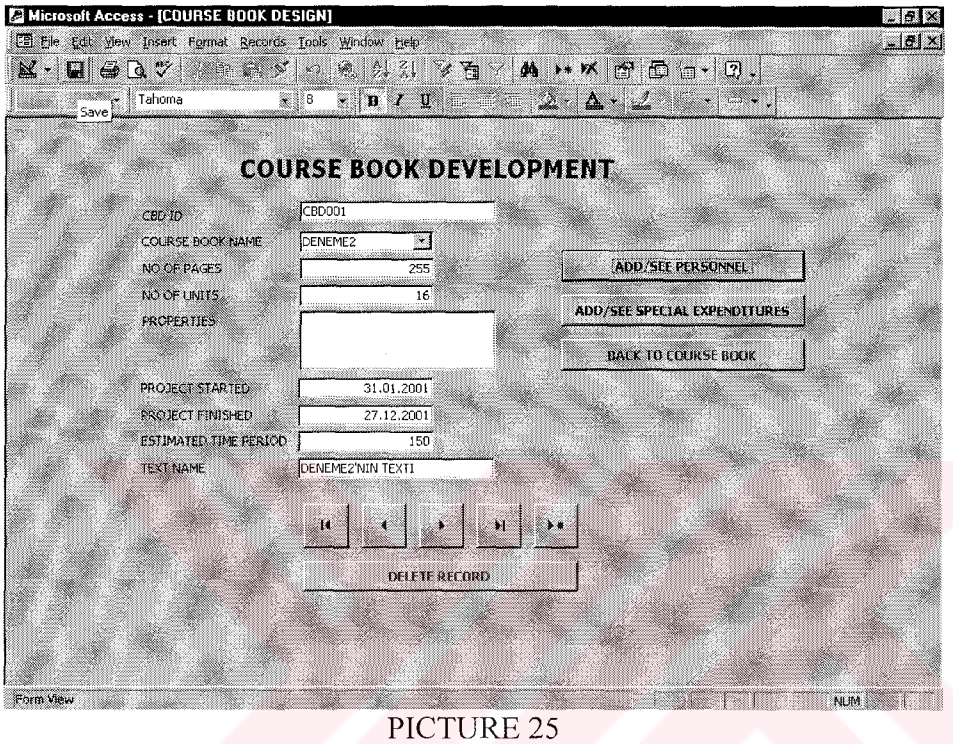


PICTURE 24

After the completion of providing general information about the course book, user can add new course book design process, view existing course book design process, add new course book printing or view existing course book printing by clicking their respective buttons by clicking their respective buttons placed on the right hand side of the form.

3.4.3.1.1. Add New Course Book Design

When the user clicks "Add New Course Book Design" button, the form presented in PICTURE 25 opens.

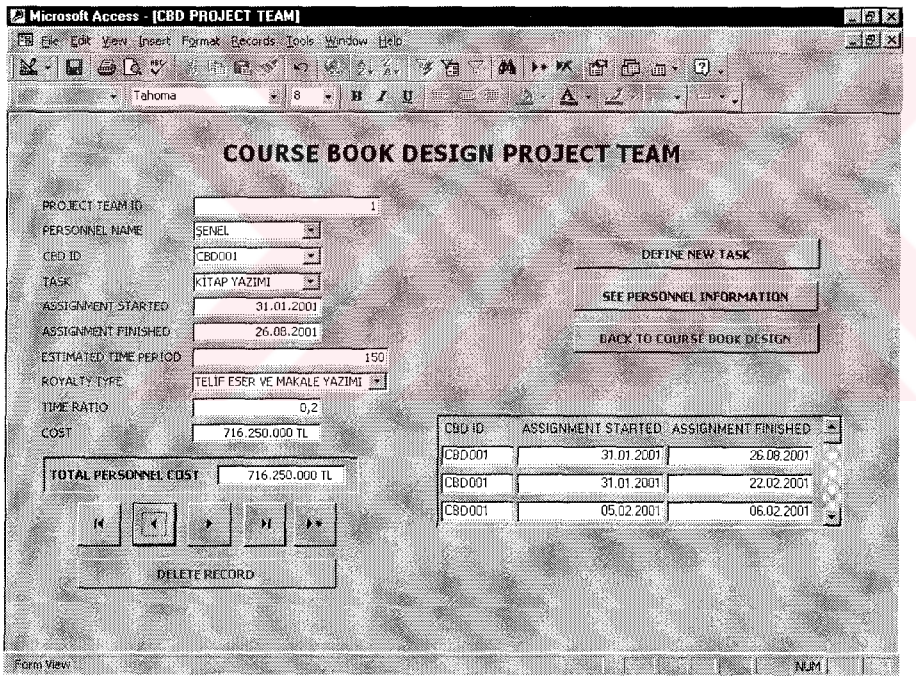


PICTURE 25

In this form, CBD ID field and course book name must be provided. All the other fields are optional. In course book development process, there are two cost items: personnel costs and special expenditures. After the completion of providing information about development process, the user can assign personnel or add special expenditure –if any- for particular project by clicking respective buttons placed at the right-hand side of the form. Uses of these options are explained in section 3.4.3.1.1.1. and 3.4.3.1.1.2.

3.4.3.1.1.1. Add/See Personnel

Once the user clicks add/see personnel button, the form in PICTURE 26 opens. The use of course book design project team form is the same as "ETV Project Team" form. The user can see assignments, make new assignments and see particular personnel's all assignments. As the time ratio field is changed, database will automatically calculate the cost incurred by assignment of particular task. One important issue regarding the use of this form is that if a person is assigned more than one task in a project, the time ratio value of the task that has the longest assignment period should be set as usual. However, for all the other tasks of a person in that project, time ratio value should be set to zero in order not to count personnel's wage cost repeatedly. When time ratio value is set to zero, only the royalty value –if exists- is calculated by the program.

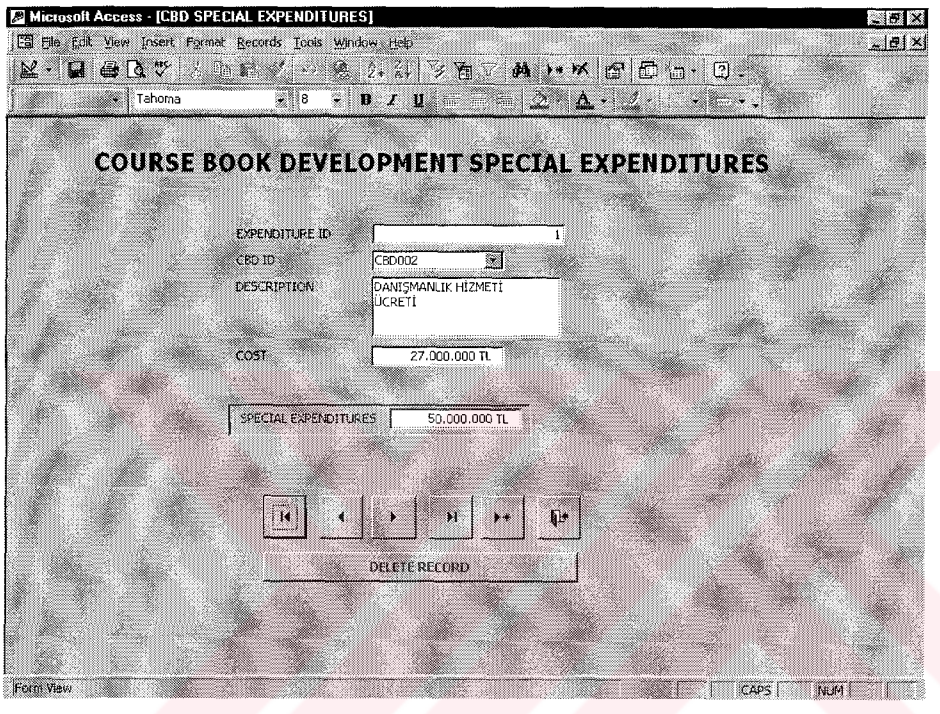


PICTURE 26

The use of define new task and see personnel information forms is explained in sections 3.4.1.2.4.1. and 3.6. respectively.

3.4.3.1.1.2. Add/See Special Expenditures

The use of add/see special expenditures is same as "ETV Special Expenditures". Form is represented in PICTURE 27



PICTURE 27

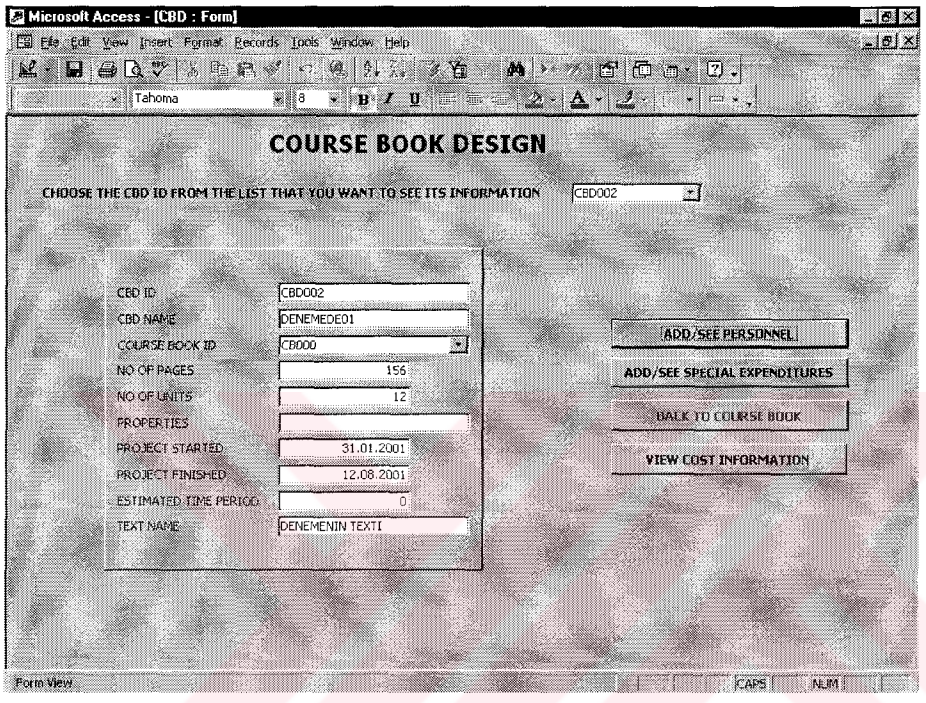
Here in this form each expenditure should be defined separately. "Special Expenditures" field show the sum of all special expenditures made for particular design project.

3.4.3.1.2. View Existing Course Book Design

Rather than navigating via buttons in form "Add/See Course Book Design", user can easily reach records that she interested in by using the form shown in PICTURE 28.

To see the information of a course book design project, user simply select the CBD ID from the list provided on the top-center part of the form.

Moreover, the user has more one option in this form than provided in 3.4.3.1.1. The User can also view cost information of a particular project by clicking "View Cost Information" button.

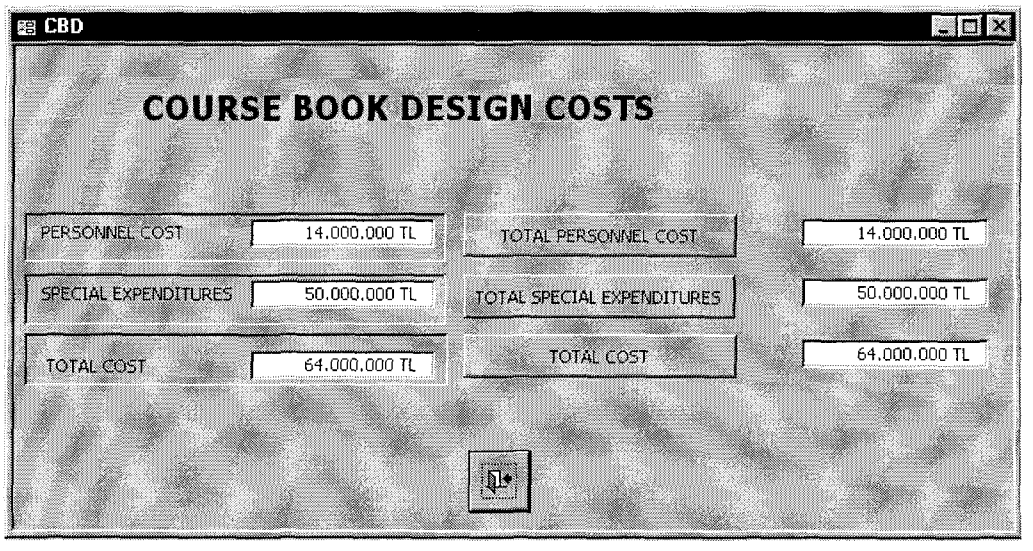


PICTURE 28

3.4.3.1.2.1. View Cost Information

Once "view cost information button is clicked, following form in PICTURE 29 opens. On the left-hand side of the form there are query results for total personnel cost and total special expenditures. The user can update cost information of the selected record by clicking the buttons at the middle of the form. One remark about the updates is that the

data on the left hand side of the form is always newer than the data right hand side of the form.

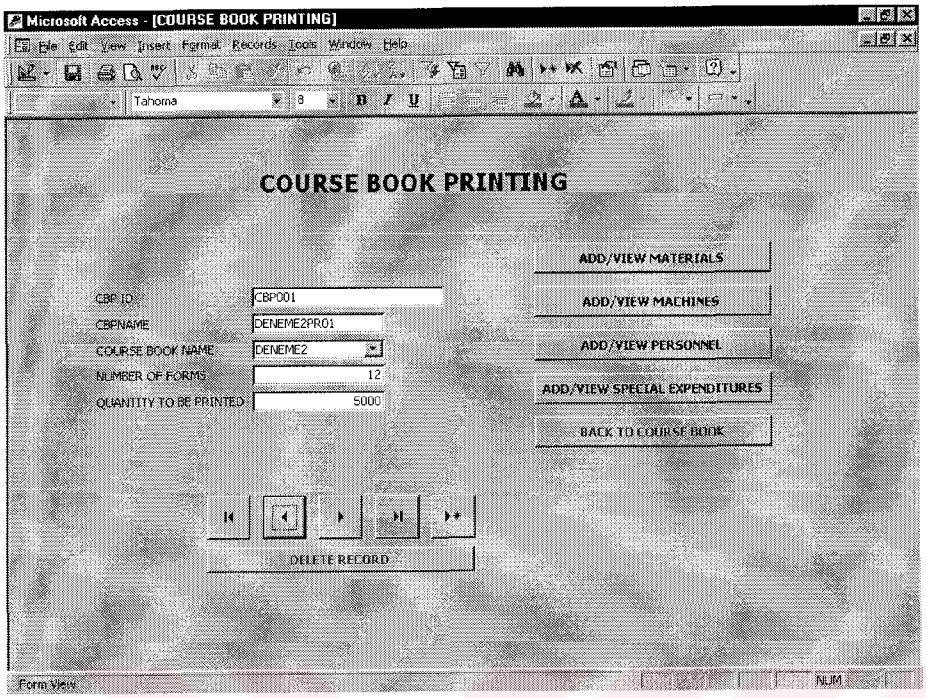


PICTURE 29

3.4.3.1.3. Add New Course Book Printing

After the completion of the course book design, second stage of the course book production comes to the scene: course book printing. If a new course book printing project is to be added, "Add New Course Book Printing" form should be used. Form is represented in PICTURE 30. In this form, all the fields are required.

After providing necessary information required to define the printing project, user can build project team, assign machines and materials to projects and add special expenditures information about printing process to the database. These are the options provided to user by the buttons placed on the right-hand side of the form. Of course, these transactions could be made through "View Existing Course Book" form, explained in section 3.4.1.4.



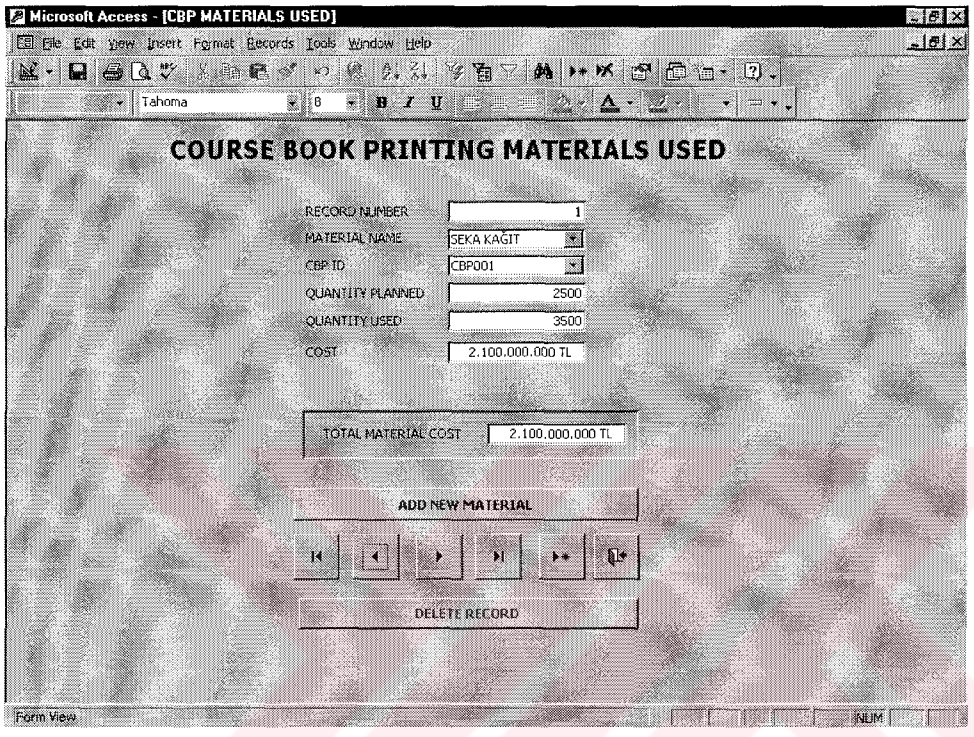
PICTURE 30

3.4.3.1.3.1. Add/View Materials

In order to keep record of which material is used in what amounts at a particular project "Add View Materials" button is clicked and following form (PICTURE 31) opens.

In this form, all the users need to do is to select project name from list, select material from the list and jot down the amount used. Then the database automatically calculates the cost incurred from that particular usage of material and updates the cost field of the selected record. If the desired material cannot be seen in the list, this means there is no

record for that material. In this case, user must define the material first by using "Materials" form, which opens by clicking "Add New Material" button at the bottom of the form.

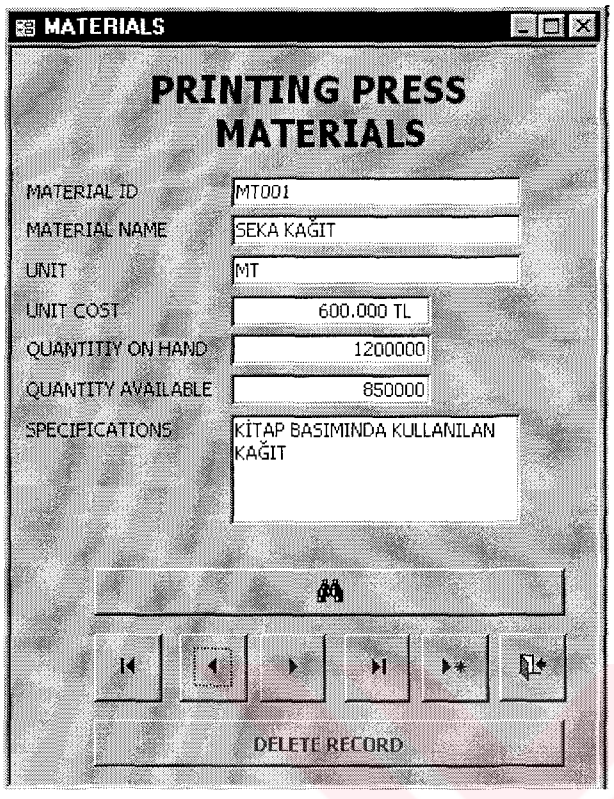


PICTURE 31

Adding, deleting records about materials used as well as navigation through records can be made in this form by using "Delete Record" button or navigation buttons respectively.

3.4.3.1.3.1.1. Add New Material

As well as adding new material information, modifications of the information of existing materials can also be made using the form "Printing Press Materials". Form is represented in PICTURE 32.



PICTURE 32

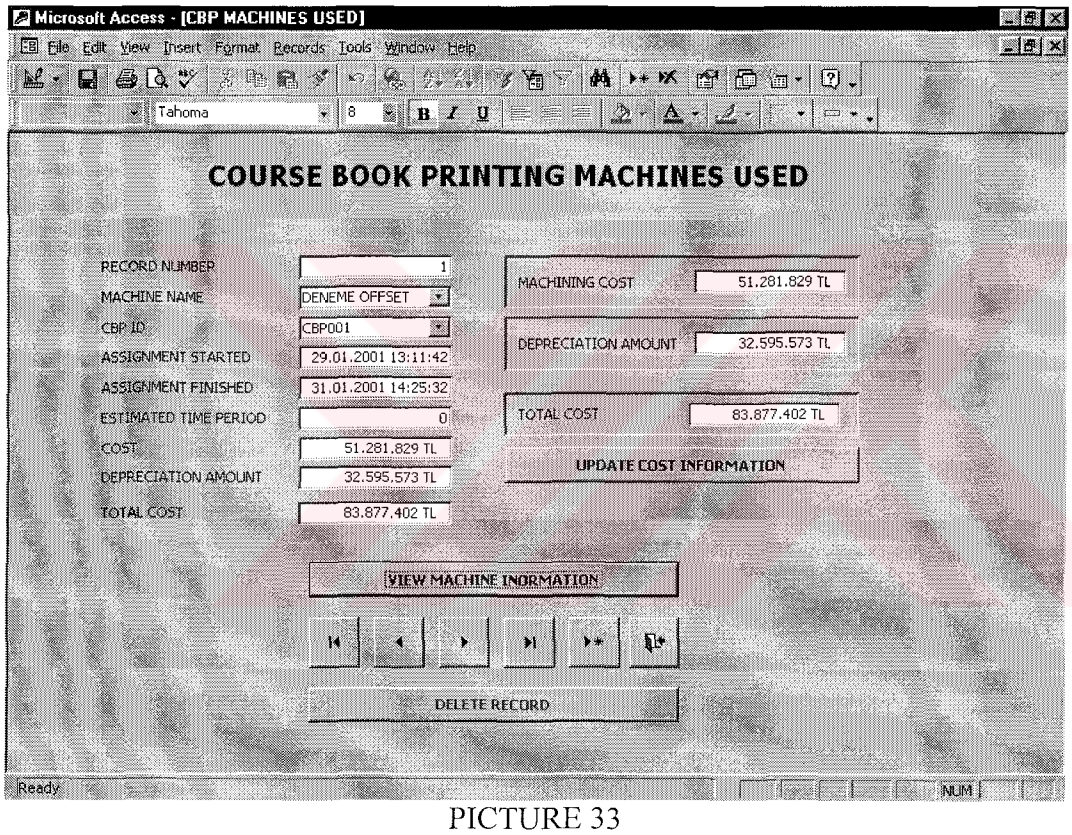
As can be seen from the picture, all the fields in this form is required to define the material exactly. To add a new record, user should go to the very end of the record-set. To find a particular record user can either use navigation buttons or the button that has binocular picture on it. If the second option is selected, an interface that asks for "MATERIAL ID" is come to the scene. When user enters the material id of the desired material, database will automatically retrieve the record.

3.4.3.1.3.2. Add/View Machines

This option is used to make assignments of machines to printing projects. It is works in same manner with "Add/View Materials" form. To assign a machine to a particular printing project, user must select machine name and printing project name from respective lists provided in form. In order to calculate the machining costs firmly, the user must enter assignment start and finish dates with assignment start and finish hours. Once all the information mentioned above provided, database will automatically calculates the machining costs.

One comment about calculation of machining costs is that the user must check out whether the cumulative depreciation of the selected machine exceeds foreseen depreciation amount for the year production is made. If the accumulated depreciation does not exceeds the foreseen depreciation amount, there is no problem. However if the accumulated depreciation exceeds the foreseen deprecation amount, depreciation amount of the selected record needs to be corrected. Using "Depreciation" form, which was explained in section 3.4.2.5.1, does this.

Machines form is represented in PICTURE 33.

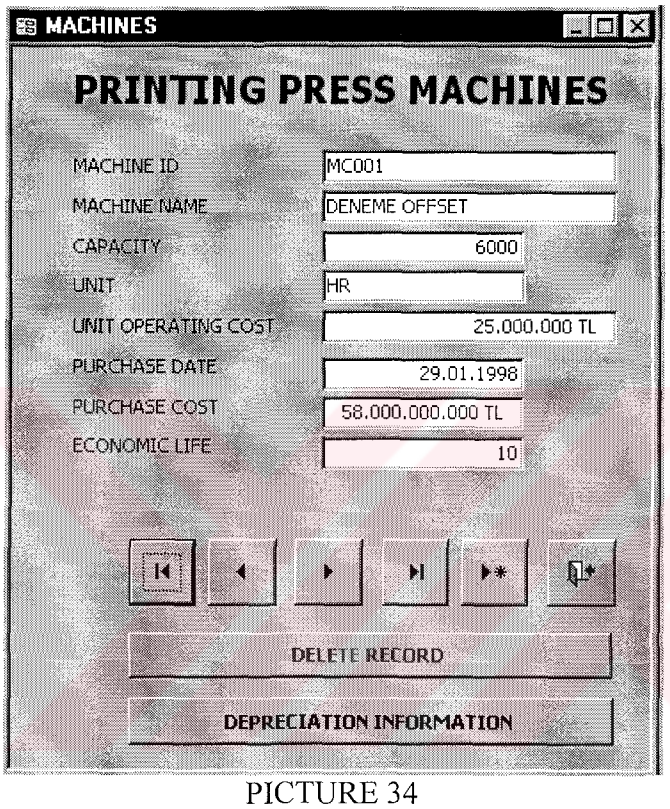


PICTURE 33

Once this investigation is made, user can update the cost information of the selected record by clicking "Update Cost Information" button.

3.4.3.1.3.2.1. View Machine Information

To see machine information in detail or add new machines the user should open the "Machines" form. This form is represented in PICTURE 34.

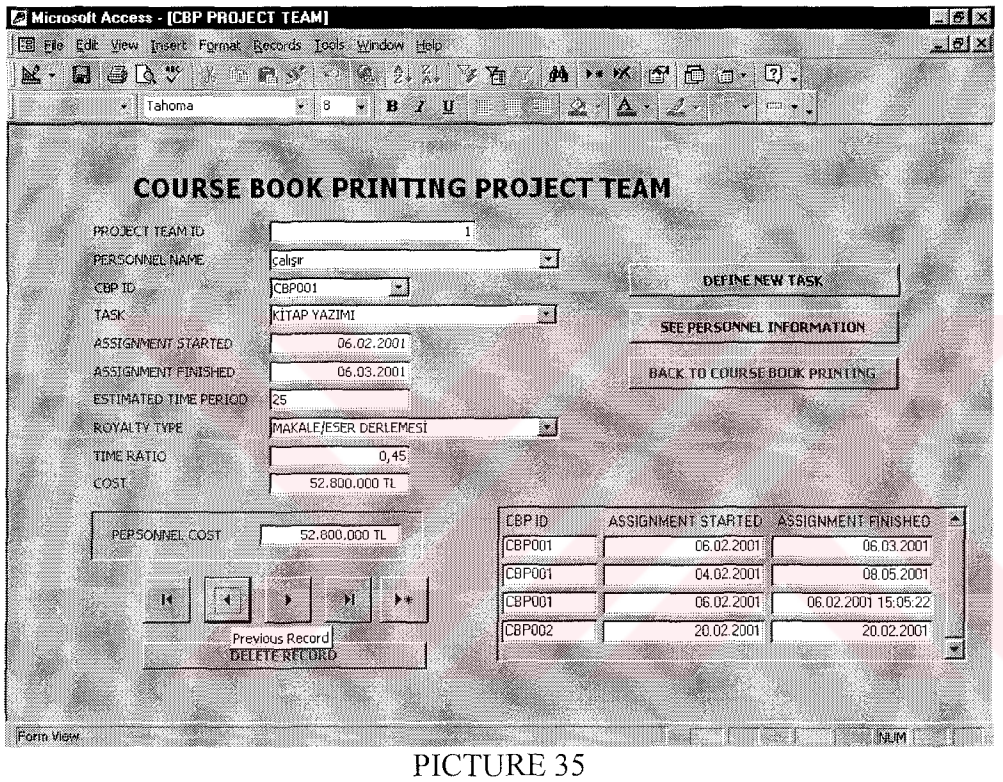


PICTURE 34

To modify existing records, user can go to the desired record by using navigation buttons. To add new record, user must go to the very end of the record-set.

3.4.3.1.3.3. Add/View Personnel

Project team of the book printing project can be constructed by utilizing "Course Book Printing Project Team" form. This form opens when "Add View Personnel" button is clicked placed on "Course Book Printing" form. The form is represented in PICTURE 35.

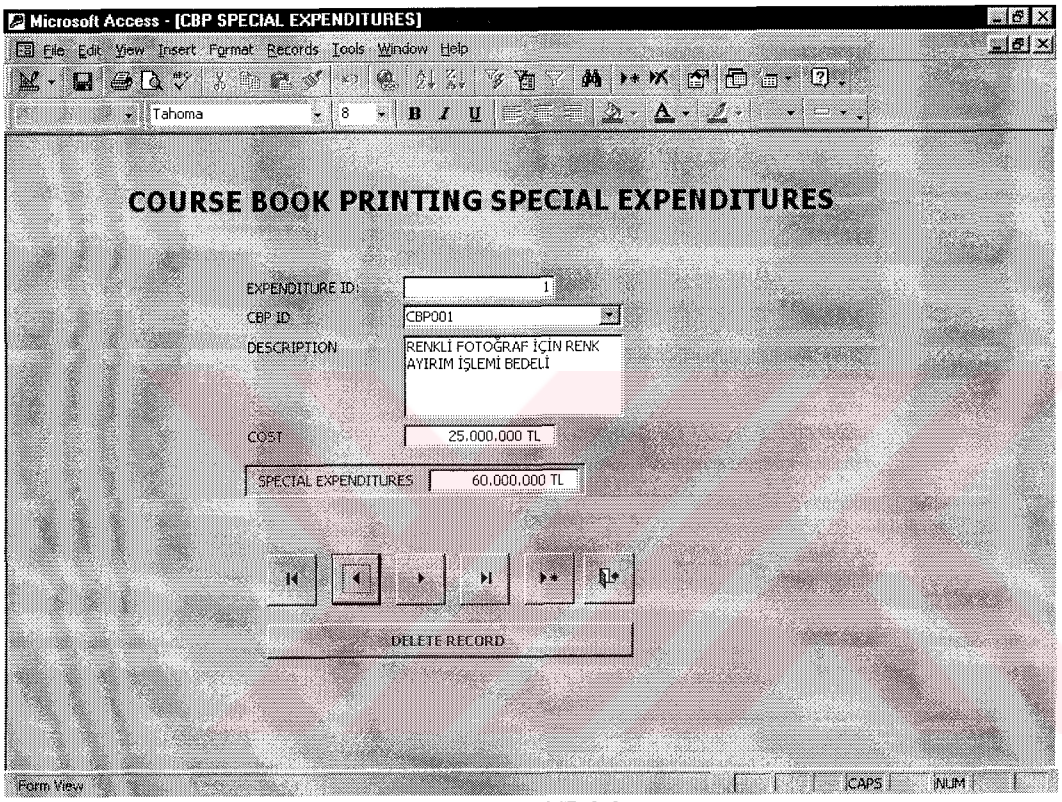


PICTURE 35

Usage of this form is same as with all the previous project team forms.

3.4.3.1.3.4. Add/View Special Expenditures

Special Expenditures form can be used for the expenditures that cannot be classified as previously explained cost items. Use of this form is also same as the previously explained special expenditures forms. Form is represented in PICTURE 36.

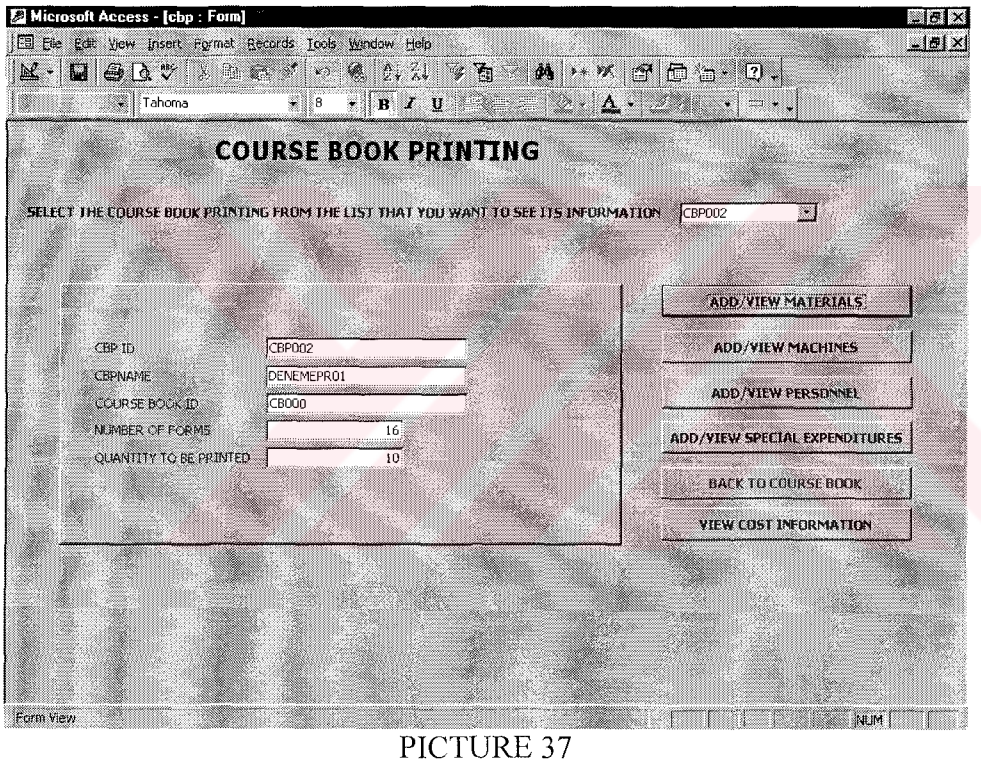


PICTURE 36

The field "Special Expenditures" returns the sum of all special expenditures made for the selected course book-printing project.

3.4.3.1.4. View Existing Course Book Printing

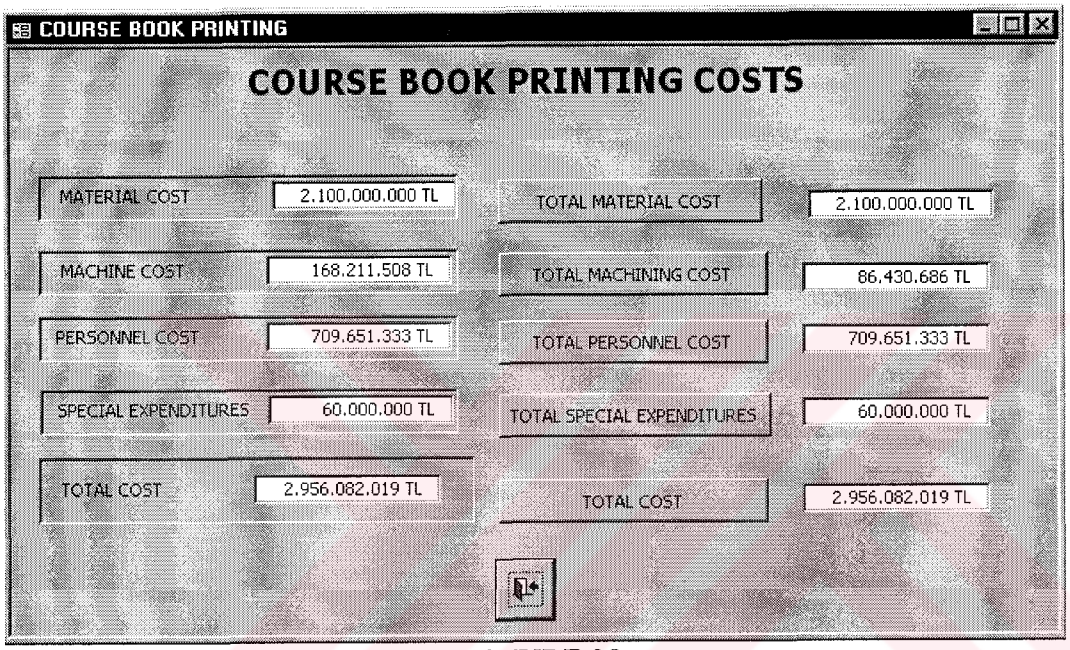
Once required information to define a course book printing project is provided, the user can make all the assignments and transactions related to that specific project by using "View Existing Course Book Printing Project" option. Form is represented in PICTURE 37. In addition to transactions about book printing explained previously, there is one more option in this form: The user can see all the costs incurred for the selected book printing project by clicking "View Cost Information" button. Explanation of this option is made in Section 3.4.3.1.4.1.



PICTURE 37

3.4.3.1.4.1. View Cost Information

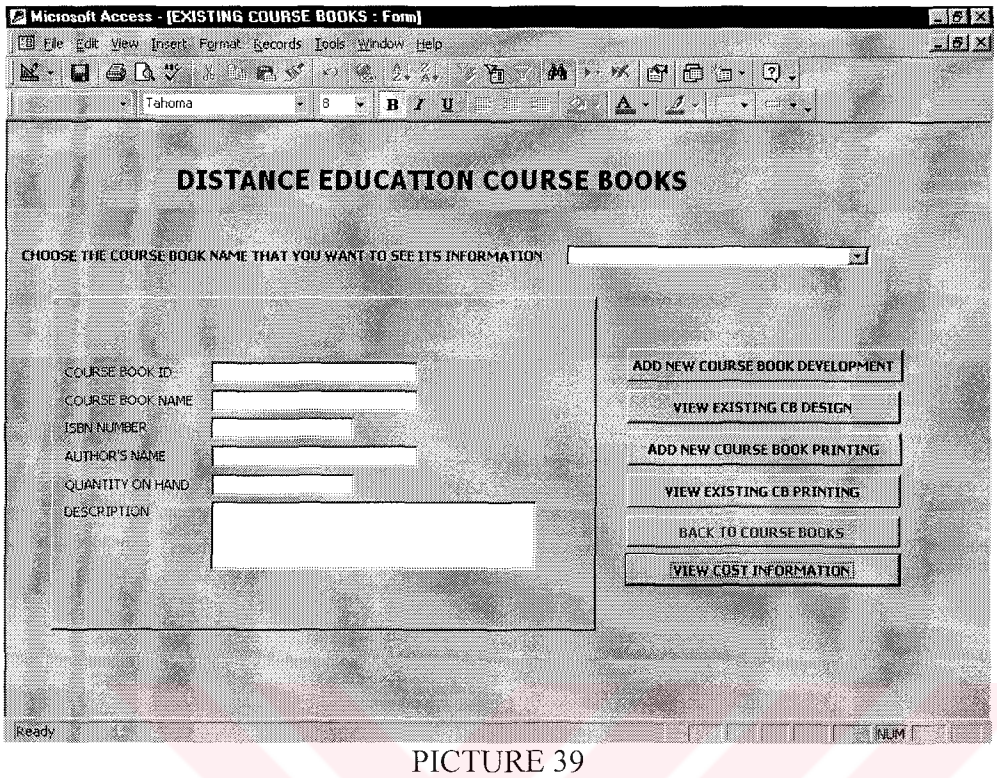
The form used to review and update course book printing costs is represented in PICTURE 38. On the left-hand side of the form total costs are viewed. To update cost information, each button on the form needs to be clicked once.



PICTURE 38

3.4.3.2. See Course Book

When the user wants to reach information about an existing course book, she should use "See Course Book" option from "Distance Education Course Books" form. When the user clicks "See Course Book" button, form represented in PICTURE 39 opens.

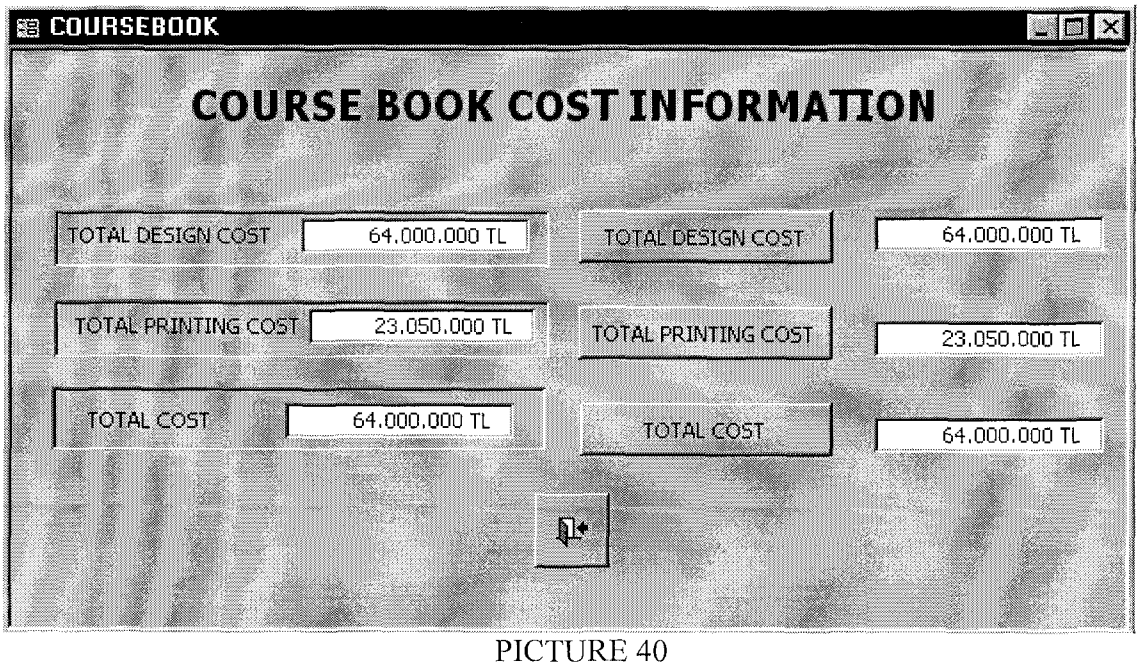


PICTURE 39

Once the user selects the course book name from the list, related record can be viewed on the left hand side of the form. On the right-hand side of the form user has five main options. Four of them are explained previously. When user clicks the view cost information button, following form represented in PICTURE 40 opens.

3.4.3.2.1. View Cost Information

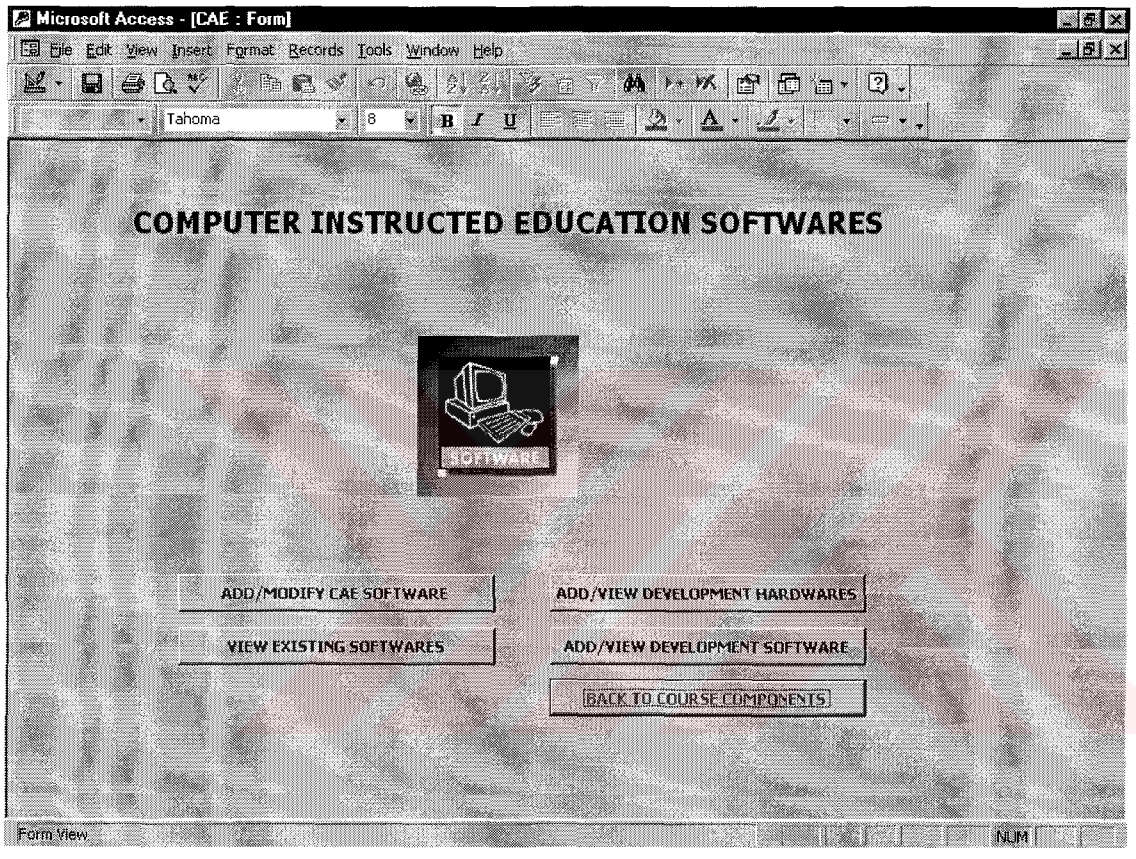
In this form, for a particular course book all design and printing costs can be viewed. Also using this form makes updates about course book design and printing costs.


COURSEBOOK
COURSE BOOK COST INFORMATION
TOTAL DESIGN COST
64.000.000 TL
TOTAL DESIGN COST
64.000.000 TL
TOTAL PRINTING COST
23.050.000 TL
TOTAL PRINTING COST
23.050.000 TL
TOTAL COST
64.000.000 TL
TOTAL COST
64.000.000 TL

PICTURE 40

3.4.4. Computer Instructed Education Softwares

When "Computer Instructed Education Software" Button is clicked from the "Course Components" form, following form opens.

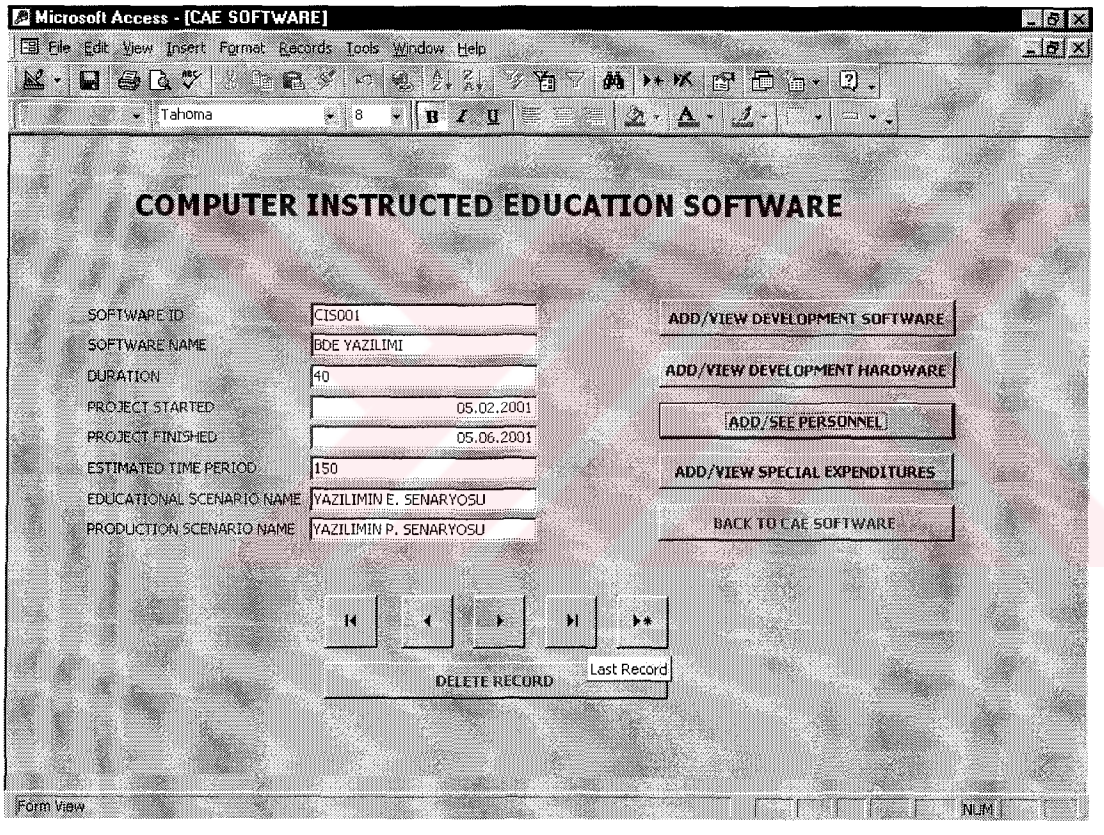


PICTURE 41

The user has four main options in this form as follows: Add/Modify CAE Software, View Existing Software, Add/View Development Hardware and finally Add/View Development Software. Other than those, user can go back to the course components form by clicking "Back to Course Components" form.

3.4.4.1. Add/Modify CAE Software

The user can add new CAE Software Project or modify existing ones on the following form. "Computer Instructed Education Software" form opens upon clicking the "Add/Modify CAE Software button on "Computer Instructed Education Softwares" form.

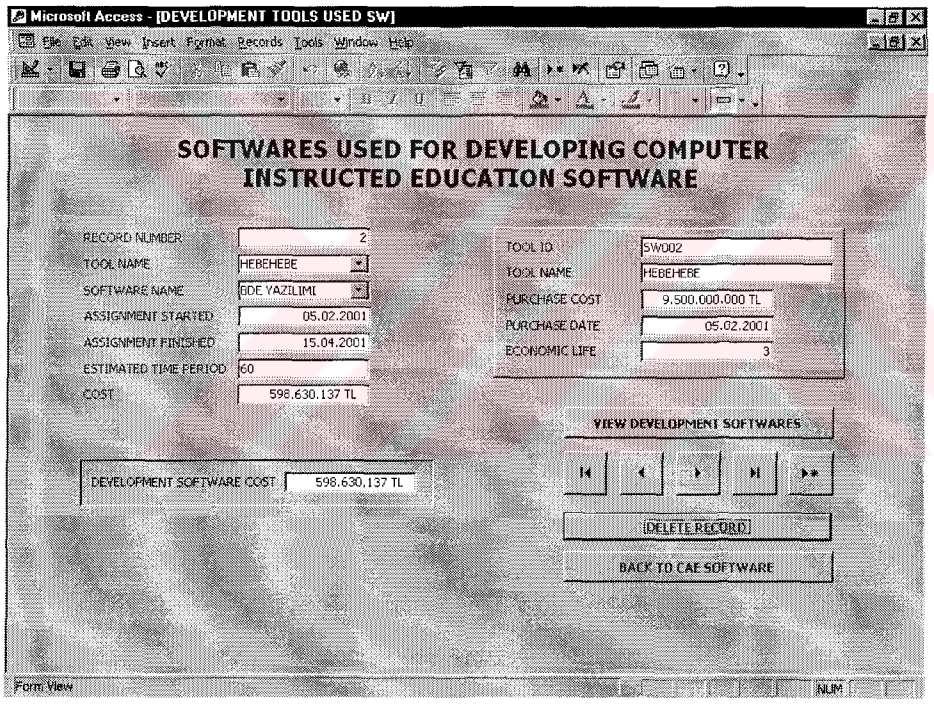


PICTURE 42

After the completion of providing necessary information to define the project, the user can make development hardware or software and personnel assignments, as well as recording the special expenditures information.

3.4.4.1.1. Add/View Development Software

Development Software is the software used for developing CAE Software. These software are only used for Computer Instructed Education Software Development Unit throughout the university. Since then, these software are treated differently from all the other software used in the process of course design. In order to assign particular development software to a particular project following form is used.



PICTURE 43

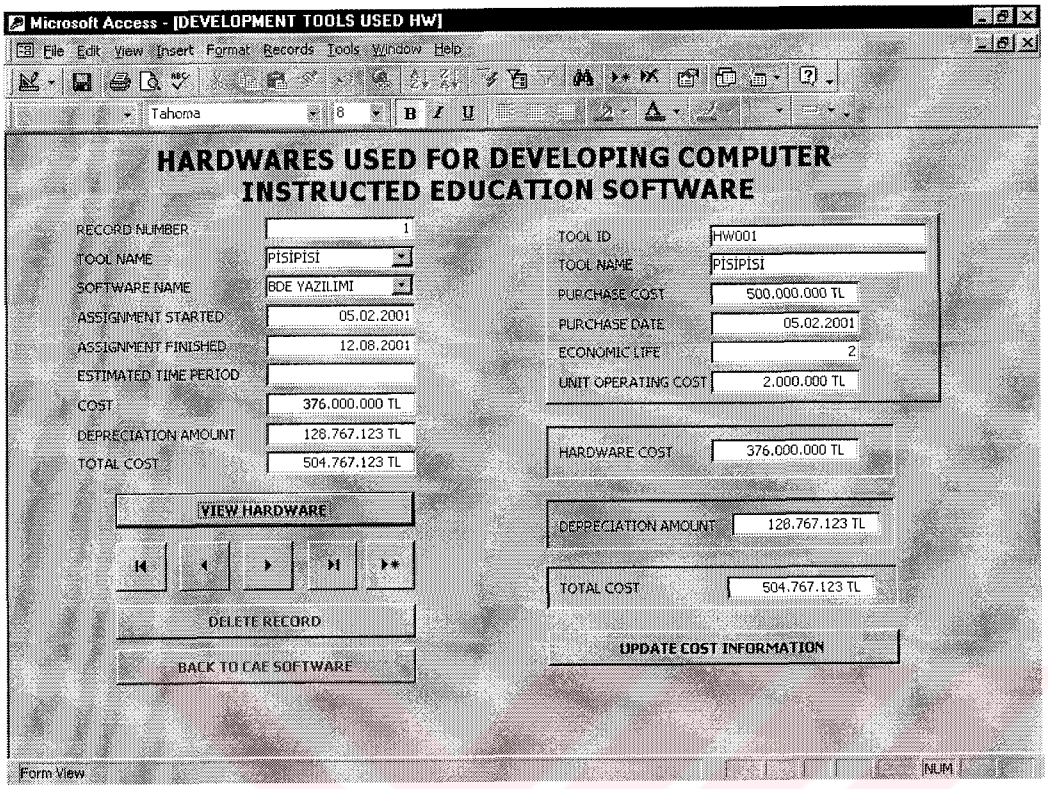
In this form, after assignment of the software to a particular design project is made and assignment start/finish dates entered, database will automatically calculate the cost of it and update the cost information of the selected record.

When the user selects particular development hardware from the list, detail information of the selected development software can be viewed on the right hand side of the form. When "View Development Software" button is clicked, a form used for making modifications on the information of existing development software or adding new development software opens. The use of this form is explained in section 3.4.4.4.

3.4.4.1.2. Add/View Development Hardware

As in the case of development software, development hardware is also used only for developing CAE Software. Since then, these hardware are treated differently from all the other hardware used in the process of course design. To assign particular development hardware to particular CAE Software design project, following form is used.

Once hardware is selected from the list provided, at the upper right hand side of the form detail information of selected form can be viewed. At the bottom of this, there are three cost calculation field. These are hardware cost, depreciation amount and total cost. Hardware cost is the cost incurred by the usage of particular hardware. Depreciation Amount is the cost of depreciation; total cost is sum of hardware cost and depreciation amount. To update the cot information of the selected record, the user should click on the "Update Cost Information" button.

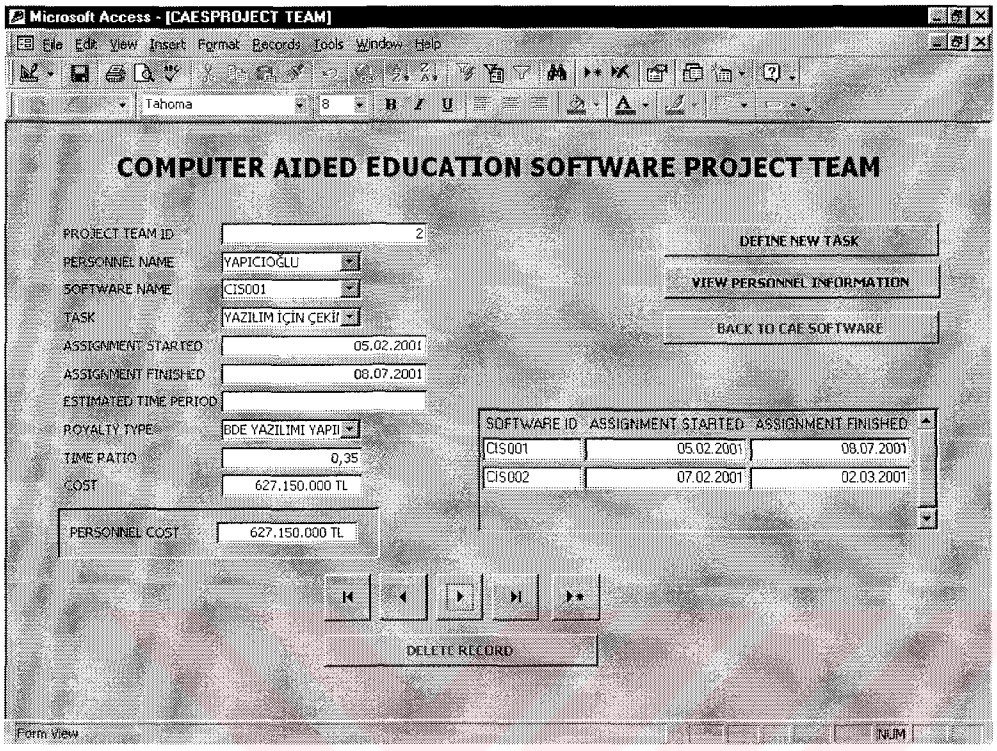


PICTURE 44

When "View Development Hardware" button is clicked, a form used for making modifications on the information of existing development hardware or adding new development hardware opens. The use of this form is explained in section 3.4.4.3.

3.4.4.1.3. Add/See Personnel

To assign personnel to CAE Software Project Team following form is used. "CAE Software Project Team" form opens upon clicking the "Add/See Personnel" button on "Computer Instructed Education Software" form.



PICTURE 45

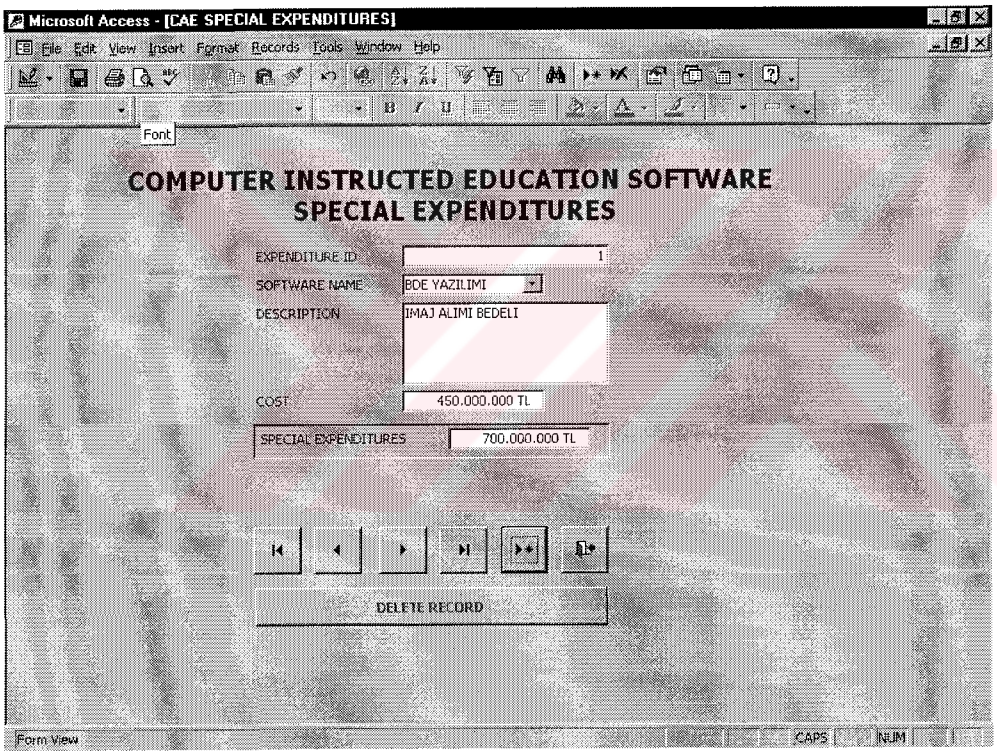
To calculate a personnel's cost, software name, personnel name assignment start/finish dates, royalty type and time ratio fields are required. Once these fields are updated, database will automatically calculate personnel's cost.

At the lower-right hand side of the form, there is a field for viewing selected personnel's other assignments.

By using command buttons on the upper-right hand side of the form the user can define new tasks or view personnel's detail information. Use of Define New Task and View Personnel Information options are explained in sections 3.4.1.2.4.1. and 3.6. respectively.

3.4.4.1.4. Add/See Special Expenditures

As in previous Special Expenditures sections, there can be costs that cannot be classified in the previously defined categories for CAE Software. For this kind of costs, CAE Special Expenditures form can be used.

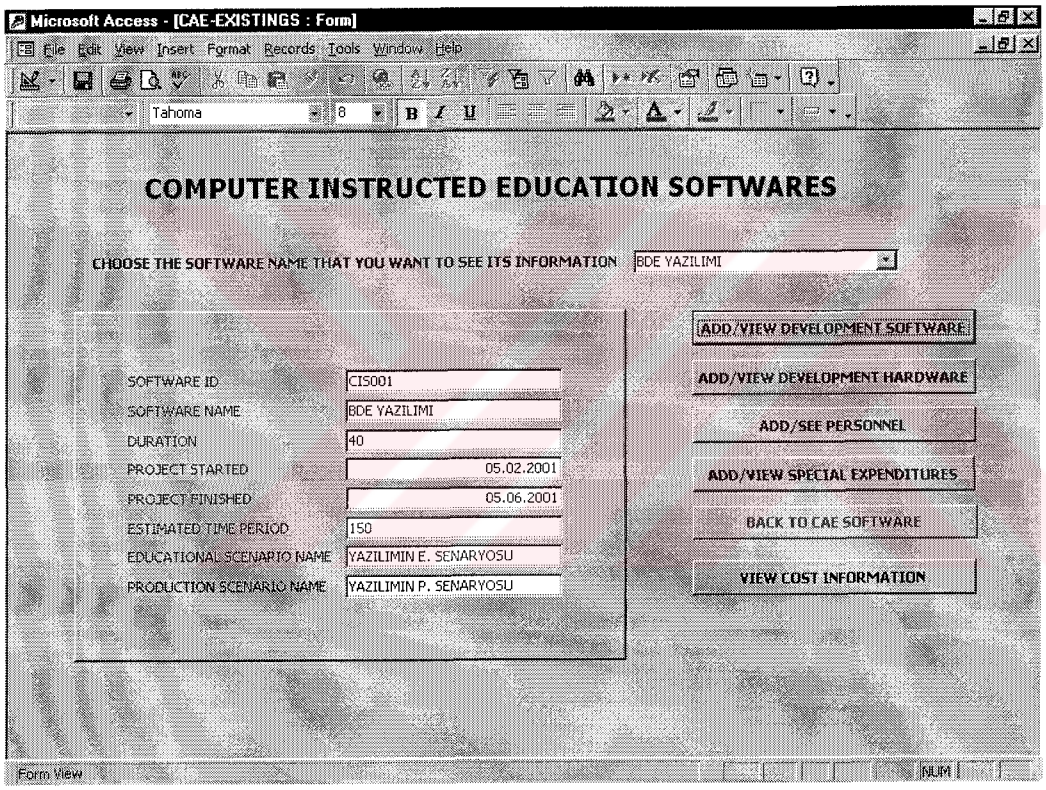


PICTURE 46

At the lower side of the form, the field named "Special Expenditures" is viewed. This field shows sum of all special expenditures made for the selected CAE Software Project.

3.4.4.2. View Existing Software

In order to view previously defined CAE Software Design Project's information, the user can use "View Existing Software" option from the "Computer Instructed Education Softwares" form. When this command button is clicked, following form opens.



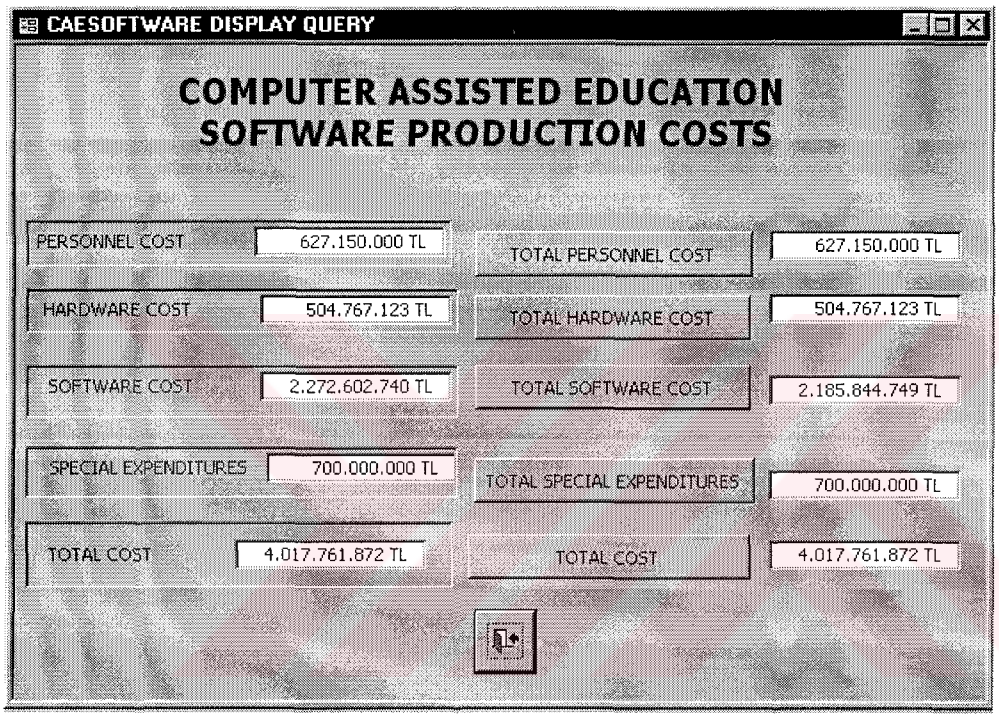
PICTURE 47

The user should select the CAE Software Name from the list provided that she wants to see its information.

The only different option in this form from the "Add/View CAE Software" form is the command button "View Cost Information.

3.4.4.2.1. View Cost Information

When command button "View Cost Information is clicked, following form opens.

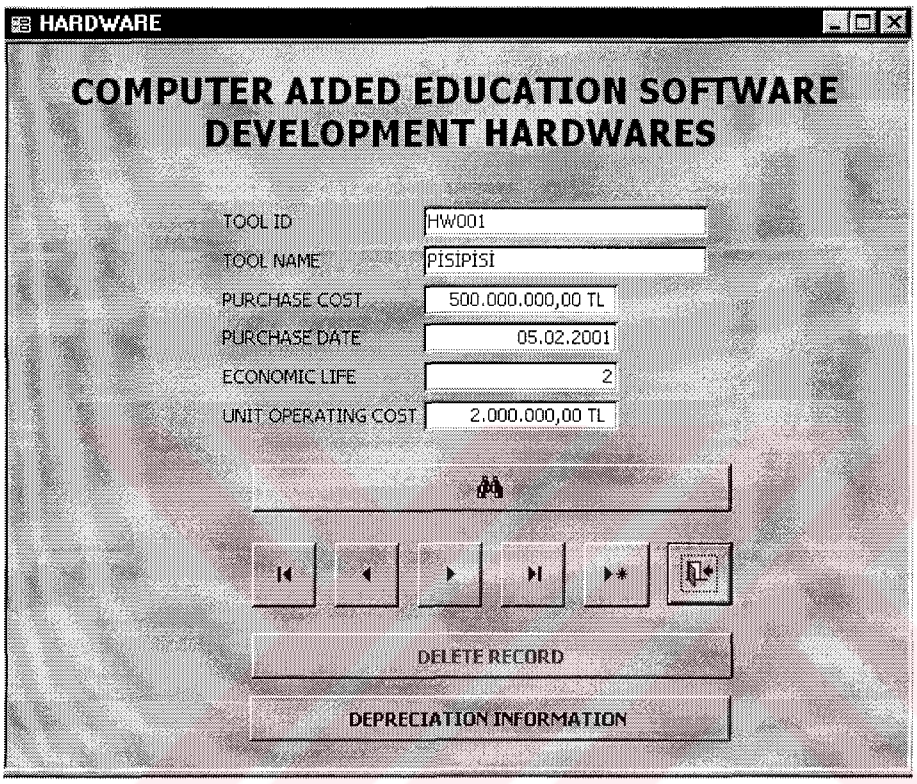


PICTURE 48

In this form, all cost categories are viewed on the left-hand side of the form. Cost Information of the selected record can be updated by using command buttons on the middle of the form.

3.4.4.3. Add/View Development Hardware

Third option in the "Computer Instructed Education Softwares" form is command button "Add/View Development Hardware". When it is clicked, following form opens.

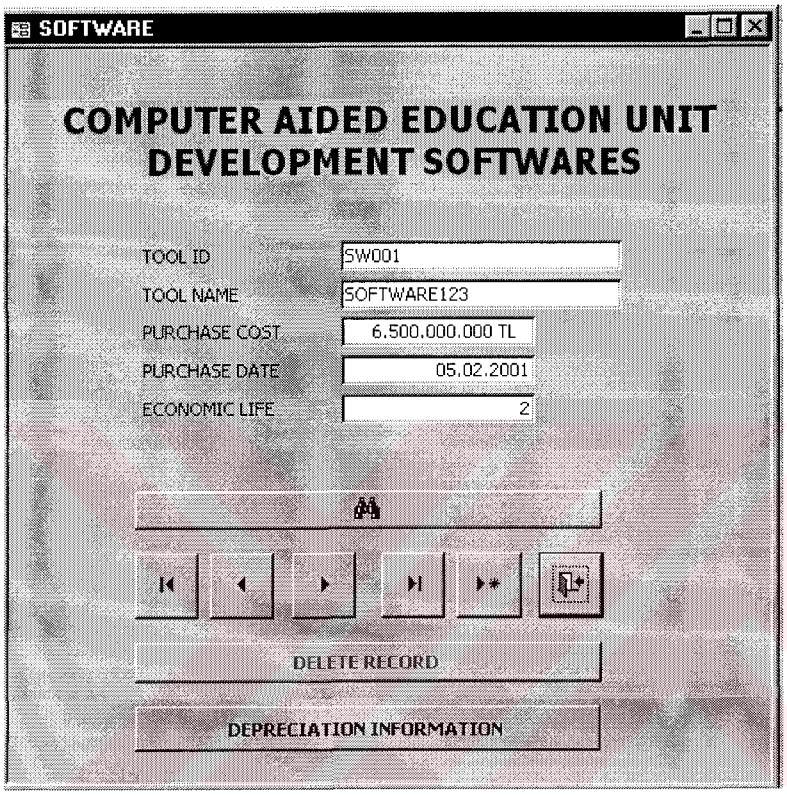


PICTURE 49

In order to add a new record, the user should go to the very end of the records. To view one of the existing records, user can either use navigation buttons or use command button that has binocular picture on it. By clicking "Depreciation Information" command button, the user can view accrued depreciation for the selected record. The Use of Depreciation Information form is explained in section 3.4.2.5.1.

3.4.4.4. Add/View Development Software

Fourth option in the "Computer Instructed Education Softwares" form is command button "Add/View Development Software". When it is clicked, following form opens.

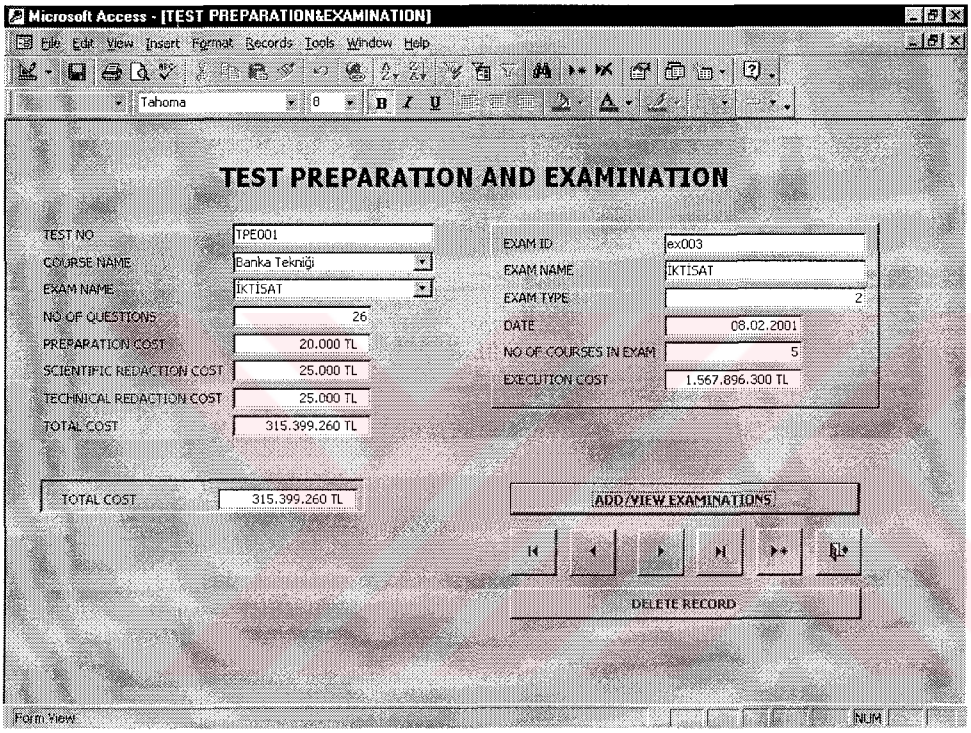


PICTURE 50

In order to add a new record, the user should go to the very end of the records. To view one of the existing records, user can either use navigation buttons or use command button that has binocular picture on it. By clicking "Depreciation Information" command button, the user can view accrued depreciation for the selected record. The Use of Depreciation Information form is explained in section 3.4.5.2.1.

3.4.5. Test Preparation and Examination

Test Preparation and Examination is the last option in the "Course Components" form. Form is represented in PICTURE 51. Test preparation cost is calculated by multiplying no of questions with the sum of preparation cost, scientific redaction cost, and technical redaction cost. Hence for the preparation cost to be calculated these fields are required.



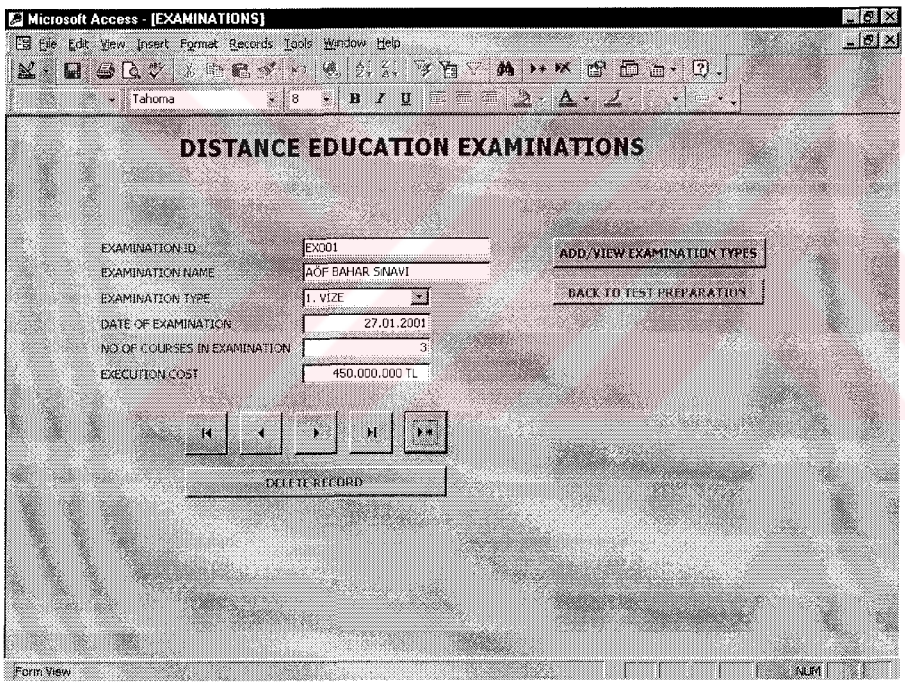
PICTURE 51

Examination execution costs are distributed across courses included in examination equally. Since then in order for execution costs to take into account which exam includes the prepared test should be defined.

After all these definitions are provided, database will automatically calculates the cost of selected test.

3.4.5.1. Examinations

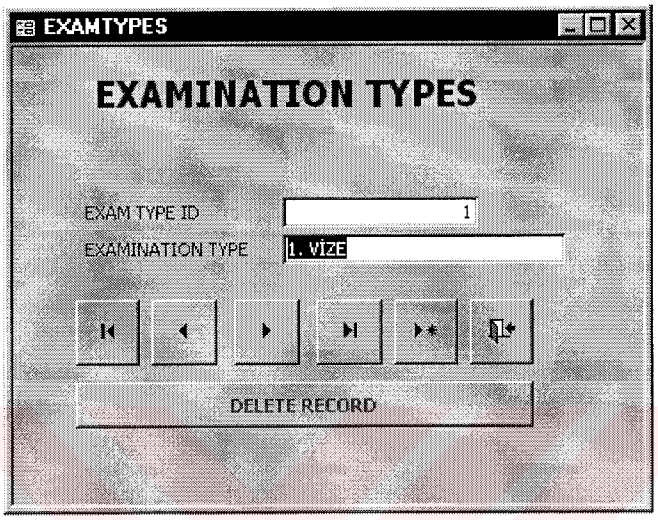
Distance Education Examinations include tests that belong to more than one course or program. Examination form is represented in PICTURE 52. Examinations are made in basis of subcontracting. So, for each exam an agreement between subcontractor and Open Education Faculty and payment is made.



PICTURE 52

3.4.5.1.1. Exam Types

All the current exam types were entered into the system. However, if there is a need to define a new examination type or modify one of the existing ones, following form can be used.



PICTURE 53

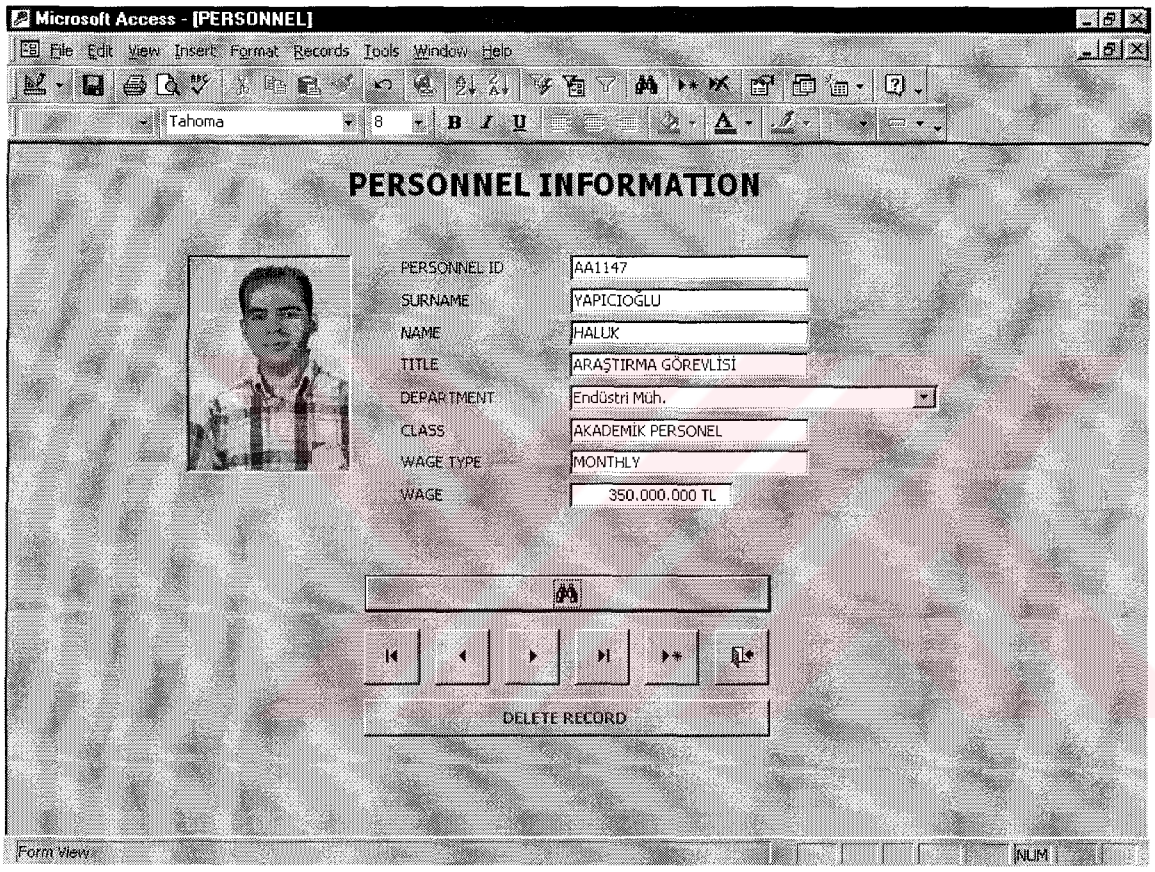
3.5. View Departments

The use of "view departments" option was explained in section 3.2.1.

3.6. Personnel Information

If the user wants to retrieve data on specific personnel, then she can enter to the personnel database by clicking on the "Personnel Information" command button on the start-up menu. Personnel Information form opens without any kind of filtering process.

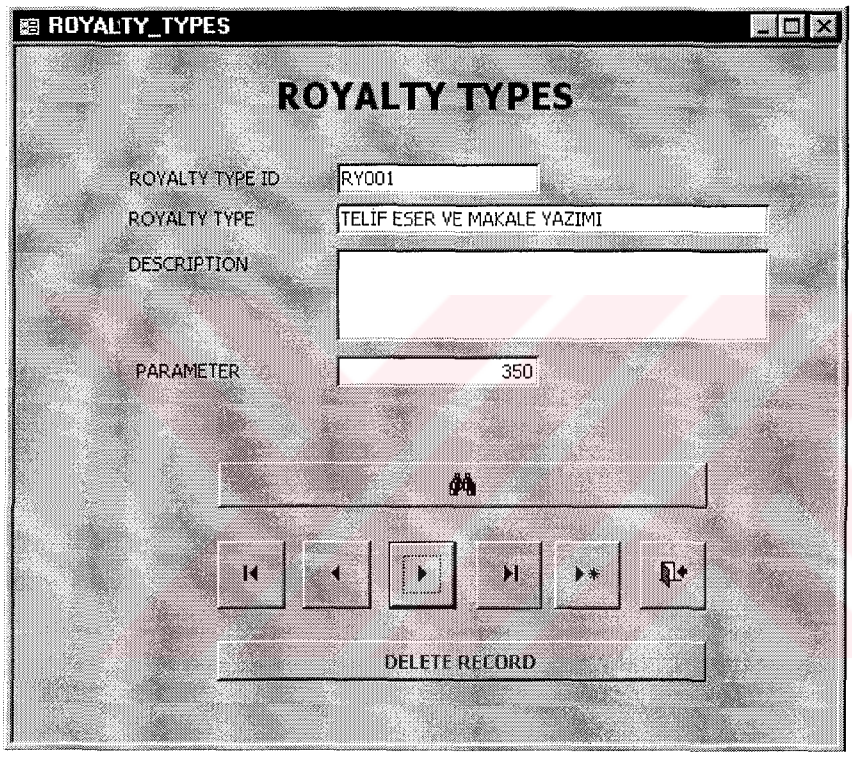
The user can search the database for a specific person by using his/hers "Personnel ID" using the search engine provided on the form. Otherwise, the user can also use navigation buttons to move around the data. However, this process can be very tedious, if there are many personnel in the organization. The "Personnel Information" form is presented below:



PICTURE 54

3.7. Royalty Types

Another type of payment made to personnel is royalty share. This payment is calculated via predefined coefficients. The user can define new royalty types and modify-view existing ones using the following form:



PICTURE 55

To define a royalty type, the only required fields are royalty type name and parameter field. All the other fields are optional. A description field is provided to the user if extra information other than name is required.