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DESIGNING A DATABASE MANAGEMENT SYSTEM FOR COURSE DESIGN IN DISTANCE EDUCATION

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Introduction

Education is an instrument to develop skills and exploit opportunities for individuals in the society. 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. 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.

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. 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 Open Education Faculty. 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. However, 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.

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 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. The proposed system 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.

Costing Approach

The analysis of the course delivery materials design and production processes 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. 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.

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 (DEDU), under the supervision of project managers for each course delivery material, this unit is chosen to be the administrator for the database. Each project manager has the responsibility of all the activities concerning their course materials, but coordination of these efforts are made by DEDU. So the most suitable place for the database is within the DEDU.

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 DEDU.

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. 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 DEDU 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 them 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. 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, and 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. 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. 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 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, six different security levels are defined.

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. 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.

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.

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

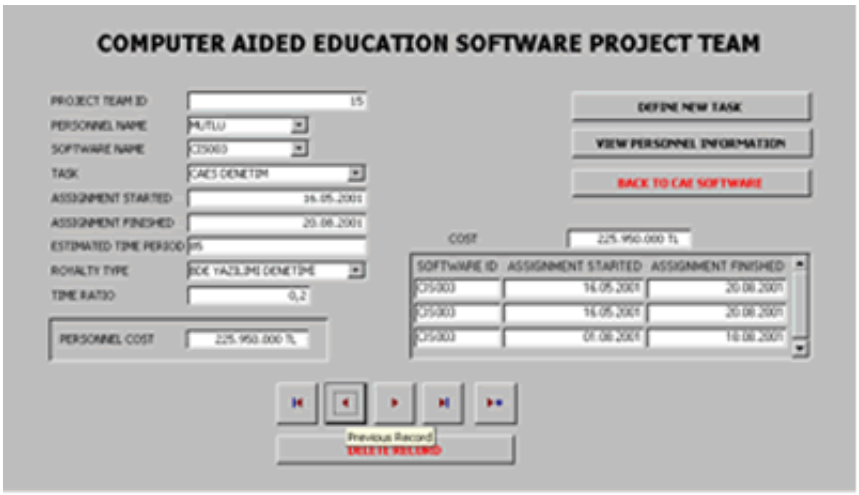

Figure 1 Example Personnel Assignment Record

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.

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.

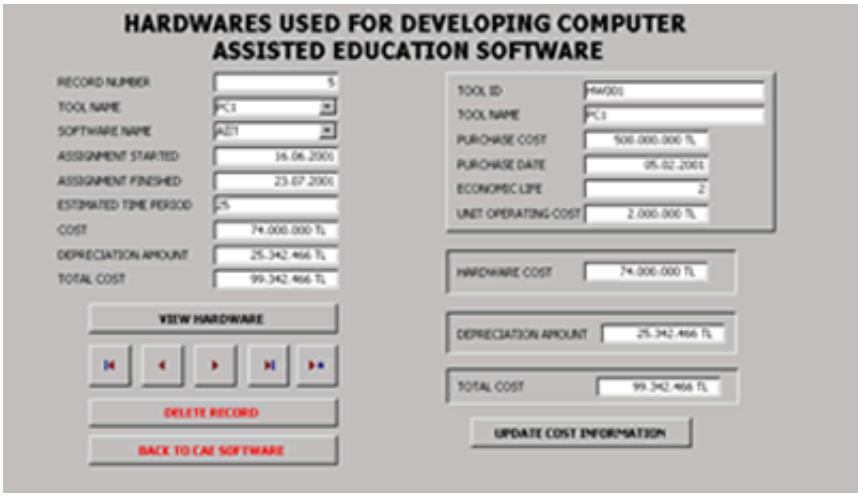

Figure 2 Example Hardware Assignment Record

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.

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.

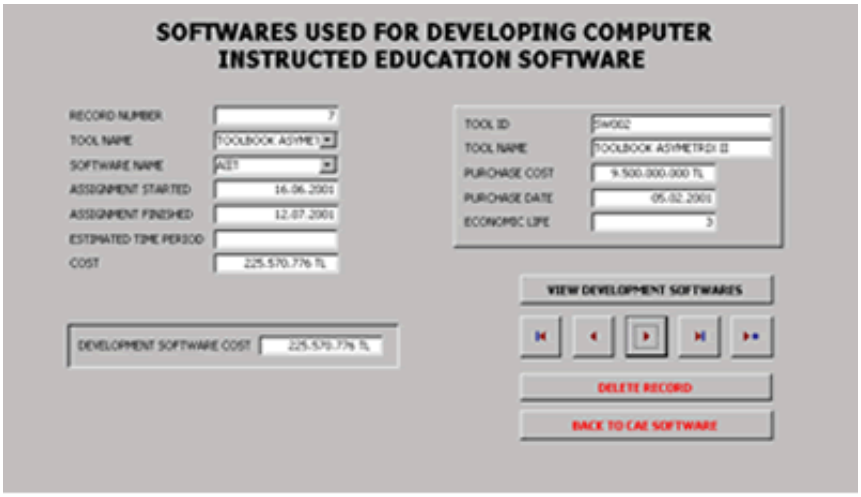

Figure 3 Example Software Assignment Record

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.

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.

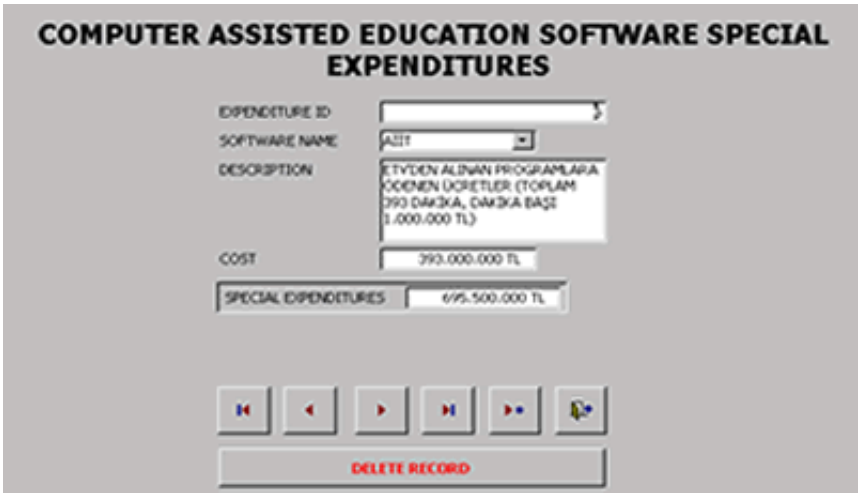

Figure 4 Example Record for Special Expenditures

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.
Total Cost

Once all cost objects' incurred costs are calculated by using the system, Total cost of the software can be viewed in the form represented in the Figure 5-5. In this form user can view total cost of each classification defined for the software development, as well as their grand total.

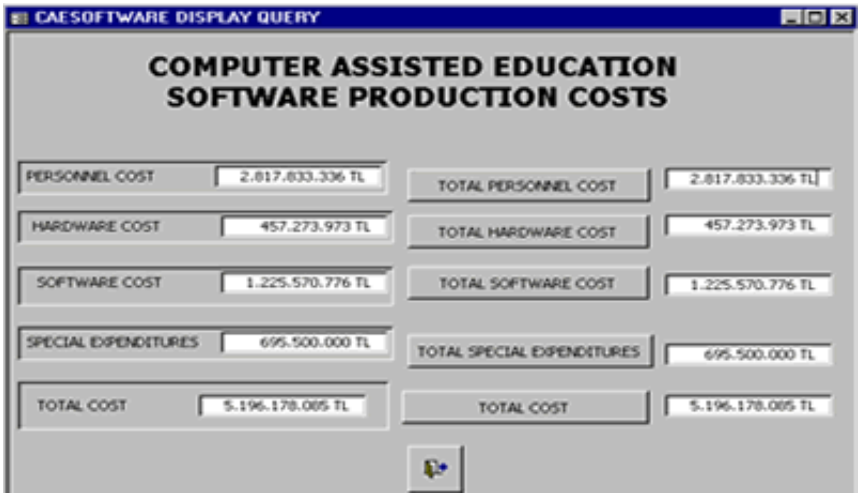

Figure 5 Cost Figures of the Ataturk's Principles and History of Revolution Course's Software

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

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.

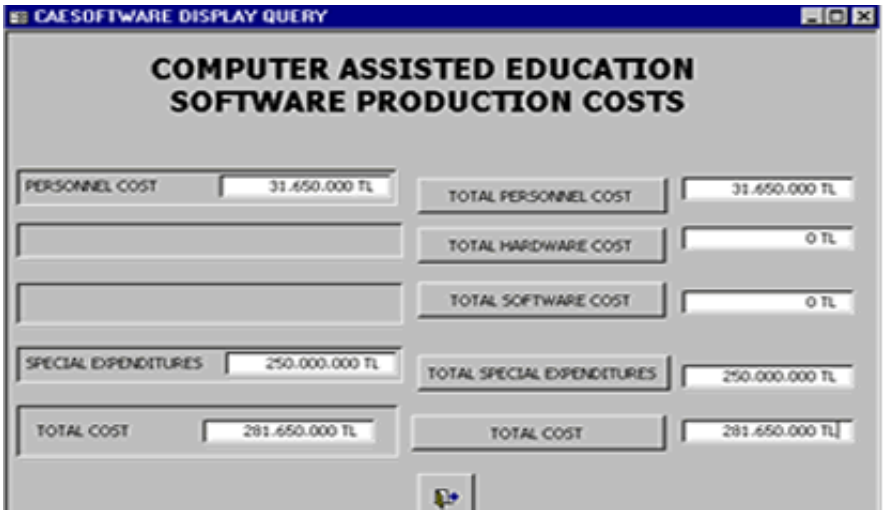

Figure 6 Total Cost of the Software by Using Current Costing Approach

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.

Results

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.

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. Within this context, proposed system can be thought as a Decision Support System. 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 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.

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