DESIGN OF AN INFORMATION SYSTEM FOR THE ADMINISTRATION OF THE UNIVERSITY

(THE OFFICE OF STUDENT AFFAIRS, THE REGISTRAR'S OFFICE, THE PERSONNEL OFFICE)

by

H.Murat MERCAN

B.S. in I.E., Boğaziçi University, 1981

Submitted to the Institute for Graduate Studies in Science and Engineering in partial fulfillment of the requirements for the degree of

Master of Science

in

Industrial Engineering

Boğaziçi University

1984

ACKNOWLEDGEMENTS

I would like to express my sincere gratitute to my thesis supervisor, Prof. İbrahim Kavrakoğlu first of all for providing me the opportunity to work on such an interesting subject and also for his valuable contributions, encouragement, help, and understanding during all the stages of this study.

I would also like to express my sincere gratitute to Yrd. Doç. Dr. Mehmet Akif Eyler for all his valuable contributio

I would further like to thank Mrs. Ferah Lök for her helps during all stages of this study.

I am indepted to all my colleagues, especially to Mr. Levent Mollamustafaoğlu, Miss Belgin Turgut, Mr. Murat Genç, Mr. İstemihan Örgeevren, Miss Ümit Aktan, and Mr. Vedat Verter for their contributions in chapter 7, and to Mr. Cemalettin Nuri Taşcı for providing me the MIS literature.

Special thanks are due to Dr. Mehmet Savsar, Assistant Professor of Industrial Engineering, Anadolu University, for his review and constructive comments.

I also sincerely wish to thank to Miss Sevinç Vuranoğlu for her tireless typing and to Mrs. Ümit Kıraç for her drawings.

H. Murat MERCAN

ABSTRACT

Information is one of the main inputs for any organization. After the computers were introduced; to gather, store, and process the information in a manner that will meet the formal information requirements of the managements have become one of the most important research areas.

In this thesis, information systems are designed for the Office of Student Affairs, the Registrar's Office, and the Personnel Office at Boğaziçi University. First, these offices are analyzed and their problems while performing their tasks are studied. Then,the new procedures are developed for some of the tasks of these offices. Also, the files and the computer programs, which form a basis for an information system, are developed. Finally, the suggestions about the implementation phase are made.

Ö Z E T

Sistemlerin girdilerinden olan bilginin önemi, bilgisayar teknolojisindeki gelişmelere paralel olarak artmaktadır. Bu nedenle gerek bilim çevreleri gerekse iş çevreleri bilginin toplanması, işlenmesi ve saklanması konusunda yöntemler geliştirmektedirler. Sistemlerin gittikçe karmaşık bir yapı kazanması, ortamın dinamik yapısı ve belirsizlikler nedeniyle bilginin sistemli bir biçimde saklanması ve işlenmesi tüm işletmeler için kaçınılmaz hale gelmektedir. Bilimsel yayınlarda "Yönetim Bilişim Sistemi, Karar Destek Sistemi" gibi adlar verilen Bilgi Sistemlerinin en temel amacı yönetimlerin her türlü bilgi gereksinimlerini ve çevrenin gereksinim duyduğu bilgileri sağlamaktır. Bu amaçla, kurulan ve yönetilen bilgi sistemleri aynı zamanda ana sistemin bir altsistemi olarak tanımlanmaktadır. Kuşkusuz dünyanın yaratılışından beri her sistemde bir bilgi akışı ve sistemler arasında bilgi iletişimi vardır. Bu açıdan bakılınca Bilgi Sistemleri ana sistemin gereksinim duyduğu bilgilerin daha iyi bir şekilde elde edilmesi, kullanılması ve saklanması konusunda yöntemler

geliştirmekte ve probleme bilimsel açıdan bakarak çözüm yolları aramaktadır.

Bilgi Sistemi Tasarımı adı verilen bu çalışmalarda yaklaşım ve tasarım yöntemi konusunda belirli görüş birliği olmamakla birlikte, genellikle Modüler Yaklaşım ve Üç Kademeli Geliştirme yöntemi adı verilen yöntemler kullanılmaktadır. Modüler yaklaşım, Bilgi Sisteminin küçük altsistemler için tasarlanmasını öneren bir yaklaşımdır. Bu yaklaşıma göre bilgi sistemi her modül için ayrı ayrı tasarlanır ve modüller için tasarlanan bilgi sistemleri bütünleştirilir. Her modül için Üç Kademeli Geliştirme Yöntemi önerilmektedir. Bu yönteme göre her modül önce analiz edilir. Sistem Analizindeki asıl amaç problemlerin saptanması, amaçların ve bilgi gereksiniminin belirlenmesidir. İkinci kademe ise Sistem Tasarımıdır. Bu kademede analizde ulaşılan sonuçlara göre ya yeni bir Bilgi Sistemi tasarlanır ya da eski sistemde düzeltmeler yapılır. Üçüncü kademe ise uygulama kademesidir. Bu kademede geliştirilen Bilgi Sisteminin uygulama evreleri tasarlanır, bakım ve yönetim politikaları geliştirilir.

Bu çalışmada Boğaziçi Üniversitesi Kayıt İşleri Müdürlüğü, Öğrenci İşleri Müdürlüğü ve Özlük İşleri Müdürlüğü için Bilgi Sistemi tasarlanmıştır. Tasarımda her müdürlük modül olarak kabul edilmiş ve Üç Kademeli Geliştirme yöntemi uygulanmıştır.

Öğrenci İşleri Müdürlüğü'nün analizi sonucu yeni

bir Yurt Sistemi ve Burs Sistemi geliştirme ve bilgisayar destekli Bilgi Sistemi kurma gereği ortaya çıkmıştır. Bu amaçla, yeni sistemler geliştirilmiş, kütük ve bilgisayar programları tasarlanmıştır.

Kayıt İşleri Müdürlüğü'nde yapılan araştırmalardan sonra yeni bir kayıt sistemi geliştirilmiştir. Aynı zamanda bu araştırmalar, kullanılan kütük ve bilgisayar programlarının yetersizliğini ortaya çıkarmıştır. Tasarım evresinde Kayıt İşleri Müdürlüğü için yeni bir Bilgi Sistemi tasarlanmıştır.

Üniversitede çalışan personele ilişkin tüm özlük işlemleri yasa ve yönetmeliklerle belirlendiği için Özlük İşleri Müdürlüğü'nün sadece bilgi gereksinimi araştırılmış ve bu gereksinimi karşılayacak Bilgi İşleme Sistemi geliştirilmiştir.

Bilgisayar programları ve kütükler yazılmadığından Uygulama kademesi için yalnızca öneriler sunulmuştur.

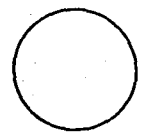
TABLE OF CONTENTS

LIST OF FIGURES

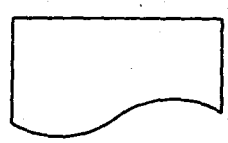
Page

LIST OF TABLES

LISTS OF CHARTS

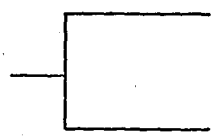
Generalized data storage 

Generalized input/ output 

Report input/ output 

Process or occurance 

Organizational units 

Additional remarks 

I. INTRODUCTION

After the computers were introduced, it was appreciated that information was a specific input for any system. From that time onwards, gathering and processing information in a manner that have met the formal information requirements of all levels of the management and the needs of the concerned parties external to the organization have been one of the most research areas. For this purpose, the scientists and the managers searched for effective ways in gathering, storing, and processing information. Information System develops or improves the information processing techniques of any organization. From this perpective, for any organization, the main aim of having a well-structured Information System is to get formal information for supporting the decisions and controlling the operations.

In literature, there is no well-defined information system development procedure. Most commonly used one is the modular approach and step-by-step development procedure. Burch et al (6) states that each management system is an integration of functional and structural subsystems. Thus

information systems should be designed for each subsystem. The intersection of the functional and structural subsystems are the modules of any organization. Most of the studies in the literature, propose step-by-step information system development procedure for each module, where the steps or phases are the analysis, the design and the implementation phase.

In this study, the information system has been developed for the Office of Student Affairs, the Registrar's Office, and the Personnel Office at Bogazici University. These offices were selected as the modules and step by step development procedure has been applied to each module.

In the analysis phase, the problems of these offices while performing their tasks and the reasons of these problems are completely studied first. Then the necessary changes that should be done in order to solve these problems and in order to improve the efficiencies of these offices are discussed.

In the design phase, first the new procedures for the tasks of the offices in order to solve the problems were developed. Then the files and the computer programs, which will form the basis for information system and will improve the efficiency of these offices, are designed. Finally the new system is evaluated.

In the implementation phase, the tasks are scheduled first and then the problems which might occur during this phase are discussed.

Section II, provides a literature survey on Management Information System. The main aim of this section is to introduce the MIS concept and to extract a procedure for this study.

The Office of Student Affairs is completely analyzed in Section III. It is concluded that the new system should be developed for the distribution of the identification cards, and for the evaluation of the applications to the dormitories and scholorships. It is also concluded that, the files and the programs should be redesigned.

The Registrar's Office is analyzed in Section IV, and it is observed that the registration process and the information system of this office affects the efficiency of this office considerably.

Since all of the tasks of the Personnel Office are defined and determined by the laws, only the necessary information that should be produced by this office are discussed in Section V.

Based on the results of Section III, the new system for the distribution of identification cards and the evaluations of the applications to the dormitories and scholorships are developed for the Office of Student Affairs in Section VI. Then the files and the computer programs are developed.

The design of an information system for the Registrar's Office is made in Section VII. At this phase,

first the new registration process is developed. Then the files and the computer programs are designed. The designes are completely based on a study made by a group of graduate students at the Industrial Engineering Department of B.U. The supervisor of this group was Yrd.Doç.Dr.Mehmet Akif Eyler.

Since the new procedures can not be developed for the tasks of the Personnel Office unless tha laws are changed by the Parlement or the procedures are revised by the Government, only the files and the computer programs are designed in Section VIII.

In Section IX, the suggestions about the implementation phase of the information system for each office are made first. Then the tasks which should be done at this phase are scheduled. Finally the evaluation of the new system is discussed and further remarks are made for the new research areas in designing such information systems.

II. LITERATURE SURVEY

2.1 INFORMATION NEEDS OF MANAGEMENTS

In any system, successful management depends on information about what is happening, and selection of appropriate reactions to changes in the environment. This means that short and long term plans are necessary for the system to work. In forming plans for the management of a system the main concern is to allocate the available resources in the most effective way.

When the Operations Research Society of America and The Institute of Management Sciences were found in the United States, Optimization techniques were presented as tools for making management activities more efficient. The optimization techniques were in general to optimize some objectives subject to some constraints. However even for a single objective the problems are great in size, and therefore even if they are assumed to be deterministic, to obtain a solution is quite difficult.

In general, the literature is focused on mathematical models and solution techniques proposed for

these models. However, the values of most of the parameters of the proposed mathematical models are diffucult to find in real systems, mainly for two reasons: (a) the parameters are random variables, and (b) past data and appropriate techniques to find the expected values of the parameters are not available for most of the systems. Therefore, it seems that the scientific literature in the area of mathematical optimization cannot be effectively utilized unless the information files to be used by decision makers within the system are defined and powerful, integrated information systems are employed (5, 13).

2.2 EVALUATION OF INFORMATION SYSTEMS CONCEPT

According to classical economists, land, labor, energy, and capital are the basic inputs of any system . However, the advent of digital computers changed our frame of reference beyond recognition. The computer is an information processing machine, and it was suddenly appreciated that information is a "specific" input of a system. The economies of computers processing persuaded people to centralize information systems (ISs), and the flexibility of the computer provided an infinite variety of ways of doing this. In perspective, computerized ISs are only the most recent of a series of efforts to record valuable structured information dating back to certain paintings on cave walls, indentations in clay tablets,

pencil works in ledgers, and, holes in punch cards (31), and thus, all organizations have some kind of IS, even though some systems may be only filing cabinets and a limited chart of accounts (6, 7, 8, 26, 28). But it seems that, to have a viable IS that is responsive to a variety of information needs, all the measurable data pertaining to the organization must be organized in such a manner that it can easily be recorded, stored, processed, retrieved, and communicated as required by users (10). By introducing computers, it was expected that, ISs with almost mystical powers will be achieved and by the help of these "all-knowing" computers, all of the decision problems of management will be solved (23, 29).

However, Ackoff (1) observed in 1967 that, contrary to the impression given by the literature, few computerized management information systems(MIS) have actualy been put into operation. Moreover most of them have not matched expectations and some have been outright failures. From 1970s onward in most of the works on ISs, the reasons behind these near - and far misses in implementation are being studied, (1, 2, 9, 12, 14, 16, 25, 30, 31) alternative policies to overcome the implementation deficiencies are proposed (1, 8, 16, 19, 31). But an agreement even on the title and the definition of ISs has not been reached yet. The widely used titles are: Data Base Systems (DBS), Information Systems (IS), Management Information Systems

(MIS), Data Processing Systems (DPS), Management Decision Systems (MDS), and Decision Support Systems (DSS) (10). The titles listed above are used interchangebly by most of the authers (1, 6, 31, 32). According to Langefors (18), the task of any data processing system is to provide information to support decision making, problem solving, or operational activities. Senko et al. (32) state that general category of "Information Systems" is considered in their work and that system performs the following primary functions: (a) storage and maintenance of represantations of structured information. and (b) presentation of structured output information from the stored representations on request. Moore and Chang (56) define three different kinds of systems in which each of them are a subset of general IS category:

TPS (Transaction Processing System) - pure data processing programs for gathering, updating, and posting information according to predefined procedures.

MIS (Management Information System) - a system with predefinid aggregation and reporting capabilities, often built upon a TPS, ad.

DSS (Decision Supporting System) - an extensible system with intrinsic capability of supporting data analysis and reduction, as well as decision modelling activities.

Most of the studies show (6, 7, 16, 18, 23, 26, 28, 29), and some of the studies claim (1, 8, 31) that it is

very diffucult to achieve an agreement on the title and definition of ISs. The definitions proposed by different authors are focused on (a) the hardware, (b) Software, and (c) the functions of the ISs. The first two groups will not be included in this study. In the last group, the authors usually try to define the IS in the total business context.

Burch at al. (6) claim that, any organization can be viewed as a total system composed of three subsystems, namely, the operations subsystem, the management subsystem, and the information subsystem (Figure I-1). The management subsystem includes all the people and activities which are directly related to the planning, controlling, and decision making aspects of the operations subsystem. The operations subsystem includes all of the activities, material flows and people directly related to performing the primary functions of the organization. The information subsystem is an assemblage or collection of people, machines, ideas, and activities that gather and process data in a manner that will meet the formal information requirements including accounting and routine operational needs; planning, controlling, and decision making needs of all levels of management; and the needs of concerned parties external to the organization (10).

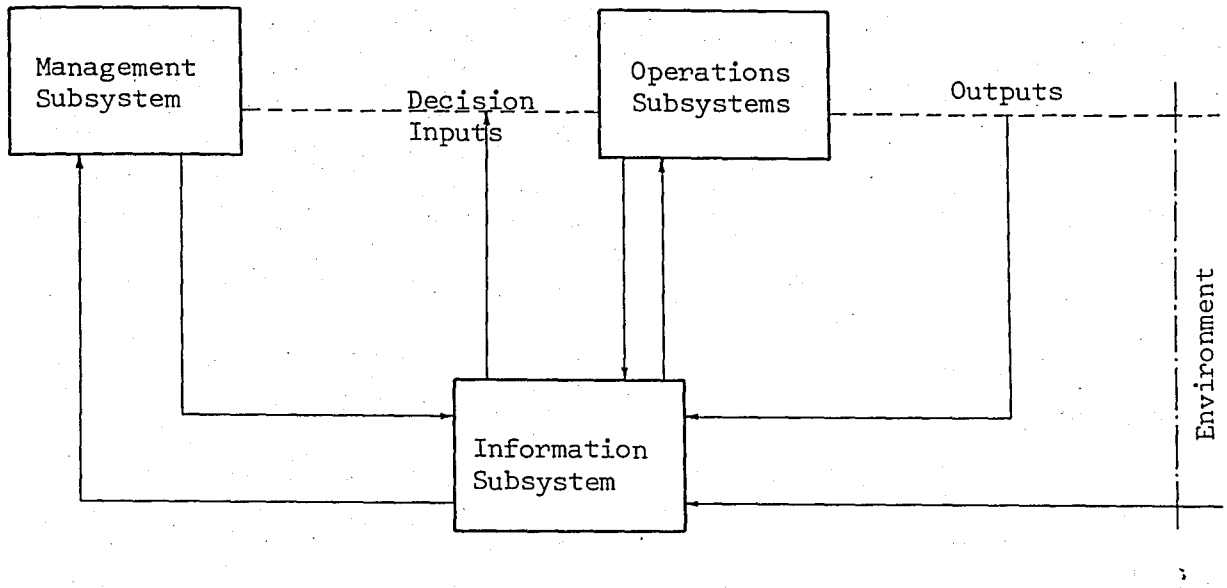


FIGURE 2-1. Example of the relationship between the management, operations, and information subsystems of an organization.

Since ISs are systems that produce information, they must receive information and store, transform, transfer, and process information. From this perspective it turns out to be impractical to logically separate between retrieval systems and processing systems. Consequently, an IS approach must keep itself open to both functions (44). Methlie (27) deals with the systems which should support unstructured

decision problems. Danovan (11) summarizes the characteristics of problems to be attacked through the use of an IS as follows: (a) The problem is continuously changing,(b) the answers are needed quickly (c) data is continuously changing, and stemming from different sources, (d) data needs to be processed into different kinds of data representations.

Among the various definitions of ISs, some common points can be observed:

- IS should be flexible (1, 6, 7, 8, 16, 19, 20, 31)
- IS should have a function of measuring the performance and monitor the system when the performance deviates from the objective, and evaluate the alternatives (6, 7, 27)
- IS should be linked with an organizational subsystem (1, 6, 8, 17, 20)
- IS should apply to all levels of management (8, 23, 25, 29)

In this study, the IS is thought as a system which provides information to managers for all of their managerial function of planning, controlling, and decision making.

2.3 EVALUATION OF INFORMATION SYSTEMS DESIGN APPROACH

It was previously discussed that, it is not even possible to define the IS in a widely agreed format. Dearden (8) claims that this is because the conceptual entity Management Information Systems (MIS) is embedded

in a "mish - mash of fuzzy thinking and incomprehensible jargon". It is nearly impossible to obtain any agreement on how IS problems are to be analyzed, what shape their solutions might take, or how these solutions are to be implemented.

According to Dearden the MIS approach attacks all the problems of management information as a whole, and in analyzing management's information requirements the systems approach should be used. Once Dearden's view is accepted, the development of an MIS program can begin. Either a group of people or a single person is responsible for developing and overseeing the construction of the entire MIS. Ackoff (1), and Dearden (8) stated that several companies have tried this approach, and many people currently advocate it. In spite of its appearent logic, however, they claim that they know of no company in which it has worked out. Dearden claims that there are four fallacies and one serious misconception behind these failures. The fallacies are(8):

- Management Information is sufficiently homogeneous so that it can be made an area of specialization for an expert.

- If the different ISs ordinarily used by a company are developed seperately, the resulting MIS will necessarily be uncordinated and therefore inefficient and unsatisfactory.

- The "systems" approach is a new boon to business administration.

- It is practicable to centralize the control over

a company's entire MIS.

The misconception is :

- The specialist expertise that creates a good logistics system for a company can extend its talents into the broad domain of general company and create a general MIS.

As a result of the research discussed in Powers and Dickon's (30) article, the following general conclusions may be drawn:

- Much of what is being generelly accepted as fundemental principles in the MIS field should be subject to rethinking and furter examination.

- Different ISs environments exist for data processing projects, generalized software project, and MIS projects.

- With respect to MIS projects, an evolutionary approach to project development should be adopted.

- Large omnibus project covering many functional areas should be avoided.

- User participation is crucial to the success of the MIS projects.

Langefors (18) claims that the system theory model had the important feature that through its use one could escape the need for people who have expert knowledge in all aspects, which is usually not possible. Systems approach provides a formal model which indeed is a series of exact

indepencies analogous to the"data independence" advocated in recent data base literature. In his study, systems theory is taken as a tool for IS design which provides a structured and modular design and development approach. In contrast to structured and modular approach, there is an integrated management information and control system which may be defined as a management oriented system conceived and designed by management as a single, total entity to control an entire organization (15). But, early implementations show that such "Total Systems" are impossible to design, develop, and implement in an effective way. "Data independence" or more accurately termed "data structure independence" is a concept by which a modular IS design procedure becomes possible. By this concept representations can be changed without effecting programs that deal with the logical structure, and data independence is an important element in the task for making ISs easier to implement and use (31). It implies that, from the user's point of view the system must be an integrated system. Thus if a user specifies information that should be contained in the system this has been taken care of by data system designers and all users then shall be able to obtain such information from the implemented system.

Figure I-2 illustrates managerial decision levels. Some authers (6, 7, 26) claim that IS should be designed and developed seperately such that the system supports these levels. Burch et al (6) state that each management system is an integration of functional and structural subsystems.

Thus ISs should be designed for these subsystems (Figure I-3). The concept of modularity allows the addition of

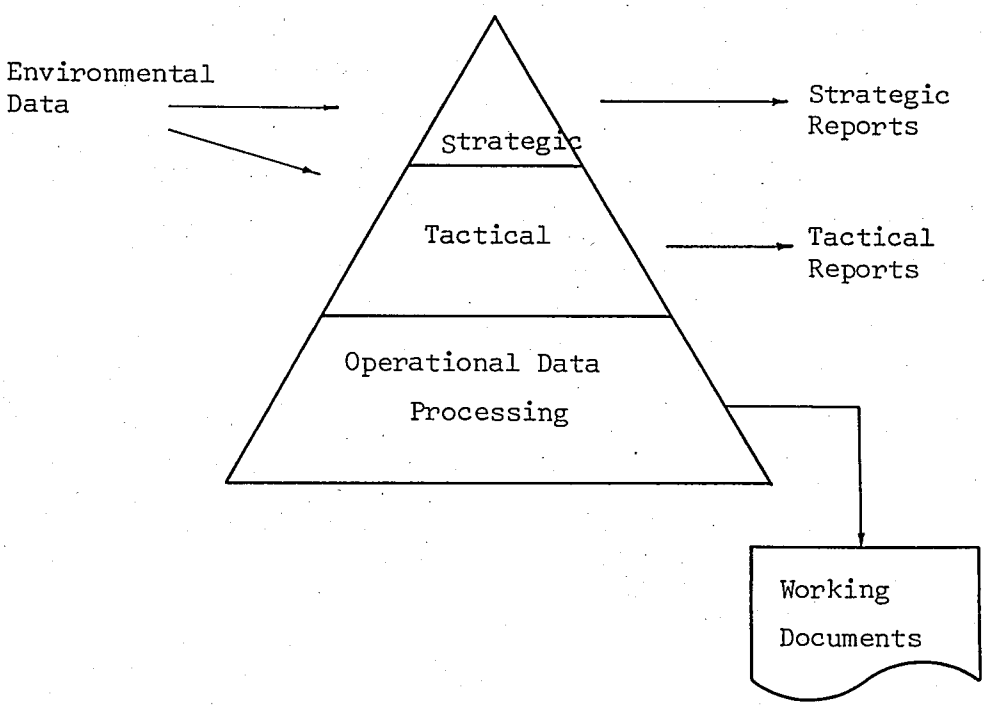


FIGURE 2-2. Typical levels of decisions making, data and information flow(6).

components to the configuration, thereby allowing it to change and grow to meet the changes in the systems needs Modular IS development facilitates the design, development, and implementation of efficient ISs, since the problems of the management of an organization are great variety and volume to be attacked at once and furthermore the experience gained by the development of very first modules makes the development of further modules easier and more effective.

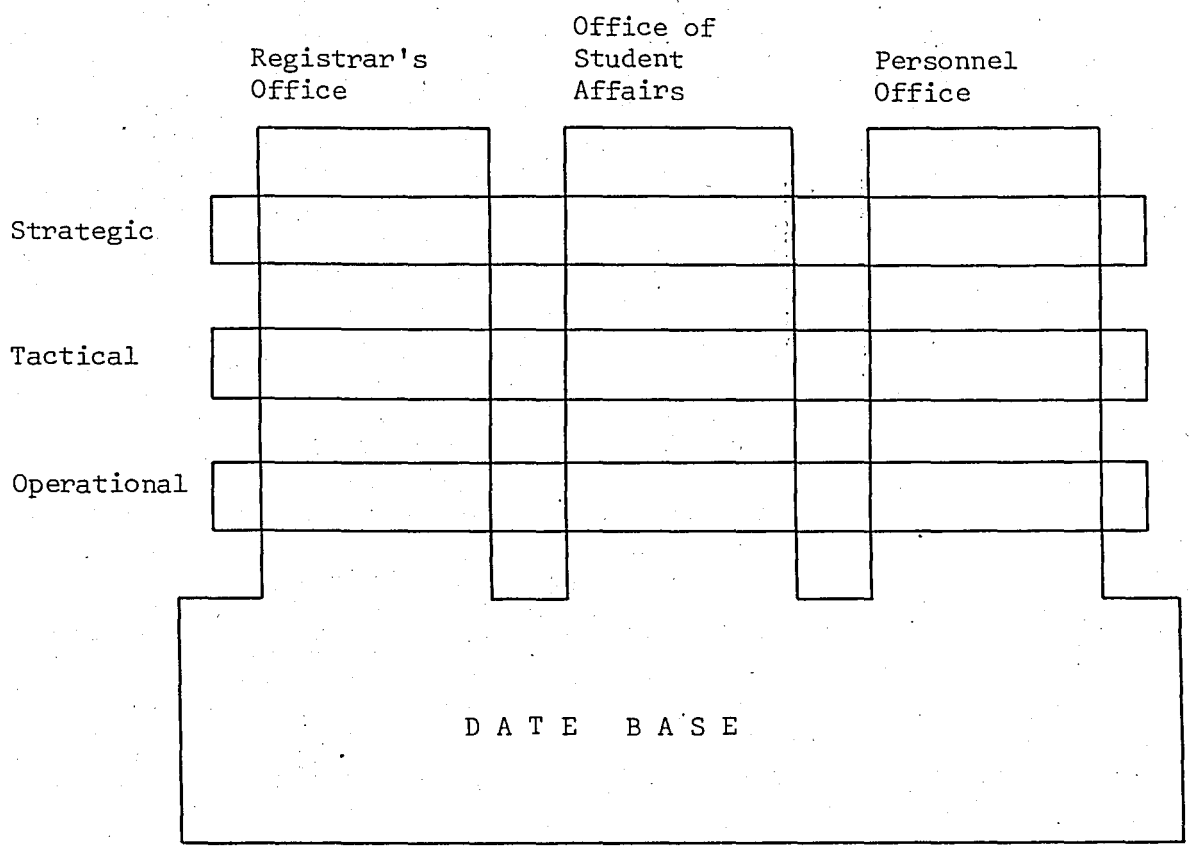


FIGURE 2-3. The functional and structural subsystems of a typical information system for a university(6).

Most of the studies (1, 3, 7, 21, 22) propose step - by - step IS development procedures for each module. These procedures are called "three step life cycle", which are criticized by some authors (6, 8, 34). The steps, which are analysis, design and implementation, and the concept of life cycle will be discussed in the following section. Some authors claim that general algorithms which are applicable in IS development for various organizations can not be established (4, 15, 16, 27, 28, 30). Doğrusöz (10) defines

a "self - organizing" adaptive design methodology, which seems highly effective. Modular and dynamic development procedures implies an evolutionary IS development approach which can be accepted as a relatively new advance in IS development area.

Furthermore, in recent works (3, 18, 21, 22, 32) the design task is decomposed into two main stages. Each author defines these two stages by different terms. Barros et al. (3) conclude that outside the computer or data processing system which is called the "interior" there is a key compoment of ISs and associated design problem which should be explicitly recognized and tackled. This component is called the "exterior" of the system.

This two stage approach which is named as "structured IS Design" seems to be justfied since it is possible for any one individual to acquire (and continuously update) sufficient skill over the whole spectrum of problems.

2.4 DESIGN AND DEVELOPMENT OF INFORMATION SYSTEMS

2.4.1 Information Systems Performance and User Involvement

By their nature, ISs are such systems that, their effectiveness are closely related to how they were designed and implemented. Measuring effectiveness of ISs is a complex task and heavily subjective. According to McFarlan; "For maximum effectiveness, a superior professional group would

devise clever, straightforward, up-to-date applications for the areas in which a company needs them most, and keep the data flowing on schedule to the satisfaction of every user in company". (25) Also, Edström (12) states that in relation to other factors (e.g., top management support, competence of electronic data processing staff, quality of goal setting) user involvement seems to be the only one that is consistently and significantly related to the quality of the final outcome. In fact, there is an agreement between researchers and practitioners that user involvement is a key to success of IS (1, 2, 12, 16, 20, 30).

Evaluation of an IS study is a difficult task because of resistance on the part of designers and users who are relieved to finally have the system implemented and because of the uncontrolled environment in which most of the systems operate (46). Also, relating performance to the use of an IS is particularly diffucult because of difficulties in obtaining a valid measure of a user's performance. In most of the studies (1, 3, 8, 12, 17, 20) the ideals of IS and videspread failure in implementation of such ideals have been reported. Swanson (33) claims that a contributing factor of these failures is the common assumption made by the designers which is originally presented and criticized by Ackoff (1), that a manager need not understand how his IS works, but knows how to use it. The implications of this assumption are particularly

interesting for MISs of the file interrogation type, systems which rely upon an information "demand" in order to achieve utilization. Swanson (33) claims according to his experience, this demand is realized only to the extent that managers "involve" themselves in MIS design and implementation, and thus develop an understanding and "appreciation" of the "whole system". A manager's understanding and appreciation of the MIS is a necessary condition for meaningful MIS inquiry (33) and this condition creates an extra difficulty in development and implementation of ISs since "one major effect of the recognition of the importance of the information aspect, and of theinfological inquire that is stimulated, is the insight that the information derives not from the data alone but depends equally on the conception of users (19)".

2.4.2 Development Life Cycle

An IS can be viewed as a large physical resource, thus must be modified to meet continuously changing conditions. "Reasons for changing the IS may be a need for improving the cost effectiveness relationship of operating the resource, increasing or decreasing capacity, confirming to new government regulations, or remedging a recurring problem (6)". If this changing activity requires a large expenditure of both time and money and can be planned in

advance, then it can be treated as a project. Since projects are logical entities having specific beginnings and ends, their structure is often portrayed as a life cycle. The basis of the development life cycle is that every application needs to go through essentially the same process when the application is conceived developed, and implemented.

The steps or phases in the life cycle for IS development are described differently by different authors, but these differences are primarily in "amount of detail, manner of categorization (13)", and in the terminology used. There is general agreement on the flow of development phases and the necessity for control over the development cycle (the development approaches in seven different studies are summarized in Table II-1). The IS development cycle consists of three basic stages: Analysis, design, and implementation. These stages will be discussed in the following sections.

2.4.3 The Analysis Phase

Some of the studies (3, 6, 32) on IS development do not include much about this stage. Instead, they refer to system analysis literature. However, Ackoff (1) divides this stage into two substages which are: analysis of the decision system and the analysis of information requirements. Orilla et al. (29) give a guideline for this stage. According to their guidline; the system analysis must be aware of

<table>
<tr><th></th><th></th><th>Ackoff (1) 1967</th><th>Davis (7) 1974</th><th>Senko (31) 1977</th><th>Langefors (18) 1977</th><th>Lundeberg et al.(21-22)1978</th><th>Barros et al. (3) 1978</th><th>Burch et al. (6) 1979</th></tr>
<tr><td rowspan="3">ANALYSIS</td><td></td><td></td><td>Feasibility Assesment</td><td></td><td></td><td>Change Analysis</td><td></td><td></td></tr>
<tr><td></td><td>Decision System Anal.</td><td></td><td rowspan="2">Analysis</td><td rowspan="2">Analysis</td><td>Activity Studies</td><td>Management Functions Definition and Structure</td><td rowspan="2">Analysis</td></tr>
<tr><td></td><td>Information Requirements</td><td>Information Analysis</td><td>Information Analysis</td><td>Management Functions Analysis System Logical Design</td></tr>
<tr><td rowspan="3">DESIGN</td><td rowspan="2">Phase I</td><td></td><td>System Design</td><td>Name - based Representation Level Design</td><td rowspan="2">Infological Design</td><td></td><td></td><td rowspan="2">Gross Design</td></tr>
<tr><td>Reorganization</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Phase II</td><td>Design of Processing</td><td>Program and Procedure Development</td><td>Stored Representation Level Design</td><td>Datalogical Design</td><td>Data System Design
Equipment Adoptation</td><td>Data Processing and Data Logical Design
Programs Logical Design</td><td>Detailed Design</td></tr>
<tr><td rowspan="4">IMPLEMENTATION</td><td rowspan="4"></td><td rowspan="2"></td><td rowspan="2">Conversion</td><td rowspan="2">Testing</td><td rowspan="4">Implementation</td><td rowspan="4"></td><td rowspan="4"></td><td>Scheduling</td></tr>
<tr><td>Training</td></tr>
<tr><td rowspan="2">Design of Control of Control System</td><td rowspan="2">Operation and Maintenance</td><td rowspan="2">Control</td><td>Testing</td></tr>
<tr><td>Conversion</td></tr>
<tr><td>Post Audit</td><td>Follow - up</td></tr>
</table>

TABLE II-1. IS Development Approaches of 7 Different Studies. (The Shaded Regions Indicate no Corresponding Study).

management's requirements from the system, in a broad sense. That is his goals and objectives must be realized. After determining the objectives of the present systems. he must study its constraints. Then, the analyst must determine what is broadly required as output, and must also observe what is specifically provided. In order to achive the desired results what processing, or type of operations are performed is the next thing that analyst should recognize. Then,it's time to look at the inputs that are used, and finally should see what controls are being used to maintain accuracy. This approach which is called a traditional approach involves a minimum of user input, relying primarily on the analyst's expertise to assure appropriate problem conceptualization, model definition, and solution generation. Most of the authors (3, 6, 18, 21, 22) who are concerned with structured IS design prefer this approach. But, especially for unstructured, unprogrammable and strategic decisions, such an approach seems inadequate. Alternative analysis approach termed "evolutionary approach" attempts to maximize user input by begging with simplistic models and iteratively updating these models based on feedback from actual usage by the client.

Lundeberg et al. (21, 22) divide the analysis stage into three substages: (a) Change analysis, (b) activity studies, and (c) information analysis. The last two substages are similar to two substages of Ackoff,

respectively. The purpose of change analysis is to study the types of changes (improvements) that are needed in order to do something about the problems experienced in the activities of the organization.

2.4.4 The Design Phase

Systems design can be defined as the drawing, planning, sketching, or arranging of many seperate elemants into a viable, unified whole. System analysis phase answers the questions of "what" the system is doing and "what" it should be doing in order to meet the user requirements, where as, system design phase is concerned with "how" the system is developed to meet these requirements (6).

Since it is difficult for any one individual to acquire (and continuously update) sufficient skill over the whole spectrum of design problems, most of the authors (1, 3, 6, 7, 18, 21, 22, 25, 32) decompose the design task into two main stages. The first stage is named as "exterior" by Barros et al. (3), and this stage deals with the outside of the data processing system. That is, there is a key component of the IS and an associated design problem which should be explicitly recognized and tackled. At this stage, user involvement is necessary for success. The second stage called as "interior" deals with the formation of data base and programs which should be performed by computer specialists.

Burch et al.(6) define basic steps in the design process of the first stage as: (a) defining the systems goal, (b) developing a conceptual model, (c) applying organizational constraints, and (d) defining data processing activities.According to them the next stage is concerned with detailed technical design specifications such as, selection of I/o media, file size, controls, programs, security and so forth (6).

2.4.5. The Implementation Phase

To implement the new system successfully, Burch et al.(6) propose a few activities that must be performed by the systems analyst. These, activities involve the training and educating of personnel and then testing of the system. Moreover, because of the dynamic environment, there is a special consideration, termed "systems conversion", required to achive the implementation of the system. The conversion phase consists of collecting the data, building the files, and testing the overall system. Davis (7) says that there are various methods of testing. One is to test the system under simulated conditions; and another is to test under actual conditions, operating in parallel with the existing systems and procedures. If any error is detected in the system test, the system is corrected and retested again. Any subsequent errors or minor modifications are handled by a group which is named the"maintenance group"

by Davis (7).

According to Davis, the last phase of the implementation stage is a "post audit" (7): This is a review by an audit task force (composed, for example, of a user representatives, an internal auditor, and a data). This group reviews the objectives of the system, compares the performance of the system and also reviews the operational characteristics of the system to determine if they are satisfactory. Also, control and security provisions are examined.

2.5 PROPOSED DEVELOPMENT METHODOLOGY for BOĞAZİÇİ UNIVERSITY

As can be seen from the literature survey there is no well defined, structured methods in the development of ISs. Most of the authors mentioned in the survey deal with the development of ISs in industrial organizations. But in this study the design of IS for a university is considered. Therefore, it is more difficult to extract a defined procedure from the literature for this study. The procedure explained below depends highly on the conditions, the needs, and the problems of the system. These conditions, in relation to the theory of IS in macro level forms the procedure.

Since universities are governed by regulations, laws and traditions there are lots of constraints on them.

These constraints force them to be sensitive to the environment and they also do not allow many changes in the operational level.

From the objectives of the systems concept, universities also differ from the industrial organizations. The main objective of an industrial organization is to make profit in terms of monetery value. The objectives of universities can not be easily quantified. These objectives may be summarized as follows:

- Better educational level.
- Scientific and technological development.
- Support of industry by training qualified personnel and developing a better technology.
- Increasing the cultural level of the society.

For an industry and a university the main aim of having an IS is to get formal information for supporting decisions, and for controlling the operations. Also time for operations, personnel needs should be decreased and works should be done on time after an IS is implemented.

In this study, the information systems of the Registrar's Office , the Office of Student Affairs, and the Office of Personnel Affairs of Boğaziçi University are developed.These offices have been selected first because they are interrelated with each other and the main concern of a university is students. Also, they have lots of problems in getting, producing and in handling information.

Since "Total System" development is almost impossible for the problem mentioned, the "modular" development method should be used. There are 19 departments in Boğaziçi University for which their jobs, and duties are well - defined and almost independent. These departments share only financial resources of the university to some extent (That is even the budget of each department is different, and the amount of financial resource and its expenditure areas are well - known at the beginning of year). The only relation between these departments is the flow of information and personnel adjustments. Because of the reasons explained above it is not unreasonable to use departments as modules of a modular approach.

The main aim of this study is to design an information system for these departments mentioned above such that thase departments can do their jobs on time, in a desired fashion, the reports between departments and to the Rectorate will be send in a desired format and on time. Also work load of the personnel is aimed to be less than before, thus better use of financial resources is going to be planned. These goals will be explained in detail in the "Analysis of the Present System" and "The Design of the Proposed System" subjects.

The methodology for all depertments are more or less the same. It can be outlined as; (a) Analysis of the Present System, (b) Design of the Proposed System, and (c) Implementation. Based on this methodology the existing

system is analyzed and IS is designed according to the following steps;

I. Analysis Phase

i. Work flow of the department

ii. Duties and responsibilities of the department.

iii. Constraints imposed by the regulations and laws on the department.

iv. Information requirements of the department.

v. Information requirements from the department.

vi. Information channels and media of the department.

II. Design Phase

i. Changes in the work - flow.

ii. Adjusting the personnel requirements.

iii. Improving the information requirements from and to the department.

iv. Improvement of the information channels.

v. Establishing the data structure and the structure of computer programs.

III. Implemantation Phase

i. To make the necessary organizational and structural changes in the organization.

ii. To prepare manuals for the users.

iii. To educate the personnel for the implemented system.

iv. To run the proposed system in parallel with the existing system.

v. If any error is detected go to the design phase otherwise continue application of the proposed system in parallel for a predifined time period.

III. ANALYSIS OF THE OFFICE OF STUDENT AFFAIRS

3.1 INTRODUCTION

The Office of Student Affairs (O.S.A) performs the following tasks, which are related to the social needs of the students;

a. Allocation of the students to the dormitories.
b. Distribution of scholorships and loans.
c. Organization of student activities.
d. Organization of the Sport Festival and other sport activities.
e. Distribution of student identification cards, IETT passes, and mails.

In this chapter the above tasks, except for the organization of the Sport Festival and sport activities are studied in detail. Then the information requirements of the O.S.A. and information channels, which are necessary while processing these tasks, are discussed.

Organization of the Sport Festival and other sport activities are not studied, because the decision

makers have decided to separate these activities from the tasks of O.S.A.

3.2 ANALYSIS OF THE TASKS OF OSA

3.2.1 Analysis Of The Dormitary System

There are four dormitories in the campus for meeting the living accodomation requirements of the students who do not live in Istanbul and those who have accodomations in Istanbul but far from the campus. Three of these dormitories are allocated for boy students and named as; the First Dormitory, the Second Dormitory and the Third Dormitory, and one of them is allocated for girl students and named as Girl Student Dormitory.

The OSA is responsible to evaluate the applications to the dormitories and also to manage these dormitories. These tasks are analyzed in the following subsections.

3.2.1.1 Evaluation Of The Applications To The Dormitories

Students apply for the dormitories throughout the year. These applications are evaluated at May/June, September/November, and February/March periods in each year. At the first period, applications of the students who have previously attended the university are evaluated. At the second period, applications of the new students are

evaluated and at the last period, all of the applications which are not accepted in the first two periods are reevaluated in order to assign students to the empty rooms. In order to apply for the dormitories students should fill out application forms and bring the following documents;

1. A formal document which shows the income of the family.
2. Decleration of residence.
3. Copy of the Birth Certificate.
4. Document which shows the conviction situation of a student given by a General Attorney.
5. Criminal Record given by the Police Department.
6. Four photos.
7. Two envolopes with stamp and correspondence adress written on them.

Students who have previously attended the university reapply to the O.S.A. with the above documents. These applications are evaluated at May/June period. The students who apply for the first time are evaluated and are either accepted, or rejected by a commission (The acceptance criteria are discussed in the following paragraphs). The applications of students who are still living in the dormitories are not evaluated, instead they are directly accepted.

After the applications are evaluated, the O.S.A. calculates the priority weights of accepted students. The priority weight for each student is calculated by subtracting the number of on leave semesters from the total number of semesters spent by the student in the university. The students choose their rooms, which they live in the next year, based on these weights by drawing a lottery which is managed by the officials. This process is as follows:

From among those students who have the same weights, a student is selected randomly by an official by pulling a name from a bag, which contains the names of all students having the same weights. The student whose name is selected then chooses a room, which has not been chosen before; he also chooses his roommates in such a way that the average weight of all roommates should be greater or equal to the weight of the lottery. Note that a student may choose his roommates from those having lower or higher weights than he has. The average however, has to be greater or equal to the current weight. This process starts from the highest priority weight and continues until all students choose their rooms.

Based on the capacities of unfilled rooms at the first, the second, and Girl Student Dormitories and on the capacity of the third dormitory, new applicants are evaluated at September/November period, by a commission. The

commission sorts the applications according to the following criteria and accepts the students until the capacity of the dormitories are filled. These criteria are stated in decreasing importance.

A. Students who do not live in Istanbul:

1. i. Students whose parents are martyrs.
   ii. Students whose parents are officials.
   iii. Students whose parents are workers.
   iv. Disabled students.
   v. Orphan students.
2. Students from rural area.
3. Students whose parents have a small business.
4. Students whose parents are retired.
5. Students whose parents are businessmen.
6. Foreign students.
7. Graduate students.

B. Students who live in Istanbul:

1. Undergraduate students.
2. Graduate students.
3. Condidates for Certificate of Education.

At February/March period the applications of the students, who have applied previously but have not been

accepted, are reevaluated. The evaluation is based on the above criteria and the capacities of the rooms which are vacated by the boarder students, who have graduated at the end of the first semester.

Meanwhile spare list which contains the names of the students who have not been accepted but who are candidates for acceptance whenever a place is vacated is prepared. Depending on the number of available places, students who are in the spare list are accepted starting from the top of the list. This process continues throughout the year.

The conceptual flow-chart of this process is shown in figure 3.1.

3.2.1.2 Management of the Dormitories

The O.S.A. is also responsible from the management of the dormitories. For this purpose, this office performs the following tasks;

1. The necessary fixtures and furnitures of the rooms are satisfied.
2. The safety of the dormitories are established.
3. Cleaning.
4. Sometimes controls are done, in order to check weather day students, or other persons live in the dormitories or not. For this purpose, the O.S.A. prepares and distributes the dormitory cards.

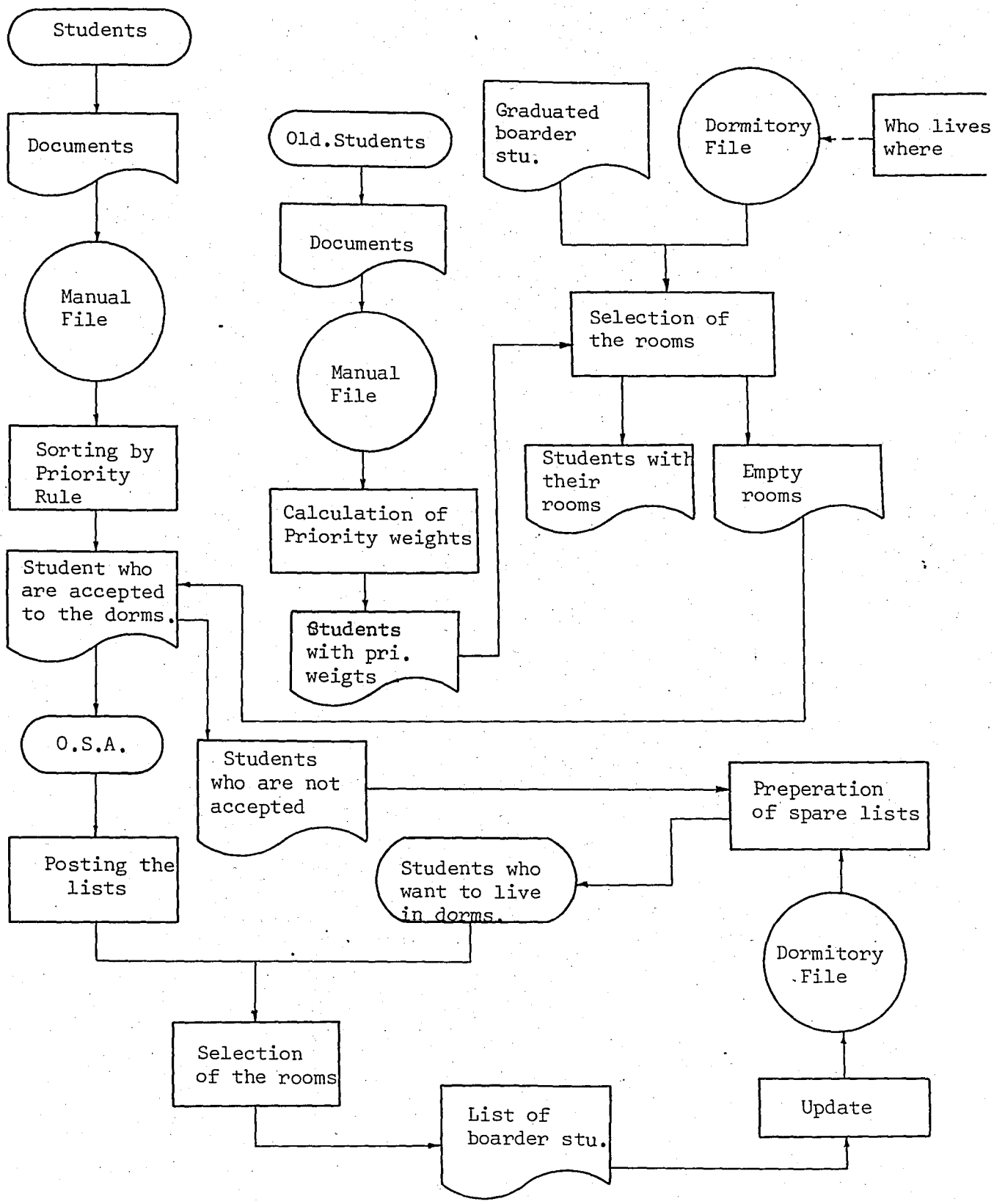


FIGURE 3-1. Conceptual Flow of the Allocation to the Dormitories.

3.2.2 Distribution of Scholorships and Loans

Scholorships and loans were given to the students before 1982. After that time, it was not possible to give scholorships because of the new University Law. It is hoped to give scholorships and loans starting from 1983 - Fall Semseter. For this reason, the procedure, which was applied before 1982, in distributing scholorships is analyzed in this section.

Student apply for scholorships and loans starting from November until the end of May. In October students apply for scholorships and loans for the current academic year. In May, students apply for the next year. In between these dates students whose income level decrease may also apply for scholorships and loans. The following documents are required from the applicants;

1. Completed application form.
2. Formal proof of income level of the family.
3. Copy of the identification card of the family head.

The applications are evaluated by a commission periodically. Almost all applicants are accepted for scholorships and loans. The amount of money given to each accepted student is calculated by a commission as follows; Some amount of money is deducted for necessary expenditures

from his family income. Some amount is also deducted for housing. The net income is divided by the total number of the members in his family and the result is considered as the share of the student from his family income. This share is compared with the necessary minimum living expense for a student (This minimum expense is decided by a commission and revised each year). If the difference is negative, that much of money is given to the student as a loan. For students whose G.P.A.'s are greater or equal to 2.50 , the loans are converted to scholorshipbs.

The O.S.A. is responsible to check weather the family income declared by a student is true or not. This control is done by either writting a letter to the source of income, or by visiting the family. But, it is not easy to make visits outside of Istanbul. For this reason, family incomes of the students, who do not live in Istanbul, can not be controlled. Also income levels, which are proved by the declaration of income taxes are not always true. Because of the above reasons, the distribution of loans is not always injustice.

3.2.3 Organization of Student Activities

Social activities of the students are done through Student Clubs. The O.S.A. controls these clubs and organizes the activities.

The O.S.A. controls the budgets and the members of the clubs. Each student in the university can be a member of any club, provided that his G.P.A. is above 2.00. Each club is directed by the board which is established from the members at the beginning of each year, provided that the members are not graduate students and are not in probation. The clubs are controlled first, in order to check weather they obey the above rules or not. Besides, the budgets of the clubs, which are prepared by the boards are controlled by the officials at the O.S.A. This office is also responsible to control the incomes and the expenditures of the clubs. For this purpose, the O.S.A. requires monthly financial reports from the clubs.

The social activities which are held both on the campus and outside the campus are organized by this office. For this purpose a coordinator works at the O.S.A. The office takes permission for the activities and finds places for the exhibitions and shows. To find a place, especially after the middle of spring term at which time most of the activities are shown, is not easy. This organization requires a well coordination with the clubs, as well as the Registrar's Office.

3.2.4 Distribution of the Identification Cards, IETT Passes, Grade Reports, and the Mails

During the registration process, at the last

Registration Hall, an official distributes the identification cards to the students. Each student should fill out this card, attach a photo on the related place, and should return the card before the deadline, which is announced by the O.S.A. The collected cards are signed by President, stamped by the O.S.A. and coated with plastics. Then, the identification cards are distributed to the students at the office. After receiving the card, each student has to sign the line besides his name on the list.

IETT Passes are distributed to the students at the middle of October. After the students fill out the passes, they biring them to the O.S.A. The O.S.A. collects all the cards and sends them to the IETT Office. At this office these cards are signed, stamped, and coated with plastics. The passes are distributed to the students, after they come back from IETT office. Each student should also sign the related place in the Student List when receiving his pass.

Grade-reports, after prepared by the Registrar's Office, are sent to the O.S.A. and these reports are distributed to the students by the officials at the O.S.A. The O.S.A. also distributes students' mails. At the office, boarder students' mails are seperated and they are given to the overlookers. Names of the day students are listed and posted, and the mails are put in a box and students get their letters from that box. Since there is no control, some letters are lost.

3.3 INFORMATION PROCESSING TECHNIQUES USED BY THE O.S.A.

While performing its tasks, O.S.A. gets information from the students and other offices, and produces information for other offices. The analysis of information processing mechanisms is important in the sense that, it helps to detect the problems of this office. In the following sections these techniques are explained.

3.3.1 Information Processing For The Dormitory System

The O.S.A. gets information from the students who apply for the dormitories. These information are stored in the Student Dormitory File.The following information are stored in this file for each student;

i. First and the last name.
ii. Department and the class.
iii. Student Number.
iv. Birth place and birth year.
v. Sex.
vi. Marital status.
vii. Home adress.
viii. Phone number.
ix. Date of the first entry to B.U.
x. ÖYS results (for new students).
xi. Grade Point Average.

xii. Date of the first entry to the dormitory.

xiii. Disabled situation.

xiv. Information about his family.

xv. Information about his home.

xvi. Criminal record.

xvii. Dormitory fee receipt.

The O.S.A. gets information from the Registrar's Office and the boards of the faculties and colleges to obtain the student list, on leave student list, and dismissed student list. With these lists and the file above, the office evaluates the applications and allocates the students to the rooms as explained in section 3.2.1. After the allocation, this office gives required information about boarder students and dormitories to the Rectorate, Office of Administrative Affairs, Cheif of Police, and Authorizes of Martial Law. The flow of this process is shown in figure 3.2.

The O.S.A. collects information about the fixtures and furnitures in the rooms, and prepares the lists of fixtures and furnitures which require repairment. This list is sent to the Maintenance and Repair Office. After repairs are completed, the Maintenanca and Repair Office informs the O.S.A. Based on the list of fixtures, the O.S.A. also prepares the list of necessary fixtures which should be bought. This list is sent to the Office of Goods. The flow of this process is shown in figure 3.3.

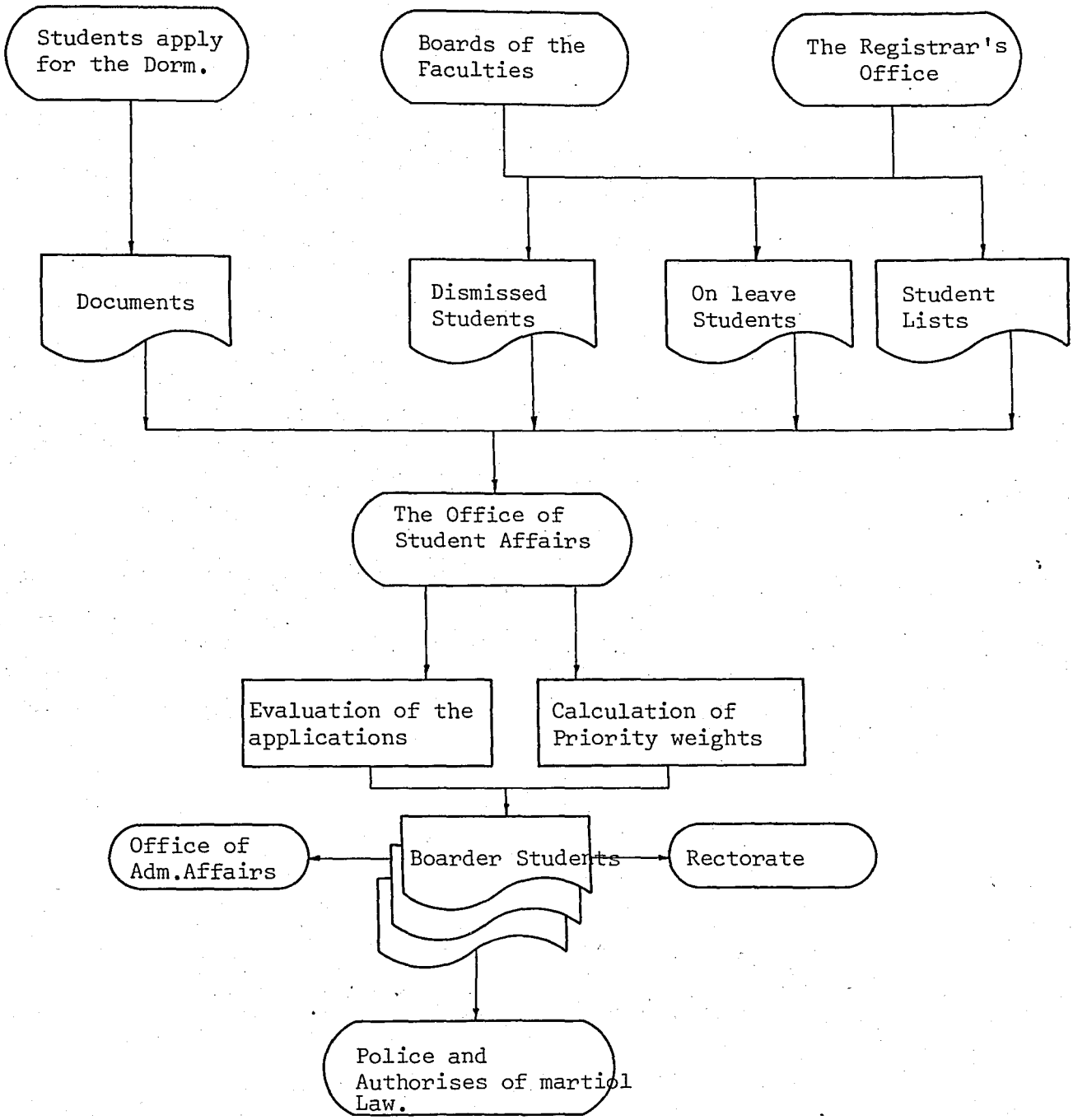


FIGURE 3-2. The Flow of Application to the Dormitories.

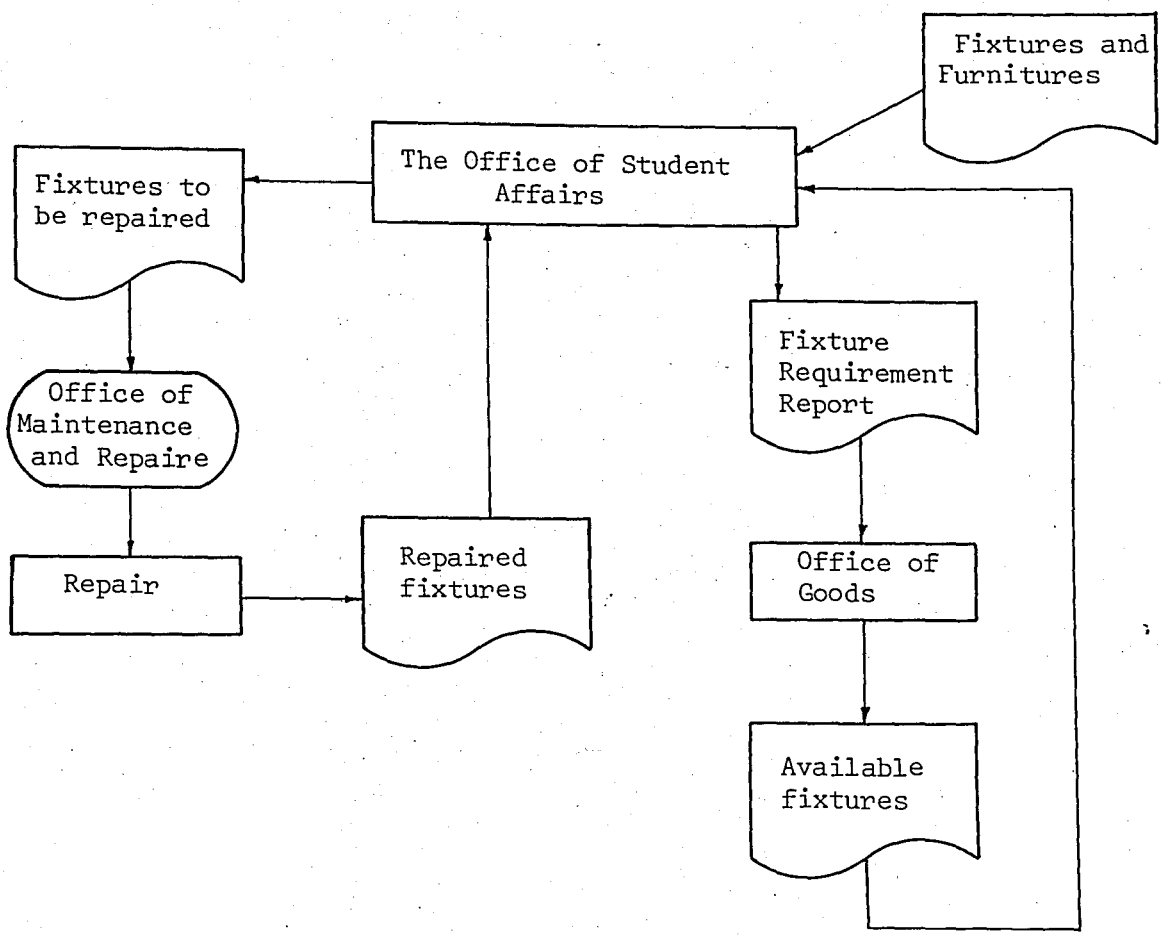


FIGURE 3-3. The Flow diagram of processing information for fixture requirements.

3.3.2 Information Processing When Distributing Scholorships and Loans

The O.S.A. gets information from the students who apply for scholorships and loans, and puts these information to the Scholorship and Loan Applications File. In addition to the information required when applying to the dormitories,

the following information are stored in this file;

- Did you apply to "Kredi Yurtlar Kurumu"?
- If yes, when was it accepted?
- Amount of money given by Kredi Yurtlar Kurumu.
- Your net income (monthly)?

The O.S.A. also gets information from the Rectorate and the Office of Financial Affairs about the availeble funds that may be used in the distribution of scholorships and loans. With these two types of information (i.e., student applications and available funds) the commission evaluates the applications as explained in section 3.2.2.

After the applications are evaluated the names of the students and the amount of money, which will be given to them are listed and sent to the Office of Financial Affairs for preparing the checks.

At the end of each semester, G.P.A's of the students who are given loans are required from the Registrar's Office for converting loans into scholorships.

The flow diagram of this process is shown in figure 3.4.

3.3.3 Information Processing When Organizing Student Activities

The O.S.A. gets information from the Clubs about the activities planned for the year, about their incomes

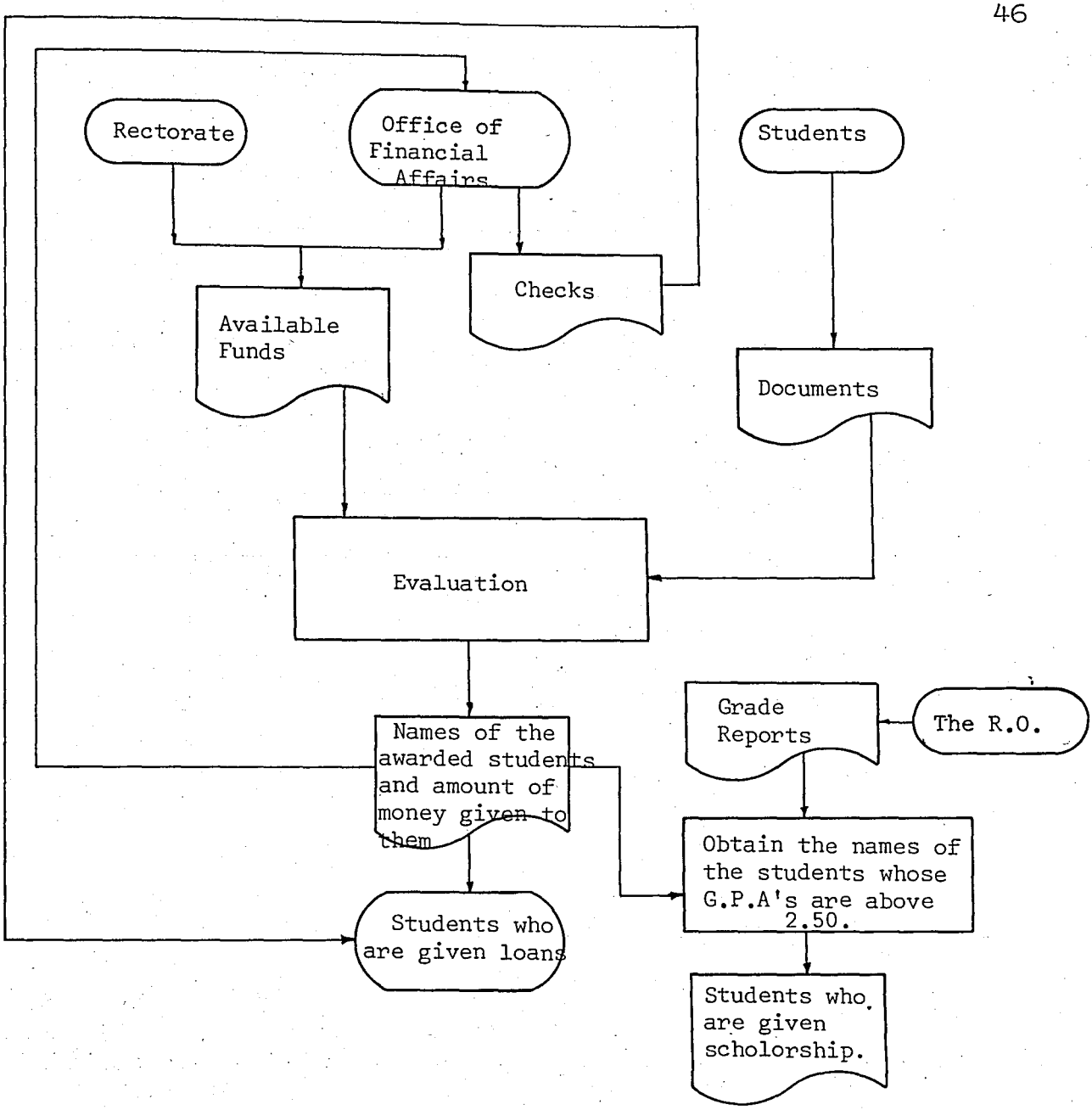


FIGURE 3-4. Flow Diagram Of Information Processing When Distributing Scholorships and Loans.

and expenditures, and their members. This office also gets information from the Registrar's Office about the academic performance of the students and information about the empty places for exhibitions. With these information, The O.S.A.

controls the clubs and organizes their activities. The process is shown in figure 3.5.

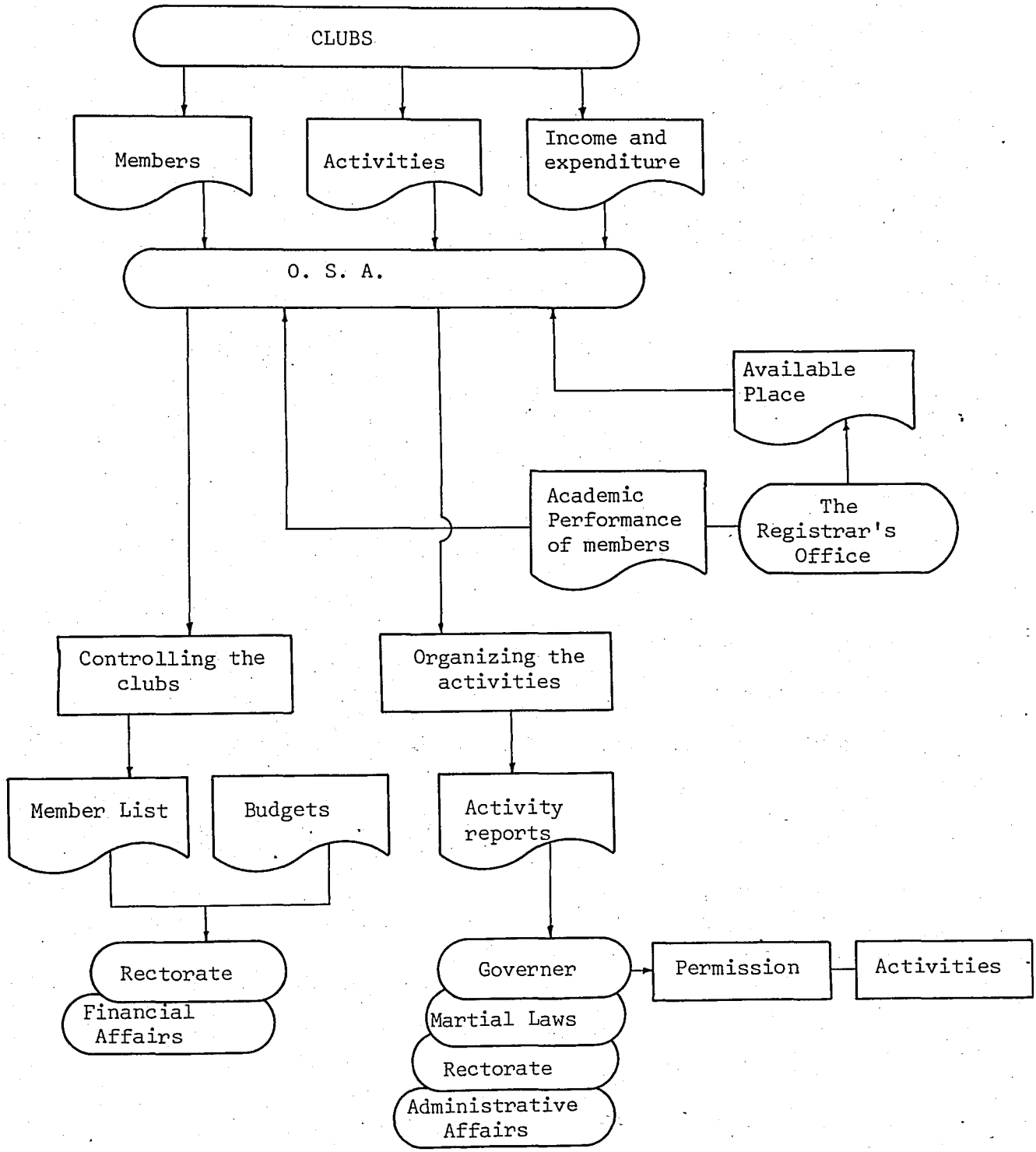


FIGURE 3-5. The Flow Diagram of Information Processing When Controlling The Clubs And Organizing The Activities.

3.4 EVALUATION OF THE INFORMATION PROCESSING MECHANISM

As can be seen in sections 3.2 and 3.3, the O.S.A. gets the necessary and sufficient information both from the students and from the departments. Eventhough it gets information, it can not process information in a desired speed and as required. The following facts show the inefficiency of the information processing mechanism;

i. Long queues are observed when the identification cards and IETT passes are distributed. Especially, distribution of identification cards causes long delays in the registration process.

ii. The evaluation of the applications for dormitories lasts too long. Thus, allocation of students to the rooms is delayed for sometime.

iii. The evaluation of the applications for scholorships and loans are not injustice. Hence, students who really need financial support may not be honored for scholorship. Eventhough they are honored, sufficent amounts can not be given to them because of the inefficient evaluation criteria.

iv. The clubs can not be controlled effectively.

The reasons of these problems may be stated as follows;

i. The office is processing information manually, which causes long delays.

ii. The evaluation criteria, both for the dormitories and for scholorships, cause problems.

iii. Distribution of identification cards and IETT passes cause problems.

iv. The clubs do not give information on time.

v. The coordination with other departments cause problems, that is the office can not get information on time.

In order to solve the problems stated above the following changes should be made in the system;

i. Identification cards and IETT passes must be distributed in such a way that students do not spend much time for it. For this purpose a new system is developed in chapter 6.

ii. Applications to the dormitories and scholorships must be combined and in the evaluation a systemmatic approach should be developed to prevent the injustice, that is the evaluation criteria must not be subjective. For this purpose a "Point System" is developed in chapter 6.

iii. For controlling the clubs, their obligations must be clearly predefined and for those who do not obey the obligations a penalty must be given. Some comments on the obligations are made in chapter 6. But, this is a very political decision; therefore to make rules of such a system is left to the decision makers.

iv. The coordination with other departments should be settled in such a way that it will not cause delays in performing the tasks. For this purpose a well - structured information system in the university must be designed and implemented. In this study, part of the information system is designed and in chapter 6 the coordination with the Registrar's Office is explained.

v. The last and the most important change that should be done is that, the information must be processed automatically as much as possible, which is the main concern of Chapter 6.

IV. ANALYSIS OF THE REGISTRAR'S OFFICE

4.1 INTRODUCTION

The Registrar's Office is one of the most important offices at Boğaziçi University. It registers all students as well as processing their academic and personal files. All academic documents, reports, and files are processed through this office. Except for the financial control and management of the university, the better this office works the better the university is managed. With that respect, to design the IS of this office is a very important task. In this chapter, an Information System has been designed for the Registrar's Office. The procedure in designing this system was to first analyze the existing system and then setting up a better system for this office.

The analysis has been made in two stages. In the first stage, the existing system was completely studied and its working procedure was reviewed; in the second stage, the information requirements of the R.O. were analyzed and thrughly studied for developing an IS.

4.2 ANALYSIS OF THE EXISTING SYSTEM

The Registrar's Office performs the following tasks:

a. Registration of the students.
b. Preparing Student Lists, Class Lists, and Distributing them.
c. Preparing Mid-Term Grade Reports.
d. Scheduling Final Exams.
e. Preparing Final Grade Reports, and Distributing them.
f. Scheduling the Courses.
g. Preparing Transcripts, Student Identification Reports, Rank Reports, etc.
h. Preparing Some Statics.
ı. Preparing the Diplomas.

As can be seen from above classification, the main concerns of this office are students' academic needs. Therefore this office must satisfy these needs on time by obeying its own regulations and state laws. The analysis is done, based on this reason, from the functional point of view. When its functions are analyzed the problems of this office would be clear, and also information that is needed by this office could be determined. These functions are analyzed in detail below.

4.2.1 Registration Of Students

The main tasks of the Registrar's Office start by the registration process. The results of this process are the main inputs for the other jobs. In this process each student uses registration cards which are composed of five parts, and are in different color for each faculty. One such registration card is shown in figure 4-1 through fig. 4-5. The first card is "Program Card" which is named "No.1 card". This card is used to store academic and personal information about the students. The second card is "Students' Card", "No.2 Card", which is used by students during the semester both as a program and as a control in entering the lectures. The third card, "No.3 Card" or "Advisor's Card", is used by the student's advisor.The fourth card is a "Control Card", or "No.4 Card"; it is used during registration to control the registration procedure. The fifth card is "Start of Registration Card". This card is mainly used to check weather a student has started his registration on time or not. Because late registration is not allowed, it is necessary to use this card.

Registration of students can be analyzed in two phases. The first phase is the registration of new students, that is students who enter the university for the first time, either by University Enterance Exam or by transferring from other Universities. And the second phase is registration of old stude who have registered at least for one semester. These phases

No.1
Program Card

BOGAZICI UNIVERSITY
..... FACULTY

19.. / ....
..... SEMESTER

1						7

Student No.

8																					27

Last Name - Name

Note: Put (X) in the following proper dark-lined squares

CLASS	X	28	29	30	31
1		1	7		
2		2	7		
3		3	7		
4		4	7		
Special		5	7		
Master		6	7		
Ph.D.		9	7		

DEPARTMENT	X	30	31
Chem Eng'g		1	0
Civil Eng'g		2	0
Electrical Eng'g		3	0
Mechanical Eng'g		4	0
Industrial Eng'g		5	0
Nuclear Eng'g		6	0
Computer Eng'g		7	0

		37
Day		
Boarder		1

		66
Female		K
Male		E

Repeated or Noncredit	COURSES Code	COURSES Number	Section	COURSE NAME	Credits	Day, Hour, Place	Instructor

Overload Permission Granted YES ☐ NO ☐ Total Credits _____

Write an R for repeated course and
a K for a non-credit course

_____ Signature-Advisor

_____ Signature-Student

FIGURE 4-1. Program Card (No.1 Card).

No.2
Student Card

BOGAZICI UNIVERSITY
REGISTRATION FORM
19../.....

.....Semester

Boardes St. ☐
Day St. ☐
☐

Last Name _____ Name _____

School _____ Dept. _____ Class _____

REGISTRAR'S STAMP

EDUCATION FEE STAMP

Courses

1. _____ 4. _____
2. _____ 5. _____
3. _____ 6. _____

2 stamps are necessary for admission to classes

FIGURE 4-2 Student Card

No.3

ADVISOR'S CARD
19../....

.....Semester

Last Name _____ Name _____ Remarks

School/Dept. _____ Class _____

Adress:

Phone. Home
Office

FIGURE 4-3 Advisor's Card

INFORMATION CARD

Birth Place and Date _____

Father's Name _____ Father's Profession _____

Mother's Name _____ Phone.Home _____

Office _____

Date of first entry to B.U. Lycee University

_____ Graduation Graduation

Degree _____ Degree _____

Citizenship _____

Lycee _____ Date _____ Date _____

Transfered from _____ Literature _____ Major

Field _____

College Completed _____ Science _____ _____

Home Adress _____

FIGURE 4-4. Information Card.

No.4 Control Card

BOGAZICI UNIVERSITY
..... FACULTY
BEBEK-ISTANBUL

198. - 8.. .... SEMESTER

CARD FOR REGISTRATION

Name-Last Name _____

School/Department _____

Class _____

1. Registration Form
2. Math 1, Chem 1, Phys 1
3. Hum. 1
4. Advisor
   (The first line should be stamped and signed)
5. Math. II
6. Physics II
7. Education Dept.
8. Registration I
9. Dean of the Student Affairs
10. Payment
11. Military Service
12. Library
13. Infirmary
14. Check

Note: Card Numbers 1, 2, 4, and 5 should be returned to the Registrar's Office

---

No.5 Start of Registration Card

BOGAZICI UNIVERSITY

198. - 8.. .... SEMESTER

Name and the Last Name _____

School _____

Department and Class _____

FIGURE 4-5. Control Card and Start of Registration Card.

are explained in steps in the following subsections.

4.2.1.1 Registration of New Students

1. Students who are eligible for registration (master students, transfer students who are accepted by the Faculty Executive Commitees and the students from ÖSYM) apply to the Registrar's Office with the following documents:

a) ÜSS result, and an Identification Card.
b) Diploma or Graduation certificate.
c) 12 photos.
d) 3 declaration of residance.
e) 2 copies of Birth Certificate.
f) X - ray.
g) A report showing student's conviction situation given by the General Attorney.
h) A report showing military situation(for the students who are in military age).
i) If a student has previously attended to another University, he must show that he did not have any punishment during that time.
j) Receipt of Tution fee.
k) For foreign students photocopy of passport and student wisa is needed instead of ÜSS results and Identification card.

For transfer and graduate students document stated in (i) is also required.

2. Students are taken to the Registration Hall by checking their ÜSS results and their identification cards. After this control is made, they get the registration cards to fill out the necessary information. Then, they give No. 4 card to an inspector who puts these cards in a queue and checks them in a first in first out basis. He checks stude name in the list, "ÜSS results". If his name is in the , he takes all the documents listed in 1, puts them in st nt's file and writes "has taken the card". He also signs t No.4 card and detaches No.5 card. If, on the other hand, a y of the documents is absent, the registration is not starte .

3. After registration starts, students either go to their advisor or to a department from where they are going to take a course. For example engineering students should go to Physics, Chemistry, and Mathematics departments before going to their advisors; since all freshmen take humanity courses, they should go to the related course instuctors to et their signs on No.4 card. Then the students go their advisors for registering to the other courses. These c ses are written on No.1, No.2, and No.3 cards.The advisor s ns No.2 card and the related place on No.4 card for each st ent. After his course schedule is completed, his advisor takes photo and No.3 card, and puts them in "Student Academic File".

4. Each student, with his X - ray goes to the Medical Center for registration. A card is also filled there and the related place on No.4 card is signed.

5. Each student does his military registration by reporting to an Office of Defense in the University.

6. Each student goes to the Library and gets registered there.

7. After he registers for his courses, completes his hospital, military and library registration, he is taken to another hall which is called Red Hall. In this hall, each student registers for a physical education course, pays money for getting identification card, and shows receipt of his tution fee, in that order. Finally he gives all registration cards to a person who is in charge there. That person controls the signs on No.4 control card in order to see weather all steps in the registration process are completed or not.If they are completed, he stamps two places on No.2 card. At this step registration has been completed.

Different registration dates were assigned to different student classes, and a student must start his registration at the specified date. But he may finish his registration until the end of registration deadline. Most of the students want to finish their registration in at most two hours. However, generally students can not finish their registration in a day because of the following reasons:

a. At the Registration Hall, control process is so slow that a student may wait for this process for hours. This process is done in order to take the documents and to check the students who are admitted to the University. If, by any means, this process is done before registration date and the control is done by a computer, then long queues may be prevented.

b. At the Red Hall long queues are also observed during registration. The main reason for these queues is that, student takes physical education courses, and gets his identification card by paying a fee on a desk, which are all irrelevant to the registration task. Office of Student Affair is responsible for such tasks and they should either be eliminated from the registration process or be combined with some other operation.

4.2.1.2 Registration of Old Students

Registration of old students is also similar to that of new students. There are slight changes in the control process and no document is needed. Also library registration, military service registration, and hospital registration are done by controlling the situation of each student at the end of the previous semester. This process is also analyzed step by step.

1.a) The lists of students who are not admitted to enroll in the next semester based on the rules of Enterance and Education Regulations of Graduate, Undergraduate, and Colleges are prepared at the end of each semester. These lists are distributed to the related faculties and colleges. This process is done after all grades are completed in the student's grade report.

1.b) These lists are examined by the Board of Directors of Faculties and Colleges, and final decision about dismissed students are given and reported to the Registrar's Office. Students are also informed by an official letter.

2. Based on these lists and grade reports, the Registrar's Office prepares the following lists;

a) Lists of Dismissed Students

b) Alphabetic sorted Students' lists for each faculty

c) On leave students' list

d) Ek-Yk lists.
(This list is used to check weather a student has completed his courses or not. If he has not completed, he should contact to the instructor who has given that course)

e) English Profiency Exam Results prepared by the Prep. School.

3. Registration control at the very first step is done based on the above lists. If a student is in a, or c, then registration is not allowed. If on the other hand, he is in d, he must complete his course that is, he must be given a letter grade in order to start registration. For this purpose, he should contact to his instructor. Other - wise he can start registration. No.5 card is detached from the Registration Card. He then proceeds the same registration steps as that of new students.

Registration of Students are done at different dates for each class. The same queues mentioned before are also observed in the registration of old students. The flow - chart of the porcess is shown in figure 4-6.

As a result of registration process the following information are produced for each student:

a. Student Number: The first two digits represent enterance year.
b. Student class.
c. Department.
d. Residential situation (Day or boarder)
e. Sex.
f. Courses taken: Repeat courses and noncredit courses are also indicated.
g. Personal information (This is obtained from the information card).

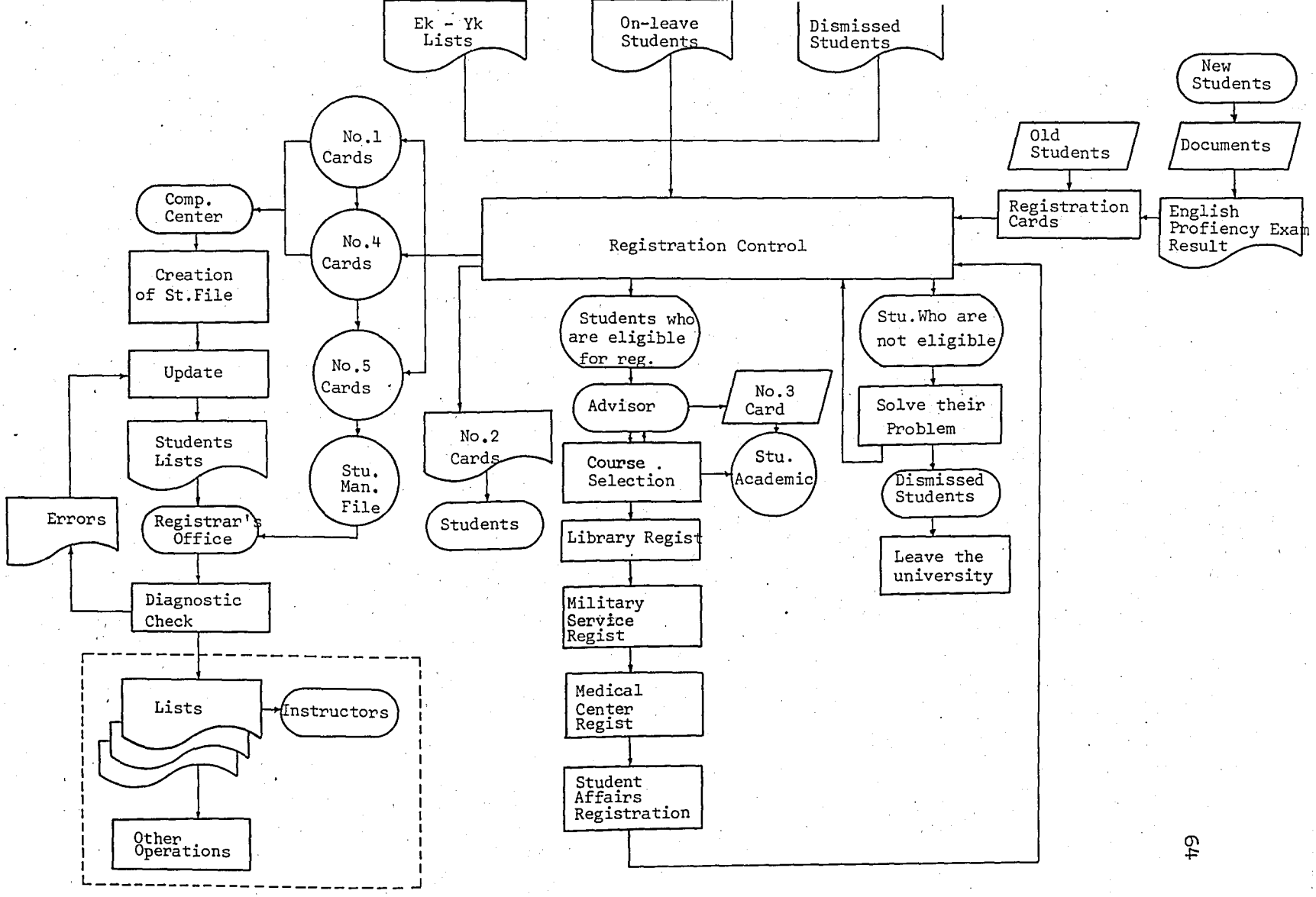


FIGURE 4-6. Flow of the Registration Process for the existing system. (The part inside the dotted rectangle shows the relation of the registration process with other operations).

4.2.2 Preperation of Lists

At the end of the registration period all of the registration cards are controlled by the Registrar's Office. No.1 cards of all students are sent to the Computer Center and the number, name, class, department, residential situation, sex, and the courses taken in that semester are punched on computer cards using No.1 cards for each student. These information are stored in the "Student Master File". Then a program is run to give alphabetic ordered student's lists. Those lists and No.1 cards are sent back to the Registrar's Office in order to correct errors, which most of the time result from punching. After corrections are made on these lists, they are sent back again to the Computer Center in order to update the students' file.

Also course lists are obtained from the Student Master file by a program. These are lists, which contain names of the students for each course. (Preperation of these lists is shown in fig. 4-7). These course lists are then sent to instructors in order to help them check the students' attandance to the classes and give mid - term and final grades. After the lists are controlled by each instructor and any error found, it is informed to the Registrar's Office for final corrections.

Those lists and the files explained above are also updated at the end of the add - drop period, at which time final lists are prepared and controlled once more.

As can be seen above, too much control process and updating are done when a file is created and the lists are obtained. This is mainly because of punching almost 6000 cards in a limited time.

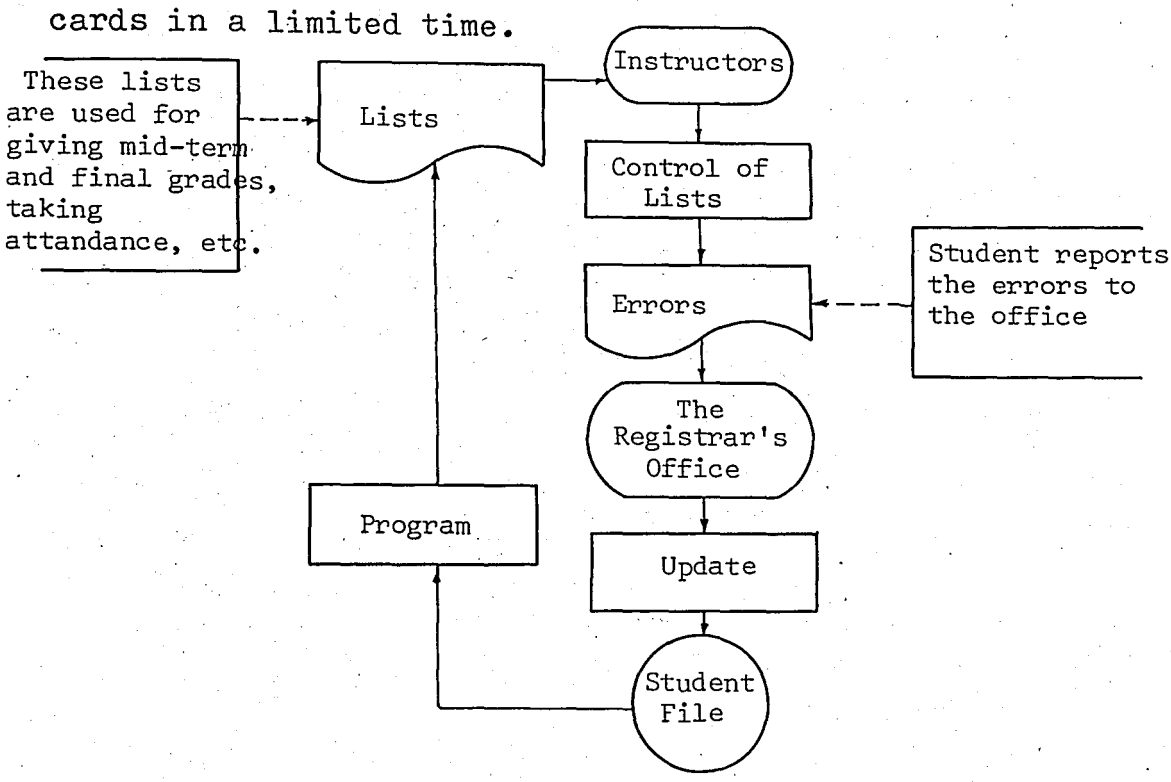


FIGURE 4-7. Flow of Producing Lists

4.2.3 Preperation of Mid - Term Grade Reports

At the end of the first mid - term instructors are supposed to give mid - term grades to each student. These grades are given so that, those students who have very low grades get a chance to withdraw from that course. In other words, these grades give an idea about each student's situation. But in recent times, this does not work well because of high work load of the Registrar's Office, and the instructors can not give grades on time.

The procedure which is shown in fig. 4-8 is as follows: Instructors give mid - term grades and write them on course lists. These lists are sent to the computer center and students' file is updated by means of these grades. Then a "Grade - Report" program is run to obtain the grade reports.

After they are obtained they are distributed to the faculties and students by means of Office of Student Affairs. If there is any error on these reports, students bring their reports back to the office and they are corrected.

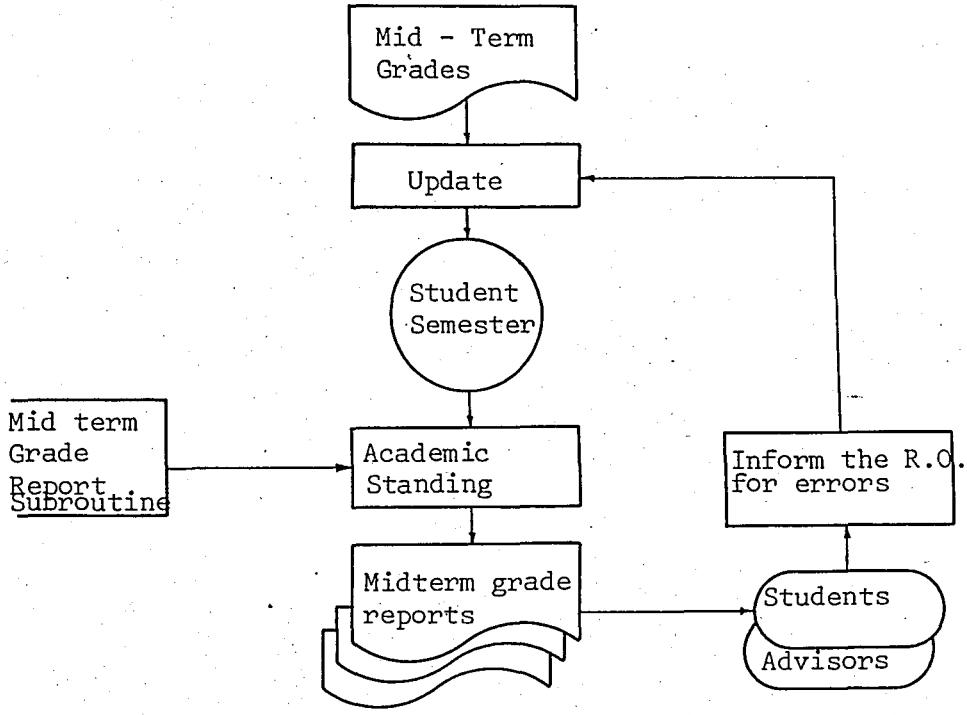


FIGURE 4-8. Flow of process in producing Mid-term Grade Reports.

4.2.4 Scheduling Final Exams' Date

Based on the course lists obtained at the end of withdraw time, dates of the final exams are scheduled. This

scheduling is done manually, which creates some problems. For instance, a student may have his finals in a week which is not desired, or two or more of his finals may coincide on the same session.

There are three exam sessions in a day.A student may not take three exams on the same date but he may take two exams which should be at nonconsequtive sessions. There are some criteria. for scheduling the exam dates. They are as follows:

1. For regular students, core courses exams should be dated on different days and exam dates for such courses are desired to be as a part as possible.

2. Exam dates for consequtive class courses should also follow the same criteria as above.

3. Exam dates for different Faculties are considered seperately.

If some of the students have not taken some of the exams because of acceptable reasons, then they are given make up exams which are generally done after finals. These reasons could be any of the followings:

1. Report of illness given by a physician working at the Medical Center.

2. If two or more finals coincide.

3. If two or more of finals are scheduled at the same date on consequtive sessions.

4.2.5 Preperation of Final Grade Reports

All instructors should give the final grades to the Registrar's Office in two days after their final exams are completed. After all grades are collected, this office sends them to the Computer Center. At the Computer Center these grades are punched and a "Grade Program" is run. For each student four copies of reports are printed. One copy is put to the student's file, the second is sent to his advisor, the third is mailed to his adress, and the last one is sent to the Office of Student Affairs. This report contains the following information.

a) Total credits attempted until that semester.

b) Total credits completed until that semester.

c) Honor points.

d) Grade point average before that semester.

e) Code, Name, Credit, Session of courses taken at that semester.

f) Letter grades.

g) Total credits obtained during that semester and total honor points gained at that semester.

h) Credits attempted, and completed after that semester.

ı) Total honor points and GPA after that semester.

The preperation of final grade reports is shown in figure 4-9.

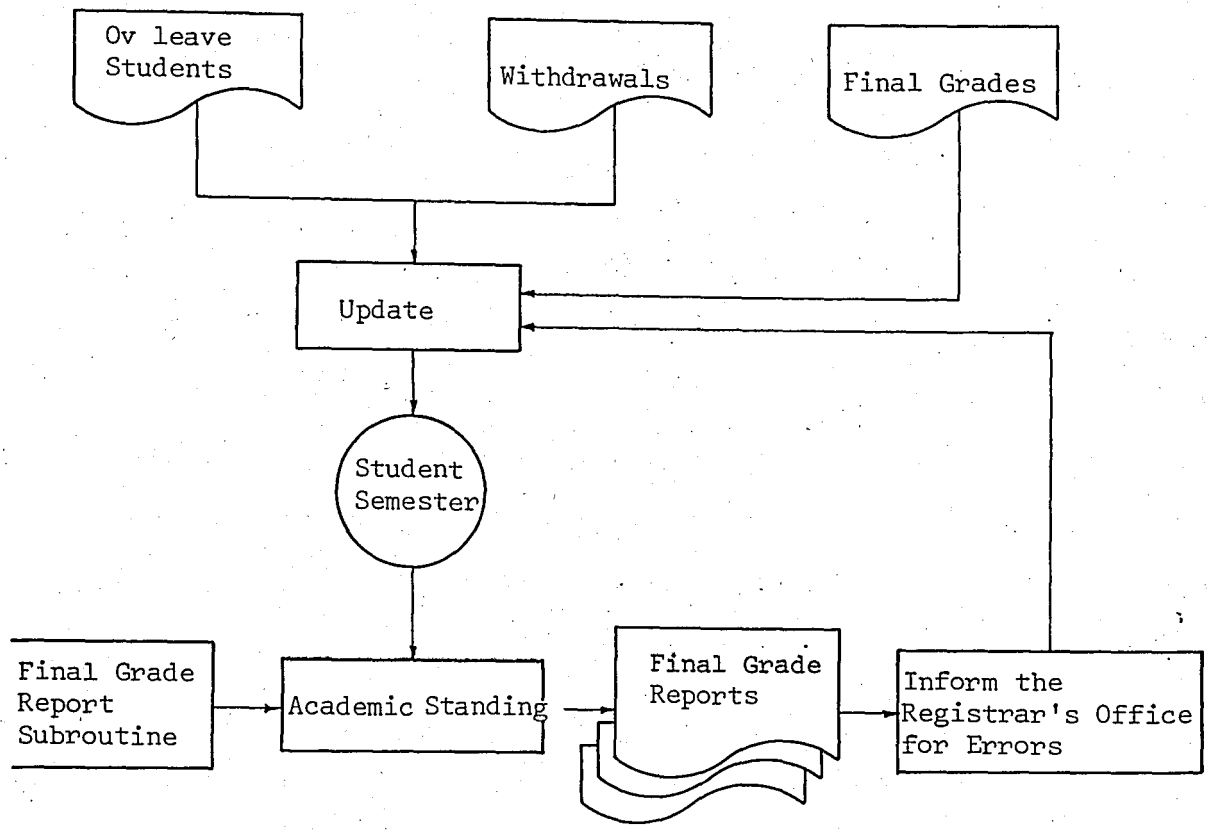


FIGURE 4-9. Flow of the process when preparing the Final Grade Reports.

4.2.6 Course Scheduling

At the beginning of each semester the Registrar's Office requires information about the courses that will be given in the next semester from each faculty and college. Based in this information, information about the capacities of classes, and predictions,which are highly based on expriences, about the number of students in each courses, the Registrar's Office prepares course schedule manually. After

they are scheduled, they are printed and distributed before the registration time of the next semester.

4.2.7 Preperation of Documents Requested by Students

a) Transcripts: If a student requests his transcripts, he first fills a "Transcript Request Form", then pays transcript fee, and then applies to the office. He may either take his transcripts or he may want it to be mailed to other places. In each case the office is responsible to prepare it.Transcripts are prepared by taking photocopy of all final grade reports which are put side by side.

b) Student Identification Report: If a student requests an identification report, he is given such report provided that he is registered. Students fill a "Request Form", attach a photo, and apply to the office for this purpose. This office prepares reports, and distributes them at specified days.

c) Rank Report: If a student requests his rank in his class and or his faculty, then this report is also given to him. The same procedure is applied as in b.

4.2.8 Preperation of Some Statistics

After registration is finished, number of students according to departments, classes, or sex are reported to the Rectorate, faculties and colleges. Also performance of the students with respect to sex, or faculties are prepared.

4.2.9 Preperation of Diplomas

At the middle of spring semester, lists of students who are candidates for graduation are prepared. These lists are sent to faculties and colleges. Executive comitees make corrections on these lists and send them back to the Registrar's Office. The office prepares diplomas according to these lists. These lists are also posted at different places of the campus to inform students. At the end of finals Faculty Executive Comitees decide about the graduations and lists of graduated students are sent to the Registrar's Office. During Graduation Ceromony diplomas are distributed.

4.3 INFORMATION REQUIREMENTS OF THE REGISTRAR'S OFFICE

In order to perform the tasks explained in section 4-2, the following information must be obtained by the Registrar's Office.

i. From the Students : Students give information about themselves by filling registration cards before the start of each semester (Figures 4-1 through 4-5).

ii. From the Faculties and Colleges : At the mid of each semester faculties and colleges inform the Registrar's Office about the courses that will be offered in the next semester.

iii. From the instructors and Prep. School : At the

middle of each semester grade - reports are prepared by processing the information given by the instructors and at the end of finals, grades are also reported to the Registrar's Office for preparing final grade reports.

4.4 CONCLUSION

From the analysis of the Registrar's Office it is observed that all of the information required by this office are generated by students, faculties and colleges, and instructors. Eventhough these information are generated, still the system does not work efficiently. The following facts show the inefficiency of the system:

i. On the average students spend at least one day for registration.

ii. Course schedules bring additional constraints on students when selecting their courses.

iii. Mid - term grade reports are not distributed on time and sometimes those reports are wrong.

iv. The workloads of officials at the office are too much.

v. Accurate information about students can not be obtained on time.

vi. The office can not make statistics because of the workload.

vii. Too much updates are made in the "Student Master File".

The reasons that affect the performance of the Registrar's Office are as follows:

i. Information channels are not efficient. That is,information in the registration cards are punched which affect the accuracy of information, and add - drop forms are also converted to machine language by punching.

ii. Information processing mechanism, that is computer programs, used by the Registrar's Office, do not work efficiently.

iii. The Registrar's Office cannot get the necessary information from the other offices on time.

iv. The computer system (UNIVAC 1106) affects the performance of this office by being off most of the time.

v. Registration process bores the officials because of irregularities at the Registrar's Office.

vi. Number of officials is not sufficient to do efficient works.

In order to increase the performance of this office the following changes should be done:

i. Registration forms should be redesigned such that no mannual conversion of information is needed,

that is punching operation should be eliminated.

ii. Registration process should be simplified so that students do not spend much time during the registration.

iii. Computer programs and files should be redesigned to meet the needs of the Registrar's Office.

iv. The Registrar's Office must get information from other offices on time.

v. The Registrar's Office should be reorganized based on the above changes.

V. ANALYSIS OF THE PERSONNEL OFFICE

5.1 INTRODUCTION

The Personnel Office (P.O.) follows and executes the appointment, adoptation, charging, vacation, military service,and the retirement tasks of the academic and the administrative personnel who work at B.U. All of these tasks are defined by the Establishment Law (No.1487), Personnel Law (No.657), and the University Law (No.2547). The results of the above tasks are reported to the Rectorate, the Office of Administrative Affairs and to the offices at which the officials work.

The laws mentioned above not only define the tasks, but also they explain the producedures that should be followed in performing the tasks. All forms, which are used while performing the tasks, are also defined and they are printed at Devlet Malzeme Ofisi. Since the procedures are defined by the laws, to make even a minor change in the system is almost impossible unless the laws are changed by the Parlement or the procedures are revised by the Government. For this reason, in this chapter a general view of the system is studied first, then information processing mechanisms, which are used in

transmission of information within the university are analyzed. These mechanisms are the only elements of the system, which can be worked throughly and at which some improvements can be made by changing the mechanisms.

5.2 ANALYSIS OF THE ADMINISTRATIVE PERSONNEL

Administrative personnel support the academic units of B.U. From this perspective, they should be well organized and well qualified.

After the University Law, there have been structural changes among these personnel, in the sense that some of them have been forced to change their social security instution, in which they belonged to. Before that law, some of the personnel were workers. By that law, they are forced to be officials. Thus, these personnel have lost some of their social rights. This caused some of the personnel to retire or resign from their works. The efficiency of the offices decreased, consequently.

The transient period explained above has increased the workload of the O.P.A., in the sense that the adoptation of these workers had to be done until the end of 1983. For this purpose, the echolons and the degrees of such personnel were adjusted.

Except for the contracted personnel, all of the officials work according to the Personnel Law. Their start of work, salary level, promotion to the next degree, and

promotion to the next echolon are all governed by that law. Since it is not possible to change these procedures, they are not analyzed in this study.

5.3 ANALYSIS OF THE ACADEMIC PERSONNEL

Academic personnel are the main elements of a university system. They educate students and do scientific and technical researchs. Eventhough the titles of these personnel show varieties, their appointment and retirement procedures are governed by the Personnel Law. Degree and echolon system, promotion of these personnel, cadres of these personnel, and gaining the title are regulated by the University Law. Since it is not possible to change this law, these procedures are not analyzed also.

The University Law has also affected the academic system of this university, considerably. One of the most important effects of this law is that; it discards the student assistantship from the system, which means that the traditions of the university are forced to be changed. This law also changes the promotion system and"gaining title" system which have negative impacts on the academicians.

In any system, adoptation to the changes effect the performance of the system. With this respect, after the changes "to reach stability" is one of the most important problems of the system. The same problems are observed at B.U., at this point.

5.4 NECESSARY INFORMATION THAT SHOULD BE PRODUCED BY THE PERSONNEL OFFICE

Eventhough all of the tasks, which should be performed by the Personnel Office are defined by the laws, it is possible to accelerate the speed of information flow and to improve the information processing mechanism. For this reason instead of analyzing the whole system; it is preferred to analyze the necessary information, which must be produced by this office. In the following paragraphs the necessary information, which should be produced by this office, are explained.

1. Monthly Available Laborforce at the University: The P.O. must produce the number and the quality of the officials working at the offices. This information supports the manpower planning decisions and it can also be used as an input for allocation of personnel within the offices.

2. Quality of Personnel: Since the education language in the university is English, at least some of the officials must be fluent in English. In addition, most of the tasks at the offices require qualified officials. To find qualified officials with the existing salary level and promotion system is not easy. For this reason, the decision makers should make optimal assignment of the officials to the offices. Therefore, the Personnel Office should produce "Qualifications of the Officials at each

Office" and "Qualifications of the Personnel at the University" reports for supporting the optimal assignment task.

3. Cadres at the University: Cadres are given to the university by the laws. Before a new official is appointed or an official is promoted to the next degree, the empty cadres at the university must be known. By empty cadres, it is ment the available cadres to which new officials may be appointed, or the present officials may be promoted. In other words, it is the number of each unused degree which is given to the university by the laws. Information about the cadre situation of the B.U. is important for the reasons stated above.

4. Monthly Promotion of Personnel to New Echolon: When an official spends a year at his work, he is either promoted to the next echolon or to the next degree provided that an empty cadre is available. An official is promoted to the next degree, if it is his third promotion in the echolons. If empty cadre is not available, he is promoted to the next echolon. Since the enterance date of each official to B.U. is different, almost at each month some of the officials are promoted. To follow and execute the promotions of the officials is one of the most important tasks of the P.O.

5. Vacations: Vacations of the personnel must be followed by the P.O. Each personnel depending on his

working years can use his vacation for a specific number of days in a year.If he does not use his vacation fully in a year, he may use the rest of his vacation in the following year. An official may also use an excuse vacation in a year, which must not exceed three months, by proving his excuse. In order to adjust the vacations of the officials without causing any problems in performing the tasks at the offices, vacations must be scheduled efficiently.

6. Register given to the Officials: At the end of each year, the behaviours and the performance of the officials must be evaluated. The officials are evaluated by the head of the official, Director of the Administrative Affairs, and the result is approved by the President. This is a secret operation and must be saved by this office.

5.5 INFORMATION STORAGE SYSTEM OF THE PERSONNEL OFFICE

Information about the officials who are working and who had worked at the university must be stored in the manual files. In order to access the files and to perform tasks faster, register numbers are given to the officials. These numbers are given to the officials according to their enterance order to B.U. Almost 1850 numbers are given to the officials from the establisment of B.U. up to now. Active files, that is files for officials who are working at B.U. are stored in an archive room. For officials who had worked previously, the files are stored in another archive room.

To reach any of the information about the officials from the active file and to perform any task,which requires that information, consumes too much time. This causes delays in transmitting some information to other offices. Even some information can not be transmitted. For doing the promotions, informing the cadre situation, and following the vacations, which should be performed more frequently, the sub files are created. They are Cadre File, Promotion File, and Vacation File. Cadre File is used to report the available cadres and it is updated manually, whenever an official resigns, retires or promotes to the next degree. Promotion file is used to report the names of the officials who are going to be promoted monthly, and the vacation file is used when following the vacations of the officials. The structures of these files depend on the experiences of the Head of the Personnel Office.

In addition to the above files, all of the formal reports, the letters that go into the P.O., the copies of the reports, and the letters sent from this office to the other offices and/or institutions, must be stored in the files. There are three files used for this purpose. They are To/From Governmental Institutions, To/From Faculties, and To/From Other Institutions.

5.6 CONCLUSION

The analysis of the P.O. shows that, it is impossible to make any changes in the system. On the other hand, for improving the efficiency of this office, information processing mechanisms must be changed. It can only be done by making use of a computer when processing information. If information are stored in the computer memory, and if some of the routine tasks are done by a computer, the efficiency of this office will increase and its manpower requirement will be minimized. At this stage the necessary information, which should be produced by this office, are suggested to be obtained by a computer. For this purpose, the suggested files and the programs are designed in Chapter 8. After stability is reached, the devolopments should be done.

VI. DESIGN OF AN INFORMATION SYSTEM FOR THE OFFICE OF STUDENT AFFAIRS

6.1 INTRODUCTION

In this chapter necessary changes in the processing of information, while performing the tasks, for the Office of Student Affairs are suggested, and the structures of the files and programs are explained.

As concluded in chapter 3, evaluations of the applications to the dormitories and scholorships, distribution of identification cards and IETT passes, and organization of student affairs must be redesigned. It was also concluded that, information should not be processed manually.

In the following sections, first the new system is designed for the mentioned tasks and then necessary files and the programs which help to process information by a computer are devoloped.

6.2 DESIGN OF A NEW SYSTEM FOR THE TASKS OF THE O.S.A.

6.2.1 Distribution of Identification Cards and IETT Passes

Distribution of the identification cards may be done by one of the following two ways;

1. During registration, students show the receipts of identification card fees and get their identification cards. Then they fill out the cards, attach photo, and return these cards to the office. After all of the cards are collected, (The deadline for returning back the cards must be announced) they are sent to the Rectorate for signing and stamping. Then these cards are coated with plastics. After the above operations are completed, they are redistributed to the students again. While distributing the cards, each student signs his name on the student list. This distribution process should be done at a specified place (for example, Red Hall) and in a specified time period (for example in a week). A penalty may be given to the students, who do not take their cards, that is they should pay some amount of money for not taking their cards in the specified time period.

2. The cards are distributed to the students, after the registration process in a specified time period. The same process, which is explained in 1 is applied.

Among the two alternatives the first one seems better than the second one, because the cards are distributed to the students without assigning a specific time. The first

alternative is not the best alternative, in the sense that it requires the cards to go and come back between the office and the students. The best alternative is; to fill out the cards by a computer, sign, stamp, and coat the cards with plastics then distribute them to the students at once. Note that photos are not attached to the cards, which is not legal at present; it may become legal in the future.

Distribution of the IETT passes depends on the IETT Office, because this office sends the passas to the O.S.A and then the O.S.A processes the operation. If it was possible to synchronize the distribution time of passes with that of identification cards, this process would not consume any additional time. But most of the time these cards are distributed later. In the latter case the same procedure as in the existing system, is suggested.

6.2.2 Evaluations of the Applications for the Dormitories and Scholorships

As said before students apply for the dormitories and scholorships with different application forms. Both of these forms contain almost the same information; for this reason it is suggested to combine these application forms. Also, in order to process information faster, these forms are designed in such a way that an optical reader can reed them. The designed application form is shown in figure 6.1. and 6.2.

BOGAZICI UNIVERSITY

APPLICATION FORM FOR

DORMITORIES AND SCHOLORSHIPS

19.. /19..

Student Number

0	00000000
1	00000000
2	00000000
3	00000000
4	00000000
5	00000000
6	00000000
7	00000000
8	00000000
9	00000000

Student Name - Last Name

I am applying for

Dormitory	0
Scholorship	0
D & S	0

Did you apply for Kredi Yurtlar Kurumu — Yes 0 / No 0

If yes, was it accepted — 0 / 0

Disabled situation — Exist 0 / Nonexist 0

If you are living in Istanbul how far is your home from the campus by public bus?

1 hr | 2 hrs | 3 hrs | 4 hrs | 5 hrs

0 | 0 | 0 | 0 | 0

Your net income earned by scholorship or working.

5000-10000	0
10000-20000	0
20000-30000	0
30000-40000	0
40000-	0

Parents Situation

Father: 0 Death; 0 Alive; 0 Stepfather

Mother: 0 Death; 0 Alive; 0 Stepfather

Mother - Father: 0 Seperated

If your father is death, is he a martyrdom? Yes 0 / No 0

Family Net Income(Monthly)

Less-than 30000	0
30000-45000	0
46000-60000	0
61000-75000	0
76000-90000	0
91000-105000	0
More than 105000	0

Residential Situation

Own	0
Rent	0
Own with credits	0
Company Housing	0

Monthly Expenditures for Housing

0	Less than 5000
0	5000-10000
0	11000-15000
0	16000-20000
0	21000-25000
0	26000-35000
0	36000-45000
0	More than 45000

Car that your family owns: 0 Yes; 0 No

Age of Your car: 0 More then 5; 0 5; 0 4; 0 3; 0 2; 0 1

Name of your car

Licence of your car

Source of Income

My father	My mother
0 Official	0
0 Worker	0
0 Farmer	0
0 Retired	0
0 Tradesman	0
0 Businessman	0 Housekeeper

1 2 3 4 5 6 7 8 9 10

0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0

Number of members of your family (Including yourself).

FIGURE 6-1 Application Form For Dormitories And Scholorships

Personel Information about Members of Family (Including yourself)

Name-Last Name	Relationship	Age	Name of the School if he is a student	Marital Status	Does he works or get. scholor.	Monthly net income

Total Net Earnings _____

Necessary Documents to be brought

1. Document for family income.
2. Document which shows residential situation.
3. Copy of Certificate of Birth.
4. Copy of Declaration of Residence.
5. Decleration of Innocency.
6. Six photos.

I confirm that all information stated here belong to me and correct.

Name - Last Name _____ Signature _____

FIGURE 6-2. Application form for dormitories and scholorships.

In the existing system, evaluation of the applications to the dormitories is done by using a priority rule which is highly subjective. Instead of a priority rule, a "Point System" is developed and suggested for minimizing the complaints. In the Point System a "Total Point" is calculated for each applicant and these points are listed in a descending order. Considering the empty places in the dormitories, tho office starts from the top and accepts the students to the dormitories until all places are filled. If there is a tie between the students with respect to their total points, the commission decides which student (or students) is to be accepted to the dormitories.

The main logic of the Total Point system is that; it must represent the relative economic and socio-economic weakness of a student. The income level, the car that a family owns, and the residential situation of a family can be used for ranking the economic wealths. The disabled situation, parents situation, and the distance of the home to the campus can be used for ranking the socio-economic wealths. In addition to that expenditures do also represent the economic wealths. The Total Point system should consider both of the above parameters and should formulate the total point of the applications. The following formula can be used for this purpose;

$$P = a. P_1 + P_2 \qquad \ldots (6\text{-}1)$$

where;

P : Total Point of a student.

a : Subjective measure.

$P_1 =$ f (Income - Expense)

$P_2 =$ f (Distance to B.U., Disabled Situation, Parents Situation).

Since the income levels stated by the students are not always true and the some of the parameters can not be quantifiable, another grading system is suggested for the next two semesters. The monetary values are subject to change as inplation rises. The logic of this system is the same as that of the equation 6-1. The feedback obtained with this system can be used for formulating (6-1). The following points are proposed for each applicant.

a. For each student whose residence is not in Istanbul;

1. If his father is martyrdom, 25 points are given.
2. If his father is an official, 20 points are given.
3. If his father is a worker, 19 points are given.
4. If his parents are officials, 18 points are given.
5. If one of his parents is an official and the other is a worker, 17 points are given.
6. If his parents are workers, 16 points are given.
7. If his family is a farmer, 14 points are given.
8. If his father is a tradesman, 13 points are given.
9. If his father is a businessman, 10 points are given.

10. 8 points are added to the total point of each disabled student.

11. 6 points are added to the total point, if the family lives in a rental apartment.

12. 4 points are added to the total point, if the house of the family was owned with credits.

13. 1 point is subtracted from the total point, if the housing expenditure of the family is between 26.000 - 35.000 TL.

14. 2 points are subtracted from the total point, if the housing expenditure is between 36.000 - 45.000 TL.

15. 4 points are subtracted from the total point, if the housing expenditure exceeds 45.000 TL.

16. For students whose family net income is greater or equal to 76.000 TL, 3 points are subtracted from the total point.

17. For students whose parents are death or whose mother and/or father is death, 3 points are added to their total points.

18. If the members of the family exceeds four, 2 points are added to the total point.

19. If the age of the car, which family owns, is less than 3 years, 2 points are subtracted from the total points.

b. For each student whose residence is in Istanbul;

1. 20 points are subtracted from the total point.

2. If his home is one hour away,2 points are added.

3. If his home is two hours away, 4 points are added.

4. If his home is three hours away, 15 points are added.

5. If his home is four hours away, 20 points are added.

c. For Graduate and Ph.D students 15 points are subtracted.

d. For the students who are candidates for Certificate of Education, 18 points are subtracted.

e. For foreigh students who are awarded to scholorships, 15 points are added.

There is no criteria for evaluating the applications to scholorships and loans. Almost all students, when applied are awarded scholarships, which decreases the share of students who really need the money. In order to increase the shares of needy students, all applications should not be accepted. The number of students who are going to be accepted for scholorships is calculated as follows;

1. Calculate the total point of each applicant and rank them in a descending order. Use the first 19 items of points for dormitories.

2. Calculate the amount of money that must be given to each applicant. For this, apply the following procedure;

2.1. Determine the amount of money, which is used for necessary expenditures. This is a parameter, which is predicted at the beginning of each year.

2.2. Take tha mean of the monthly housing expenditure group , which each applicant has stated in the application form. For housing expenditures more than 45.000, take the mean as 60.000 TL.

2.3. Add the amounts stated in 2.1. and 2.2. This is the expected necessary expenditure for each family.

2.4. Subtract the mean of the family net income (This is also stated by the students in the application forms) from the expected necessary expenditures and divide the result by the number of members in the family. The result is the share of the student from the family income.

2.5. Add his income, which he earns by either scholorship, or by working outside, to his share.

Determine the average amount of money that is necessary and sufficent for education. Subtract this value from the share of student. The result is the amount of money that must be given to the applicant.

3. Take the average of this amount calculated for each student.

4. Divide the available funds with the average, calculated in step 3. The result is the number of students to be awarded.

After the number of students is determined that much of students are awarded from the top of the applicants' list, whose total points are ranked in descending order. The amount of money, which will be given to each student is calculated as follows;

$$\text{The amount of money given to each accepted applicant} = \frac{\text{(Available funds)} \cdot \text{(Total points of the student)}}{\text{(Total points of the accepted applicants).}}$$

The distribution of loans with this method is highly objective. But it may cause some problems. Especially the applications of the students who are in the boarder line of the rank list must be carefully examined by a commision. As a result of this examination, the commision may or may not change the number of students receiving financial support.

To control the truth of information, which have been stated by the applicants is perhaps the most important and difficult task. Especially to check the truth of the incomes of the businessmen, tradesmen, farmers are not easy. The controls may be done by either visiting the family, or writing letters to the source of income. Especially, precise controls should be done for the following students;

1. Students whose family income is less than 75.000 TL, but pay more than 35.000 TL. for housing expenditure.

2. Students whose monthly income is less than 75.000 TL, but own cars which are 3 years old or less.

For financial control, boards of the clubs should report monthly financial budgets to the O.S.A. If they do not obey, penalty is given to them.

6.3 THE FILES

In order to process information by a computer, five files are designed for the Office of Student Affairs. They are Student File, Dormitory File, Club File, Total Points for the Dormitory, and Total Points for Scholorships. The structures of these files, their memory requirements are explained in the following subsections.

6.3.1 Student File

This file contains the following information for each student;

1. Student Number (8 bytes).
2. Name and the Last Name (20 bytes).
3. Sex (1 byte).
4. Nationality (3 bytes).
5. Birth place and birth year (4 bytes): The first two bytes are used to enter the traffic code of the birth city and the second two bytes are used to enter the last two numbers of the birth year.
6. Marital Status (1 byte): For married students "M", for unmarried students "S" is coded.

7. Class (1 byte).

8. G.P.A. (4 bytes).

9. Number of on leave semesters (1 byte).

10. Application for dormitory (1 byte): If he has applied, "1" otherwise "2" is coded.

11. Application for scholorship (1 byte): If he has applied, "1" otherwise, "2" is coded.

12. Application to Kredi Yurtlar Kurumu (1 byte): If he has applied "1", otherwise "2" is coded.

13. Was it accepted (1 byte): If it was accepted, "1", if it was not accepted, "2" is coded.

14. Information about his father (1 byte): 1 is coded for alive, 2 is coded for death, 3 is coded, if he is a stepfather, and 4 is coded, if he is a martyrdom.

15. Information about his mother (1 byte): The same codes as in 14, are used.

16. Father's Profession (1 byte): 1 for official, 2 for worker, 3 for farmer, 4 for tradesman, 5 for businessman, 6 for retired, and 7 for unemployed are coded.

17. Mother's Profession (1 byte): 1 for housewife, 2 for official, 3 for worker, 4 for farmer, 5 for tradeswoman, 6 for businesswoman, and 7 for retired are coded.

18. Residential Situation (1 byte): 1 for own, 2 for rent, 3 for own with credits, and 4 for company housing are coded.

19. Car that his family owns (1 byte): 1 for "owns", and 2 for "does not own" are coded.

20. Age of the car (1 byte).

21. Number of the members of the family(2 bytes).

22. Net income earned by scholorship or by working (1 byte): At this space the income level, which is stated in the application form is coded.

23. Family Income (1 byte): At this space the income level of the family, which is stated in the application form is coded.

24. Monthly expenditures for housing (1 byte): At this space the housing expenditure level, which is stated in the application form is coded.

25. The time spent on the road when coming to the campus from his home (1 byte).

26. Dormitory Number (4 bytes): The first byte shows the building number, the second byte shows the floor number, and the last two bytes show the room number at which he lives.

27. Clubs (8 bytes): Clubs are coded. Each of two bytes shows that a student is a member of that club. Thus, a student can be a member of at most four clubs.

6.3.2 Dormitory File

This file contains the following information for each room:

i. Room Number (4 bytes).

ii. Available beds (2 bytes): This entry shows the maximum number of students who can live in this room.

iii. Available closets (2 bytes).

iv. Available chairs (2 bytes).

v. Available bookshelves (2 bytes).

vi. Available table lamps (2 bytes).

vii. Additional beds in case of emergency (1 byte): This entry shows the maximum number of additional beds that can be put in a room in case of emergency, which arises when the number of students that must live in the dormitory exceeds the capacities of the dormitories.

6.3.3 Club File

The aim of this file is to control the earnings and the expenditures of the clubs on a monthly basis. The structure of this file is shown in figure 6.3, and it contains the following information;

a. Club Identification

i. Code of the Club (2 bytes).

ii. Name of the Club (30 bytes).

iii. Number of its members (2 bytes).

iv. Student number of the students who are in the executive committee of the club (80 bytes).

v. Number of months (2 bytes): This is a counter

which denotes the number of months that has been passed from the beginning of the fall semester. The records following this number in the file are repeated until this number is reached.

b. Identification of the carnings.

i. Total amount of the earnings (8 bytes).

ii. Number of the earnings(2 bytes): This record is used to specify the number of the earnings in a month.

c. Earnings

i. Date of earning (10 bytes): This entry shows the date at which a club earns money.

ii. Source of the earning (20 bytes).

iii. Amount of the earning (7 bytes).

iv. Number of the student who enters information to this record (8 bytes): Only an accountant, or his assistant can enter this information.

d. Identification of the expenditures

i. Number of the expenditures (2 bytes).

ii. Total amount of the expenditures (8 bytes).

e. Expenditures

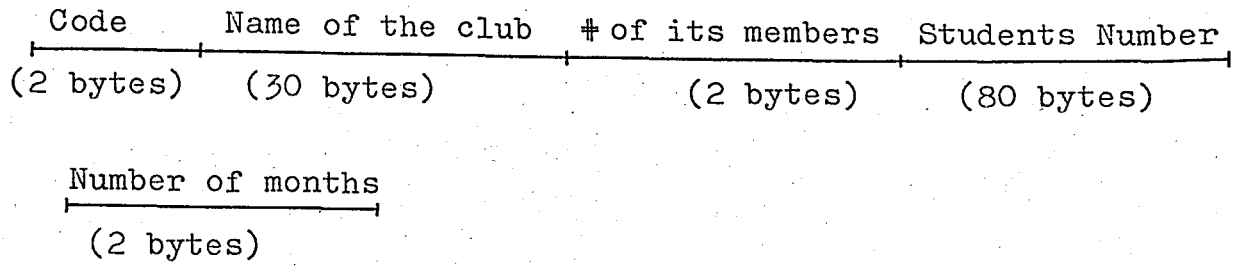
i. Date of the expenditure (10 bytes).

ii. Source of the expenditure (20 bytes)

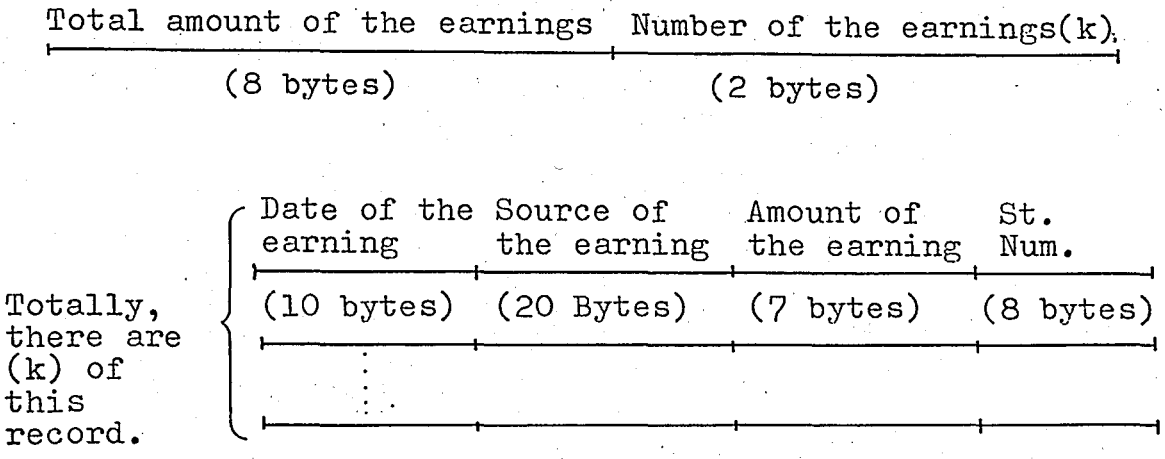
iii. Amount of the expenditure (7 bytes).

iv. Number of the student who enters information to this record (8 bytes).

a. Club Identification



b. Identification of the earning



c. Identification of the expenditures

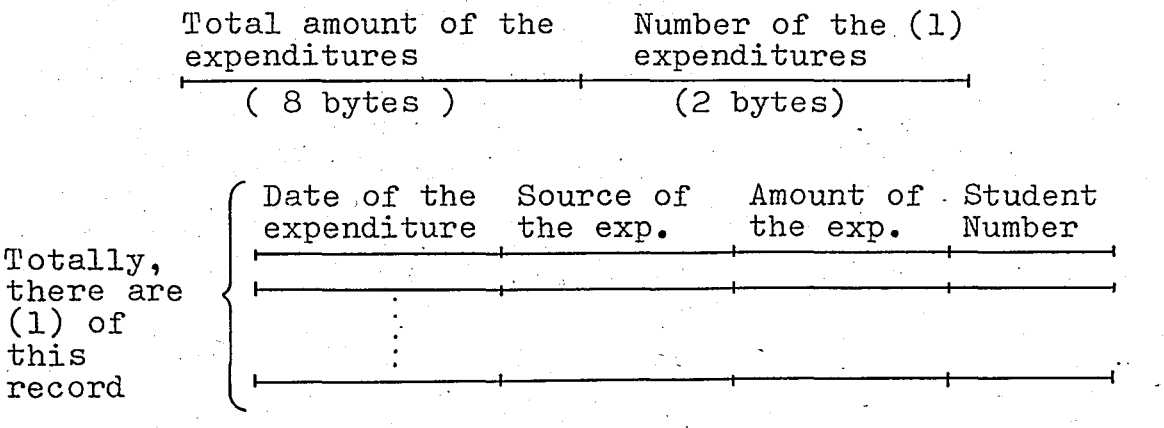


FIGURE 6-3. The Structure of the Club File.

6.3.4 Total Points of the Students for the Dormitory

This file is created by the "Total Points of the applicants to the dormitories" program and contains the student number (8 bytes) and the total points of each student (2bytes) who has applied for the dormitory.

6.3.5 Total Points of the Students for Scholorship

This file is created by the "Total points of the Applicants to Scholorships" program, and contains the student number (8 bytes) and the total points of each student (2 bytes) who has applied for scholorship.

6.3.6 Memory Requirements of the Files

To analyze the memory requirements of the files is important in the sense that it gives an idea about the cost of using a computer for supporting the information system of the O.S.A. Because of the uncertainities about the data, which will be stored in these files, memory requirements of the files are calculated with the following assumptions and are shown in table 6-1.

i. There are 4000 students at the university.

ii. There are 150 rooms in the dormitories.

iii. On the average the number of earnings and expenditures is 20 per month for each club.

iv. 1000 students apply to the dormitories and scholorships each year.

Memory Requirements / File	For each element (bytes)	Total (Mbytes)
Student File	For each student: 100	0.39
Dormitory File	For each room: 25	0.003
Club File	For each club/year: 12720	0.248
Total weights of the students for the dormitory	For each applicant: 11	0.011
Total weights of the students for the scholorship	For each applicant: 11	0.011
	TOTAL	0.663 Mbytes

TABLE 6-1. Memory Requirements of the Files.

As seen from the table 663 Kbytes of memory are required for the files.

6.3.7 Creating and Entering the Files

The files explained in the previous subsections are used by the programs, which will be explained in the

next section. The usage of these files is very important. This subject is explained in the following paragraphs.

a. Student File : The first eight records of this file is created by the information about students, which are stored in the Student Master File prepared for the Registrar's Office. "Number of on leave semesters" record (9^{th} record) is increased by one for each on leave student. This is done by an update program. All of the records, which are between 10^{th} and 26^{th} records of this file are created by transferring the information stated in the application forms. For students who did not apply to scholorships and, dormitory zeros are entered. Dormitory number record, and club codes are entered by the officials who are working at the O.S.A.

b. Dormitory File : This file is created during the implementation phase by the officials working at the O.S.A.

c. Club File : Information to this file is entered by the accountant or by the assistant accountant of each club at the first week of each month. This file is a tape file and it is active only at the first week of each month. The clubs should enter this file in the specified period. For clubs who do not enter the information, a penalty is given.

6.4 THE PROGRAMS

The programs which are explained in the following subsections and the files, which were explained in the previous section form a basis for an information system designed for the O.S.A. The following programs are designed in this section;

1. Total Points of the Applicants for the Dormitories.
2. Available Spaces in the Dormitories for New Applicants.
3. Fixture Requirement.
4. Total Points of the Applicants to Scholorships.
5. A Program which finds the number of applicants to scholorships.
6. A Program which finds the amount of money for each student who is accepted for a scholorship.
7. Program for producing lists.
8. Program for updating the files.

In the following subsections these programs and their relations with the tasks of the O.S.A. are analyzed.

6.4.1 Total Points of the Applicants for the Dormitories

This program calculates the total points of each applicant from the Student File as explained in section

6.2.2. Points, which are explained in section 6.2.2., are given to each student according to the value of each record which is between fourteenth and twentyfifth records of his Student File. Then the points for each record are summed, which gives the "Total Point" of each student.

The flow diagram of this program and its relations with other tasks are shown in figure 6.4. As seen from that

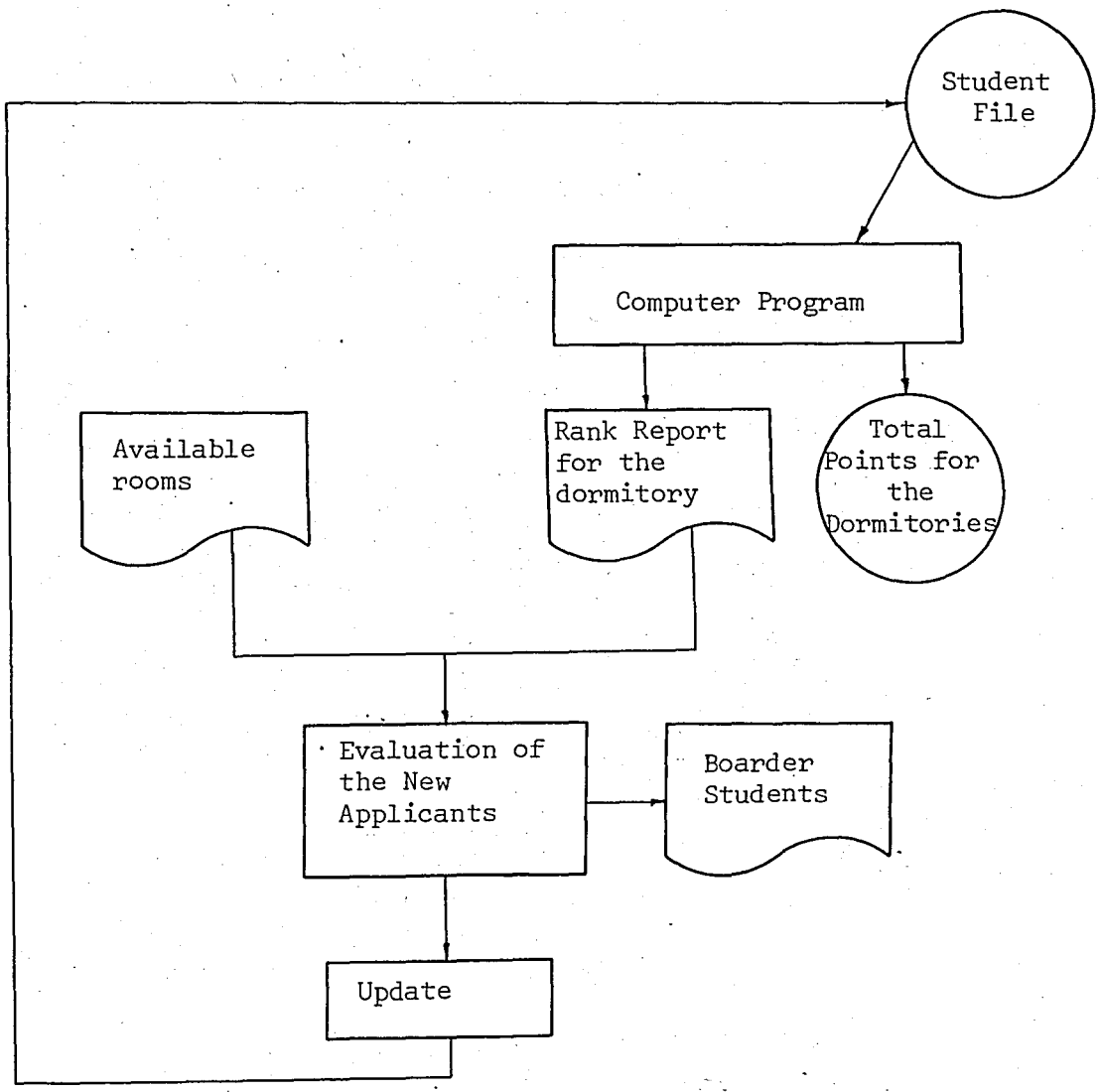


FIGURE 6-4. The Flow Diagram of "Total Points of the Applicants for the dormitories" program and its relation with other tasks.

figure the output of this program and the list of empty rooms are used in the evaluation of the applications to the dormitories. After the students are allocated, the twentysixth entry of the student file is updated by coding the room number of each student to that entry. Note that this program also produces "Total Points for the Dormitory" file.

6.4.2 Available Spaces in the Dormitories for New Applicants

This program uses Student File and the Dormitory File, and searches the rooms at which there are available places for new applicants(Figure 6-5). The format of the available rooms is shown in figure 6-6. Note that this output, and the "Total Points for the Dormitory" file, produced by the previous program, is used in the evaluation of the applications which is shown in figure 6-4.

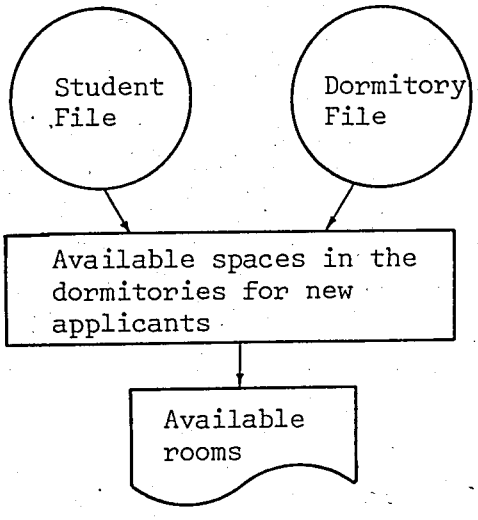


FIGURE 6-5. The Flow Diagram of the "Available Spaces in the Dormitories for New Applicants" program.

Room No	No.of beds	No.of students who live	Available beds
. . . . .			

Number of available places in the 1st Dormitory: _____
Number of available places in the 2nd Dormitory: _____
Number of available places in the 3rd Dormitory: _____
Number of available places in the Girl Student Dorm: _____

FIGURE 6-6. The Format of the "Available Rooms" Report.

6.4.3 Fixture Requirements

The purpose of this program is to produce the list of fixtures which will be ordered to the Office of Goods. Since the number of beds in each room shows the capacity of that room, this program subtracts the number of other fixtures from this number for each room and prints the results as shown in figure 6-7.

Room Number	No.of closets to be ordered	No.of tables to be ordered	No.of bookshelves to be ordered	No.of chairs to be ordered	No.of tablelamps to be ordered
TOTAL					

FIGURE 6-7. Fixture Requirement Report.

6.4.4 Total Points of the Applicants for Scholorship

This program calculates a total point for each student for scholorship evaluation. The total point is calculated by subtracting the point, given for the value of twentyfifth record on his student file, from his total point, which is calculated for his application to the dormitories. If a student does not apply to the dormitory but applies for scholorship, his total point is calculated

in the same way explained in section 6.4.1.

6.4.5 Finding the Number of Students for Scholorships

This program finds the number of students for scholorships as explained in section 6.2.2. The algorithm is as follows;

1. Calculate the total points of each student by using the grading system explained in section 6.2.2 and the records, which are between the sixteenth and twentyfifth records of the Student File.

2. Take the mean of the family income from the related record of the Student File (a).

3. Take the mean of the housing expenditure from the related record of the Student File (b).

4. Calculate the following equation for each student;

$$\text{The share of a Student} = \frac{\text{a-b-Necessary expenditures}^{(1)}}{\text{Number of members in the family}} + \text{His income}$$

5. Find the amount of scholorship by subtracting the amount of money necessary for an ordinary student from the share of the student.

---

(1) The value of this parameter is given to the program.

6. Add the result obtained for each student, whose total point is positive and divide the result by the number of students. This is the average amount of money given as a scholorship to the students.

7. Divide the available funds by the number obtained in step 6. The result is the number of students, who will be given financial supports.

The result of this program is used when distributing scholorships. The flow diagram of this program and its relations with other operations are shown in figure 6-8.

6.4.6 Finding the Amount of Money Given to the Students

This program uses Total Points file and the number of students who are going to be awarded scholorships. It selects the students from the top of Total Point file and calculates the amount of money for each student with the following formula;

$$\text{Amount of money given to each student} = \frac{\left(\text{His Total Points}\right)\left(\text{Available funds}\right)}{\left(\text{Total points of the students to be awarded}\right)}$$

6.4.7 Program For Producing Lists

This program produces the following lists by using the Student File, Club File, Dormitory File, Total Points

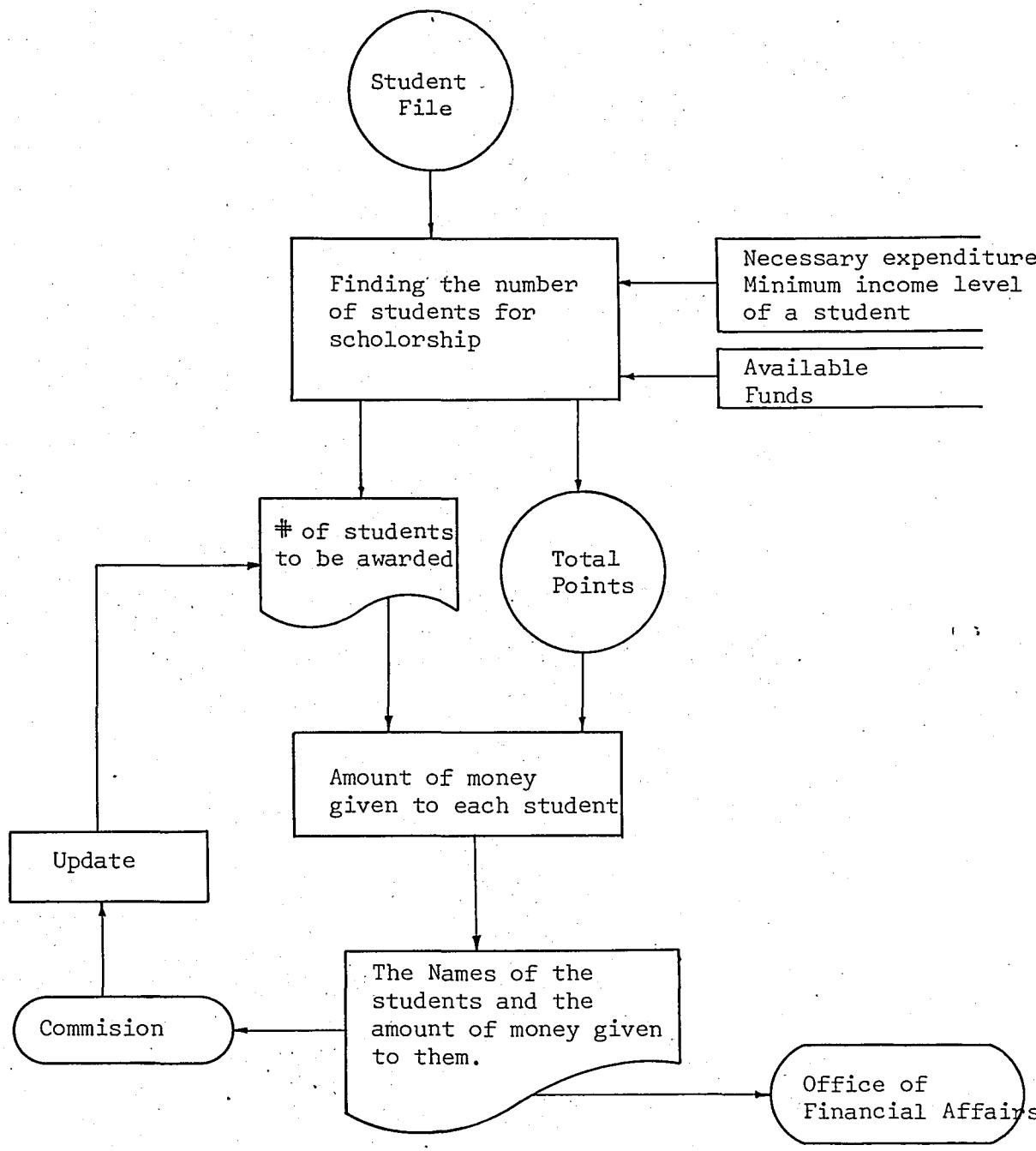


FIGURE 6-8. The Flow Diagrams of the "Finding the number of students for Scholorship" and "Amount of Money given to each student" programs, and their relations with other tasks.

of the Applicants for Dormitory File, and the Total Points of the Applicants for Scholorship File. In paranthesis, the

number of the file which is used when producing the list is specified. The numbers from 1 to 5 show the files mentioned above, respectively.

1. List of boarder students with their priority(1).

2. List of the members of the clubs (1).

3. List of the names of the members who are in the executive comitees of the clubs (1,2).

4. List of the names and total points of the students who are not accepted to the dormitories(1,4).

5. List of the names and the total points of the students who are not accepted for scholorship (1,5).

6. List of the Student File (1).

7. List of the Club File (2).

8. List of the Dormitory File (3).

9. Lists of students whose information stated in their application forms seem to contradict. These situations were explained in section 6.2.2.

6.4.8 Program For Updating The Files

The following updates must be done throughout the year by a computer program.

1. "Number of on leave semesters" record of the Student File for each student who is given permission.

2. "Dormitory Number" record of the Student File is updated for each student who is accepted to the dormitories.

3. "Clubs" record of the Student File is updated for each student who has resigned from the club.

4. Dormitory file is updated whenever any changes occur in the information stored in it.

5. Club file is updated whenever any changes occur in the information stored in the Club Identification Part.

6. "Number of Months" record is updated at the beginning of each month.

7. "Dormitory Number" record of the Student File is updated whenever a boarder student leaves the university.

6.5 EVALUATION OF THE PROPOSED SYSTEM

In this section, the tasks which should be done by the officials, and their due dates are reviewed first and then the advantages and the disadvantages of the proposed system over the existing system are discussed.

6.5.1 Review of the Tasks

The tasks of the O.S.A., and the relations of these tasks to the files and the programs are explained in the following steps;

1. After the deadline for applying to the dormitories, the evaluation of the applicants is done by running the related programs and the results are announced at most in a week (figure 6.4).

2. The list of students, who have applied to the dormitories but were not accepted is obtained in descending order of their total weights.

3. During registration period, identification cards are distributed to the students as explained in section 6.2.1(The first alternative is selected).

4. Announce the deadline for collecting the identification cards.

5. Send the collected cards to the Rectorate.

6. After they come back, send them for coating with plastics.

7. After they are coated, distribute them to the students in a week.

8. After the IETT office sends the IETT cards, distribute them to the students in a week.

9. Announce a deadline for collecting the IETT passes.

10. Send the collected cards to the IETT office.

11. Distribute the cards to the students in a week after the cards come back from the office.

12. Announce a deadline for applying to scholorship in the current semester.

13. Evaluate the applications by running the related programs (figure 6.7).

14. Inform the Office of Financial Affairs about the names of the students and the amount of money given to them.

15. At the end of the Fall Semester, take the list of the boarder students, who are graduated from the Registrar's Office and update the Student File.

16. Obtain the list of available rooms again and accept the students to the dormitory starting from the top of "Total Point" list until the capacity is filled.

17. Obtain the list of Club File to control the earnings and the expenditures of the clubs, at the second week of each month.

18. Take the lists of students whose G.P.A's are below 2.00, who have more than 8 repeat courses. Make a membership control with the information obtained.

19. Take the lists of students, whose information stated in their application forms seem to contradict. Control the truth of the information for such students.

20. At the middle of each spring semester announce the deadline for application to the dormitories.

21. At the end of the deadline, obtain the list of the applicants with their priority weights.

22. Assign a lottary date for the selection of the rooms.

23. At the end of each spring semester, make the lists of fixtures in the dormitories to be repaired, and also produce fixture requirement report and send it to the Office of Goods.

24. Distribute the mails as it was done before.

25. Organize the social activities as before: The organization of the social activities depends on the dates of the exhibitions, shows and it also depends on the available places at the campus. It is not possible to computerize the organization of the social activities. The Registrar's Office can provide the reports which show the empty places at the campus. With this information, monthly schedules of the activities can easily be done.

Manpower requirements of the proposed system have not been analyzed in this study, because it will be better to analyze the manpower requirements in the implementation phase, at which the structures of the files are designed, and the procedures for the users are developed. At this phase, the prediction about the labor force can be done more accurately.

At this stage it can only be said that, at least one official should be trained for updating the files and for using the programs.

6.5.2 Advantages and Disadvantages of the Proposed System over the Existing one

The proposed system has some advantages over the existing one. They are as follows;

1. Information are processed faster than before.

2. Objective measures for evaluations of the applications for the dormitories and scholorships are developed.

3. The dormitories are used more efficiently than before; because, as soon as a boarder student leaves the university, a new applicant is accepted in place of his.

4. Both membership control and financial control of the clubs are done by means of a computer. This makes it more efficient than before.

5. The proposed system decreases the manpower requirement because information is processed by a computer.

The disadvantages are;

1. The cost of information processing is more than before because, an optical reader is required which in turn requires special papers for detecting the information.

2. Computer usage is also costly, and a terminal may be needed for processing the information.

3. To establish the security of the files is more difficult than before. The security must be established by the computer specialists who are in charge of writing the files and the programs.

To overcome these disadvantages is not difficult, because the cost of using computer when processing information decreases as the quantity of information increases. Even if the cost is higher, it can be compansated by increasing the tution fees.

To establish the security of the files requires sophisticated files. Also it depends on the file capabilities

of the coming computer system. After the new system is implemented, this disadvantage can be overcome by the computer specialists who know the capabilities of the new system.

VII. DESIGN OF AN INFORMATION SYSTEM FOR THE REGISTRAR'S OFFICE

7.1 INTRODUCTION

In section 4-4,it was concluded that the registration process, and computer operations must be redesigned in order to improve the efficiency of the Registrar's Office.

Computer operations can be thought as; conversion from source document, entering the data to the files, and running the programs. Conversion from the source document is made by punch machines which create a lot of problems. In addition, this device can not be used in the new coming Computer System. Because of these reasons a new device should be used. The analysis about the conversion devices is made in section 7.1.1.

Files and programs do not meet the requirement of the Registrar's Office. If the following tasks are made by means of programs, the efficiency of this office will be increased:

1. Preparing the Grade Reports,
2. Scheduling the Courses,
3. Scheduling the Exams,
4. Preparing the Transcripts,

5. Preparing the Lists which are necessary for academic tasks.
6. Statistical Analysis.

Programs and the files, which are used by these programs, are designed in this chapter.

As stated in chapter 4, the registration process is time consuming and boring. This process has three main steps. At the first step, registration cards are given to the students who are eligible for registration. At the second step, students register to the library, medical center, military service, and the courses. At the last step students take their physical education courses, pay a fee for identification cards, and thus finish their registration. The first step can be called the controlling step. If this control is done after registration, students do not spend any time on that. There are two ways of eliminating this step. The first way is to announce these students who are not eligible for registration before the registration date, and let them solve their problems before they finish their registration. The second way is to announce the registration criteria that should be followed by the students in order to register and to indicate that registration of thase students, who do not meet these criteria, will not be accepted. No matter which way is selected after the registration, lists of students who do not meet these criteria are obtained by a computer program and a penalty

is given to them.

The third step can be called as "end of registration step". Students also spend too much time at this step. Especially students spend much time when they take their identification cards. First a receipt of identification card fee is given, then money is taken from the students and the cards are given to them. In addition, identification card number is also noted on the student's list. These operations are irrelevent of the registration process. For that reason these operations must either be combined with other operations in the process or eliminated from the registration process. For this purpose the following two alternatives are suggested.

1. Student pays money to the bank before registration. At the last step he declares the Identification Fee Receipt, and identification card is then given to him with No.2 card, without noting card number.

2. To eliminate these operations from the registration process. With this alternative, The Office of Student Affairs is responsible to distribute them after the registration.

Among these alternatives the first one seems to be better than the second one. Since a quantitative measure is not available, selection among these alternatives will be highly subjective and is left to the decision makers.

These two changes in the registration will result considerable savings in the registration time. No changes are considered in the other operations; Library registration can not be eliminated because it is an effective control on the berrowed books, Medical Center registration can be eliminated after in information system for Medical Center is implemented. For the time being it is suggested not to change this operation because of the practical reasons. With the same reasoning military service registration is not also changed.

Based on the above conclusions, a new registration process is designed in the following section. The structure of the files and the programs, and the necessary minor changes in other tasks, which may result from the design of computer operations are also explained in the next sections.

7.1.1 Comparison of Conversion Devices (1)

There are five different kinds of devices that can read source documents. They are;

1. Magnetic Ink Character Recognition Equipment(MICR),
2. Optical Character Recognition Equipment (OCR),
3. Microfilms,
4. CRT terminals,
5. Optical Readers.

---

(1) This subsection is completely based on a book "Principles of Data Processing" written by Robert A.Stern, Nancy B. Stern, John Wiley Inc., 1973.

Among these devices microfilms, MICR, and terminals are not suitable for the registration process because of the following reasons:

1. MICR devices can only detect numbers and a special ink is required which is too expensive.

2. Microfilms are also costly and the use of microfilms require an additional computer hardware and viewers that are relatively costly.

3. Terminals are not suitable for entering information of 4000 students. Either students themselves can enter the data which is practically impossible, or secretarians can enter the data from the terminals. In the latter case, terminals are used as punch-machines. The opportunity cost of entering the data from the terminals is higher than its gain, because there will be a limited number of terminals at the campus.

Optical Character Recognition Equipment, commonly referred to as an optical scanner reads characters from printed documents. No special ink or typing is required. These devices can read source documents that contain regular typed printing as input, directly into a computer system. Even handwritten materials, if the characters are printed in a standard form, can be read with some sophisticated optical scanners. The main advantage of this machine is that it saves considerable time and expense by eliminating the control and conversion process. The main disadvantage

of this machine is that rigid comformance to standard type forms is required by devices, and erasures and slight overlapping of positions cause enumerable errors in transmission. In addition, this device is very expensive. In 1970's the cost of this machine, depending on the speed of recognition, varied from $160.000 to $400.000 and monthly rentals varied from $2500 to $ 6000. A cost analysis has not been done but an analyst in 1970s has concluded that this device could only be monetarily justified,if the system has been processing 20000 documents per day. If a cost analysis had been done in Turkey, the amounts would have been higher. In addition to the cost configuration, availability of special papers in Turkey that this machine can read is also in question. For these reasons these devices are assumed to be infeasible for at least in the coming years.

Optical reader detects the presence of pencil marks on predetermined grids. The advantage of this device is the same as that of optical scanners. But the capacity of this device is much less than optical scanners, which can read handwritten or typed data. Characters that are sensed by this device often must rigidly conform to the standards. Typing erasures and overlapping of positions can cause erroneous transmission of data. On the other hand, the use of this device is easier than that of optical scanners in Turkey. The cost analysis has not been done for this device. But it seems feasible for B.U. This device can either be

bought or borrowed. The cost analysis must be done from this perspective.

As a result of the analysis of these devices optical readers seem to be more appropriate than other devices. The registration process which is designed in the following section assumes the presence of an optical reader before it is implemented. However, the designed process does not depend on this machine, except for the registration cards. If, by any reason, this machine is not available, conversion from the source document must be designed in advance.

7.2 DESIGN OF A REGISTRATION PROCESS

It is assumed that optical reader is availeble and registration cards are designed such that it can read them. For a proposed registration card see figures 7-1 through 7-5.

7.2.1 Registration of New Students

A. At the English Profiency Exam Date: Students give all documents to the Registrar's Office. No.4 card is given to them with a sign on the first line. This signature shows that students has started registration. If all documents are brought,the third line is also signed. If on the other hand any of the documents are not brought, they are noted on the No.4 card and the third line is not signed.

No.1 BOGAZICI UNIVERSITY 19.. /....

Program Card ..... FACULTY .....SEMESTER

I. Student No. II. LAST NAME-NAME

0 00000000
1 00000000
2 00000000
3 00000000
4 00000000
5 00000000
6 00000000
7 00000000
8 00000000
9 00000000

III. CLASS

1 0
2 0
3 0
4 0
5 0 Special
6 0 Master
7 0 Doctorate

IV. Sex

M F
0 0

V. Day-Boarder

D B
0 0

Signature-Advisor

Signature-Student

Marital Status

S M
0 0

VIII. Is there a change in the personel infor.

Yes No
1 0 0 Adress
2 0 0 Phone
3 0 0 Last Name

VI. COURSES

0 00000000 00000000 00000000 00000000 00000000 00000000
1 00000000 00000000 00000000 00000000 00000000 00000000
2 00000000 00000000 00000000 00000000 00000000 00000000
3 00000000 00000000 00000000 00000000 00000000 00000000
4 00000000 00000000 00000000 00000000 00000000 00000000
5 00000000 00000000 00000000 00000000 00000000 00000000
6 00000000 00000000 00000000 00000000 00000000 00000000
7 00000000 00000000 00000000 00000000 00000000 00000000
8 00000000 00000000 00000000 00000000 00000000 00000000
9 00000000 00000000 00000000 00000000 00000000 00000000

VII. Total Credits

0 00000000 00000000 00000000
1 00000000 00000000 00000000
2 00000000 00000000 00000000
3 00000000 00000000 00000000
4 00000000 00000000 00000000
5 00000000 00000000 00000000
6 00000000 00000000 00000000
7 00000000 00000000 00000000
8 00000000 00000000 00000000
9 00000000 00000000 00000000

0	0	0
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0

Courses Taken	Credit
1 _____	_____
2 _____	_____
3 _____	_____
4 _____	_____
5 _____	_____
6 _____	_____
7 _____	_____
8 _____	_____
9 _____	_____
Total Credits	_____

FIGURE 7-1. Program Card Designed For The New Registration Process

INFORMATION CARD(1)

Birth Place and Date _____

Father's Name _____ Father's Profession _____

Mother'S Name _____ Phone(2) Home _____/_____

(Phone Number) (City Code)

Date of First entry to B.U.	_____	LYCEE		UNIVERSITY	
Ctizenship	_____	Graduation Degree	_____	Graduation Degree	_____
Lycee	_____	Date	_____	Date	_____
Transfered From (University)	_____	Literature	_____	Major	_____
College Completed	_____	Science	_____		_____

1. Students who are registering for the first time have to fill out all the information, other students should fill out only the changes in their home adresses, or phone numbers.

2. City code must be written down. If there is no "city code" write down the name of the city.

FIGURE 7-2. Information Card for the new registration.

No.2
Student Card

BOGAZICI UNIVERSITY
..... FACULTY
REGISTRATION FORM

19.. / ....

.....Semester

Last Name _____ Name _____

Faculty _____ Dept _____ Class _____

REGISTRAR'S STAMP

EDUCATION FEE STAMP

Courses

1. _____ 5. _____
2. _____ 6. _____
3. _____ 7. _____
4. _____ 8. _____

FIGURE 7-4. Students' Card (No.) for the new Registration Process

ADVISOR'S CARD

No.3 19.. / ....Semester

Last Name _____ Name _____ COURSES

School/Dept. _____ Class _____

Address _____

_____

Phone _____

	Code	Tittle
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____

FIGURE 7-4 Advisor's Card (No.3) for the new Registration Process.

No.4
Control Card

BOGAZICI UNIVERSITY
..... FACULTY
BEBEK-ISTANBUL

19../.... .....SEMESTER

CARD FOR REGISTRATION

Lack of Document

1	2	3	4	5	6	7

Name - Last Name _____

School/Dept. _____

Class _____

1. Registration has started
2. Math 1, Phys 1, Chem 1
3. Completion of Documents
4. Math. II
5. Phys. II
6. Education Department
7. Hum. 1
8. Library
9. Medical Center
10. Military Service
11. Payment (Tution and Identification.card fee)
12. Check

FIGURE 7-5 Control Card (No.4) for the new registration process.

B. Library, Medical Center, and Military Service Registrations are made until the end of the registration date. In order to be registered to these offices, students must bring documents requested by the related offices. Lack of documents is not allowed.

C. At the registration date, each student goes to his department, takes No.1, No.2, and No. 3 cards and fills them. Then he goes to his advisor for course selection. If a student is supposed to take and/or wants to take a course or courses from other departments, he goes to these departments. Related lines are signed by his advisor and/or instructor. The advisor takes No.3 card, and puts it into his file.

D. After he completes his registration (i.e, all necessary lines are signed), he brings his receipt of tution fee, identification card fee and the rest of necessary documents to the Registration Hall. At this hall No.4 card is checked by an official and if everything is completed, related places are stamped. Then No.2 card, and identification card are given to him.

7.2.2 Registration of Old Students

A. Each Student takes a registration card from his department and fills them before going to the Registration

Hall, he must get registered at the Library, Medical Center, Military Service Offices, and must schedule his program with his advisor and/or an instructor.

B. At the Registration Hall student shows his tution fee receipt, receipt of identification card fee, and attaches a formal letter which states that "he has right for registration" (if he did not have right for registration beforehand) to No.4 card. This card is controlled by an official. If everything is completed, related places are stamped. Then No.2 card, and identification card are given to him.

Figure 7-6 gives a flow chart for the Registration Process.

7.2.3 Scheduling the Registration Dates

Scheduling the registration dates depends on the number of officials, traditions gained throughout the years, and the workload of the advisors. Based on the above facts, two different scheduling system is offered one of which may be selected by the decision makers.

1. Registration dates for each student classes are assigned on a specific date.

2. Registration period is decided and announced to the students. During that period students are supposed to finish

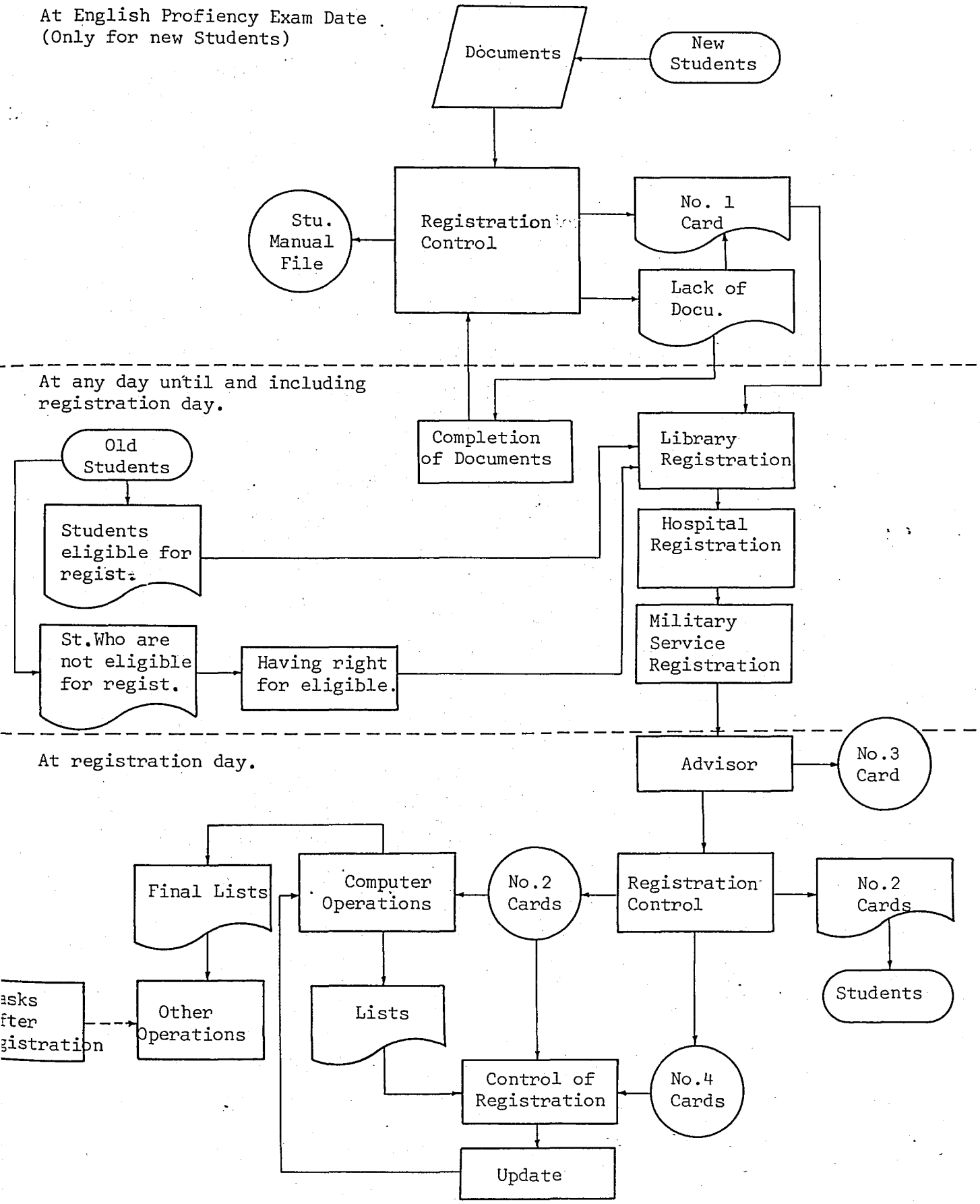


FIGURE 7-6. FLOW OF REGISTRATION PROCESS

their registration. No specific date is assigned for student classes.

7.3 FILES

In this section, files that are used by the Registrar's Office are explained. These files and the computer programs which will be explained in the next section, form the basis for information processing techniques of this office. If they are implemented, tasks of this office will be done more effectively than before.

In order to minimize the memory requirement and the use of special papers, which can be recognized by an optical reader, coding of student numbers and courses are changed. In the next subsections these codes are explained and in the subsequent sections, the following files are designed.

i. Student Master File
ii. Student Semester File
iii. Course File
iv. Semester Course File
v. Class File
vi. Scheduling File
vii. Classroom File
viii. Course Relation File
ix. Instructor File

7.3.1 Student Numbers

In the existing system, student numbers are made up of seven digits. The first two digits show his enterance year and the last five digits show the student number, which has no meaning as far as the students are concerned. For this reason, most of the students do not know their number.

The number proposed here is made up of eight digits. The first two digits show the enterance year, the third one shows the faculty in which a student is registered, the fourth and the fifth digits show the department of a student, and the last three digits show the student number given by the Registrar's Office. Each student needs to memorize only the last three digits, which is much more easier then before.

In order to simplify the search operation, all student files are sorted according to student numbers in ascending order. By the coding system explained above, these files can be sorted such that students are listed according to their departments and faculties.

Faculty codes and department codes are shown in table 7-1.

Faculty Code	Faculty Name	Department Code	Department Name
1	Engineering Faculty	11	Chemical Engineering
		12	Civil "
		13	Computer "
		14	Electrical "
		15	Industrial "
		16	Mechanical "
2	Faculty of Business Administration	21	Economy
		22	Management
		23	Public Management
3	Faculty of Natural Science	31	Biology
		32	Chemistry
		33	English Literature
		34	History
		35	Mathematics
		36	Philosophy
		37	Physics
		38	Psychology
		39	Sociology
		40	Turkish Literature

TABLE 7-1. Faculty and Department Codes.

Faculty Codes	Faculty Names	Department Code	Department Names
4	Colleges	51	Computer
		52	Electronics
		53	Management
		54	Tourism
5	Institute of Social Science	61	Economy
		62	English Literature
		63	Management
		64	Politics
		65	Psychology
		66	Public Managements
		67	Sociology
		68	Tourism Guiding
		69	Turkish Literature
6	Institute of Physical Science	81	Chemical Engineering
		82	Chemistry
		83	Civil Engineering
		84	Computer Engineering
		85	Electrical Engineering
		86	Industrial Engineering
		87	Mathematics
		88	Mechanical Engineering
		89	Nuclear Engineering
		90	Physics
7	Institute of Enviromental Science	91	Biomedical Engineering
8	Institute of Earthquake Engineering	92	Earthquake Engineering
9	Prep.School	00	

TABLE 7-1. Continued

7.3.2 Course Codes

In the existing system, course codes are made up of alphabetic and numeric characters. The first two characters of each course code represent the department at which the course is offered and the last three numbers show the number of the course, which is given by the department.

Using alphabetic characters in the registration cards requires much space because it is necessary to leave an empty space for at least 30 lines on the forms. For this reason instead of alphabetic characters, numeric characters are used for specifying the departments.

The proposed course codes are made up of eight characters.The first character shows the type of the course that is taken. 1 is coded if this course is a noncredit course, 2 is coded if it is a repeat course, or 3 is coded if it is a regular course. The second and third characters show the code of the department at which this course is offered. Fourth, fifth, and the sixth characters show the number of that course. The last two characters show the section number of that course. For example 31530301 represents IE 303, regular course for section 1 (Note that the IE department has code 15).

7.3.3 Classroom Codes

Classrooms in the campus are also coded. The first two numbers in the code show the building number, the third one shows the floor number, and the last two numbers show the room number.

7.3.4 Student Master File

This file contains all academic and personal information about students who have been registered at Boğaziçi University for 10 years. Since it contains information about previous semesters, it is updated at the end of each semester after all grades are given.

Student Master File has three different records, which are shown in Figure 7-7. These records are; Student Identification Record, Semester Record, and the Course Record. The structure of these records are as follows:

a. Student Identification Record

This record contains the following information:

i. Student Number (8 bytes).

ii. First and the Last Name (20 bytes): There is a blank between the name and the last name.

iii. Birth Place and Birth Year (4 bytes): The first two bytes show the code of birth place (Traffic codes are used for this purpose) and the last two bytes show the birth

year. For students who were born in Cyprus "68" is coded and for foreign students, depending on their nationality, a code between 69 and 98 is coded. Therefore 30 different nationalities, can be stored in this entry. If, on the other hand, a student's birth place is different than those that have codes, then "99" is coded.

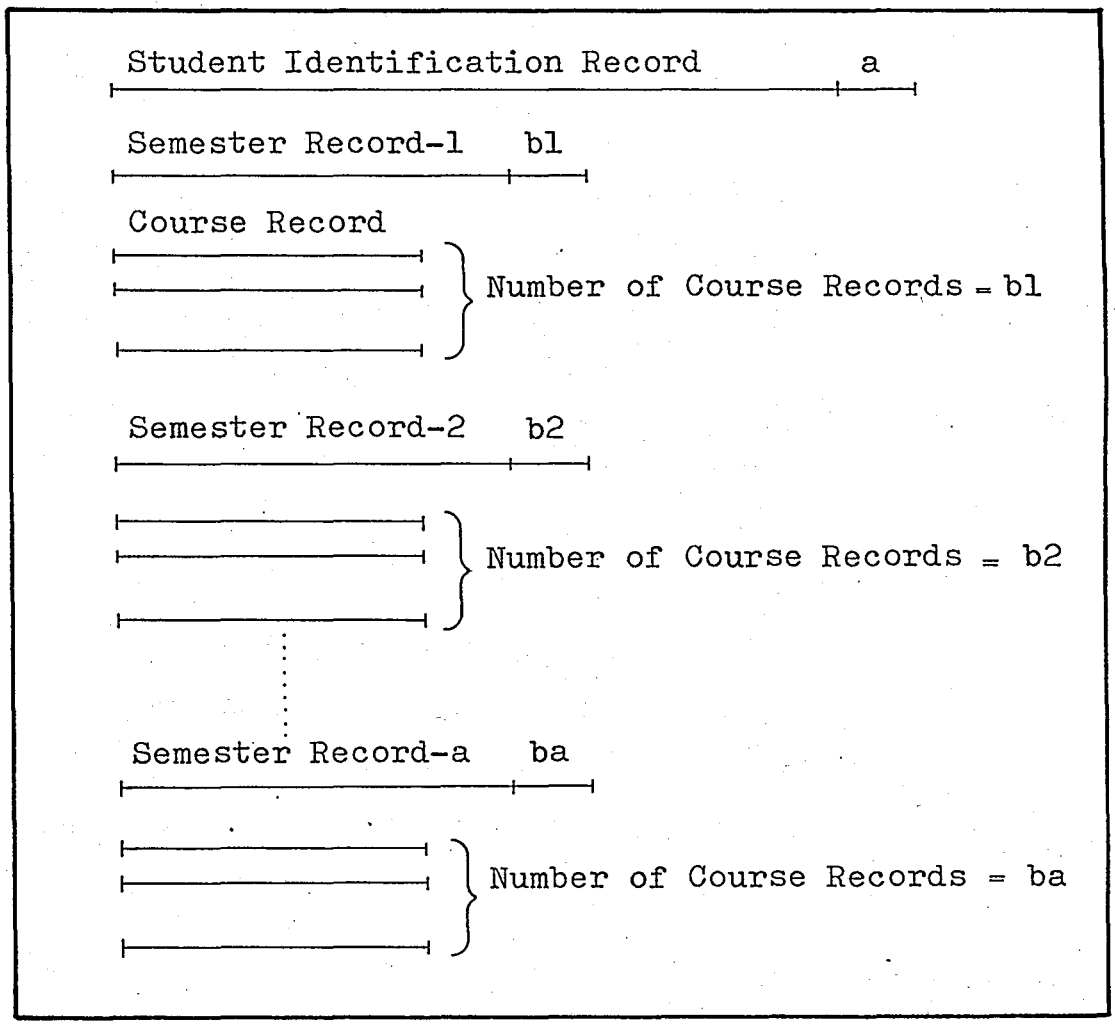


FIGURE 7-7. Structure Of The Student Master File.

iv. Citizenship (3 bytes): United Nation Codes are used for this record.

v. Father's Name (10 bytes).

vi. Sex of a student (1 byte): For female students "K", for male students "E" is coded.

vii. Marital Status (1 byte): For married students "M", for single students "S" is coded.

viii. Reason and Date of Leaving (3 bytes): This record is used to denote the year at which a student has left the university and the reason for leaving. A student leaves the university if he graduates, or transfers to another university, or if he is dismissed from the university because of an unsatisfactory study. The numbers 1, 2, or 3 are coded respectively. The last two bytes show the year of leaving.

ix. Faculty (20 bytes): Name of the university, from which either a student has been graduated, or has been transferred just before entering B.U.

x. Lycee (20 bytes): Name of the lycee from which a student was graduated.

xi. Graduation Date (6 bytes): Graduation date of a student from an educational institution just before entering B.U.

xii. Address of a Student (50 bytes).

xiii. Phone Number (10 bytes): The first byte shows weather the phone is in Istanbul or not. If the phone is in

Istanbul "1", if it is not in Istanbul "0" is coded. The rest of the numbers are phone number including the city code.

xiv. Credits Attempted (3 bytes).

xv. Credits Completed (3 bytes).

xvi. Honor Points (5 bytes).

xvii. Semester Number (2 bytes): This record shows the number of semesters that a student has spent until the current semester, or date of leaving. Semester record is repeated as many times as this number.

The structure of this record is shown in figure 7-8.

Stu.No.	Name and Last Name	Birth place and year	Citizen ship	Father's Name	Sex.
(8 bytes)	(20 bytes)	(4 bytes)	(3 bytes)	(10 b.)	(1 byte)

Marital Status	Date of Leaving	Lycee	Faculty	Address
(1 byte)	(5 bytes)	(20 bytes)	(20 bytes)	(50 bytes)

Phone No.	Cre.Att.	Cre.Comp.	Hon. Points	Sem. No.
(10 bytes)	(3 bytes)	(3 bytes)	(3 bytes)	(2 bytes)

FIGURE 7-8. The Structure of Student Identification Record.

b. Semester Record

This record is used to distinguish the semesters that have been spent until the current semester, or date of leaving. This record contains the following information.

i. Date of the Semester (5 bytes) : This part is used to specify the academic year of a semester at which the next record is valid (the next record is a course record which shows the courses that have been taken by a student in this semester). The first four entry show the year of that semester and the last one shows the type of the semester, that is 1 is coded for fall semester, and 2 is coded for spring semester.

ii. Class Code (1 byte): This code is used to specify the class of a student at which the next record is valid. One of the following number is coded for each student:

a. For freshmen, 1 is coded,

b. For sophomores, 2 is coded,

c. For juniors, 3 is coded,

d. For seniors, 4 is coded,

e. For master students, 5 is coded,

f. For doctorates, 6 is coded,

g. For special students, 7 is coded.

h. For prep. students, 0 is coded.

iii. Number of Courses that has been taken(2 bytes): This is also a counter which shows the total number of courses that have been taken at that semester. The next record

(course record) is repeated until the number of courses taken at that semester is reached.

This record occupies eight bytes of memory and its structure is shown in figure 7-9.

Date of the semester	Class Code	Number of Courses
(5 bytes)	(1 byte)	(2 bytes)

FIGURE 7-9. The Structure of a Semester Record.

c. Course Record : This record occupies twelve bytes in the memory and stores the following three different information:

i. Course Code: This record specifies the code of each course that is taken. The coding system was explained in section 7.3.2.

ii. Credits : Credit of a course is entered in this record. Two bytes are allocated for entering the credit. If a course is a non-credit course, then "00" is entered.

iii. Letter Grade(2 bytes): Letter grade given to each student from that course is entered in this space.

The structure of this file is shown in figure 7-10.

Course Code	Credits	Letter Grades
(8 bytes)	(2 bytes)	(2 bytes)

FIGURE 7-10. The Structure of Course Record.

7.3.5 Student Semester File

This file contains information about students in the current semester. This record contains two different types of information which are similar to those of Student Master File. The first part is called as "Student Identification Record", which contains personal information about students, and the second part is referred to as "Course Record", which is similar to that of Student Master File. The structure of this file is shown in figure 7-11. The information stored in these records are as follows:

a. Student Identification Record.
   i. Student Number (8 bytes).
   ii. First and the Last Name (20 bytes).
   iii. Residential Situation (1 byte): For day students "D" is coded and for boarder students "B" is coded.
   iv. Marital Status (1 byte).
   v. Graduation Situation (1 byte): For students who will possibly graduate at the end of the semester "M" is codded. For others "N" is codded. After the final grades are given, this record is updated and for graduated students "G" is coded.
   vi. Credits Attempted (3 bytes).
   vii. Credits Completed (3 bytes).

viii. Honor Points (5 bytes).

ix. Grade Point Average (4 bytes).

x. Number of Courses taken in this semester(2 bytes).

b. Course Record: This record is similar to that of Student Master File. This file is also used for giving mid - term grades. The grades, which are given after the first midterms are coded. After the final exams, these grades are converted to letter grades.

Student Identification Record

Stu. Number	Name and the last name	Res. Situ.	Grad. Situ.	Marital Status	Cre. Att.	Cre. Comp.
(8 b)	(20 b)	(1 b)	(1 b)	(1 byte)	(1 byte)	(1 byte)

Hon. Points	G.P.A.	# of Courses taken
(5 bytes)	(4 bytes)	(2 bytes)

Course Record

Course Code	Credits	Letter Grade
(8 bytes)	(2 bytes)	(2 bytes)

FIGURE 7-11. The Structure of Student Semester File.

7.3.6 Course File

This file stores information about courses that have been given at Boğaziçi University. This file is created mainly for two reasons. One reason is that; instead of

storing names of the courses for each student, it is preferred to store course codes for each student. Thus, storage requirement is minimized. The second reason of creating this file is to prepare an "Information Bank" for course descriptions. The structure of this file is shown in figure 7-12. This file contains the following information:

i. Course Code (8 bytes).

ii. Name of the Course (20 bytes).

iii. Course Description (250 bytes): In this space the content of the course is explained.

Course Code	Course Name	Course Description
(8 bytes)	(20 bytes)	(250 bytes)

FIGURE 7-12. The Structure of Course File.

7.3.7 Semester Course File

This file is used to store information about the courses that are given in the current semester. This file contains the following information:

i. Course Code (8 bytes).

ii. Credits (2 bytes).

iii. Expected number of students who will take this course/Number of students who are taking this course (4 bytes): This record is used for two

different purposes. First, it is used to denote the expected number of students who will take this course for scheduling the courses. After students take their courses, this record is used to specify the number of students who are taking this course in the semester. The latter number is used when the exam dates are scheduled.

iv. Instructor Number (4 bytes).

v. Number of lecture hours (1 byte).

vi. Number of problem session hours (1 byte).

vii. Number of Labrotory hours (1 byte).

viii. Number of Consequtive hours necessary (1 byte): If three consequtive hours are necessary "3" is coded, if two consequtive hours are necessary "2" is coded, otherwise "0" is coded.

ix. Time - lecture (2 bytes for each lecture): This part is used to give the "lecture hour group code" to the lectures. This lecture hour groups will be explained in section 7.4.1.

x. Time - problem session (2 bytes).

xi. Time - labrotory hour (2 bytes).

xii. Place - lectures (5 bytes for each lecture hours which are assigned to different groups): This record shows the places of the lectures, which are scheduled at different lecture hour groups.

xiii. Place - problem session (5 bytes).

xiv. Place - labrotory (5 bytes).

The structure of this file is shown in figure 7-13.

Semester Course File

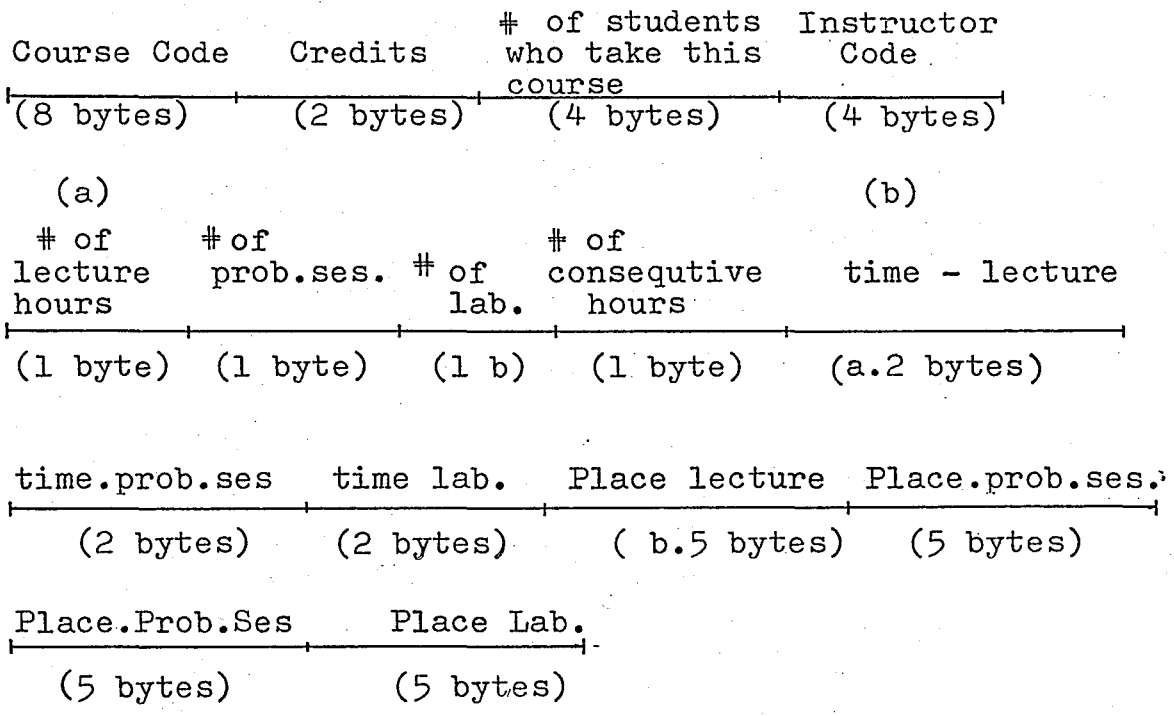


FIGURE 7-13. The Structure of the "Semester Course File".

7.3.8 Class File

This file contains information about the courses that should be taken in each student classes. The following information are stored in this file.

a. Class Identification Record: This record gives general information about student classes. The subrecords are as follows;

i. Class Code (3 bytes): The first two bytes represent the department of the class and the third byte represents the code of the class.

ii. Number of core courses (1 byte).

iii. Number of complementary courses that should be taken (1 byte).

iv. Number of elective courses that should be taken (1 byte).

v. Number of options (1 byte).

b. Core Course Record for each Option

i. Option name (10 bytes).

ii. Code of the core course (8 bytes).

iii. Number of its prerequisites (1 byte).

iv. Codes of the prerequisite courses (iii x 8).

The structure of this file is shown in figure 7-14.

Class Identification Record

Class Code	Number of Core Courses	No.of.Comp. Courses	No.of Option
(3 bytes)	(1 byte)	(1 byte)	(1 byte)

Mass Course Record

Option Name	Code of Core Course	No.of its prerequisites	Code of.Pre. Course	Code of Prereq.
(10 b)	(8 bytes)	(1 byte)	(8 bytes)	(8 bytes)

As many as the previous record.

As many as the number of core courses

FIGURE 7-14. The Structure of the Class File.

7.3.9 Scheduling File

This file is created by the "Scheduling" program and contains the following information:

i. Code of the Course (8 bytes).

ii. Number of Lecture Hours (1 byte).

iii. Number of Problem Session Hours (1 byte).

iv. Number of Labrotory Hours (1 byte).

v. Lecture Hours ((ii) times 2 bytes).

vi. Problem Session Hours ((iii) times 2 bytes).

vii. Labrotory Hours ((iv) times 2 bytes).

viii. Classroom Codes for lectures ((ii) times 5 bytes).

ix. Classroom Codes for Prob. Session((iii) times 5 bytes).

x. Labrotary Codes (5 bytes).

The structure of this file is shown in figure 7-15.

Course Code	(a) # of lecture hours	(b) # of Prob.Ses.Hours	(c) # of Lab.Hours	Lecture Hours
(8 b)	(1 byte)	(1 byte)	(1 byte)	(ax2 b)

Prob.Ses. Hours	Lab. Hours	Classroom Codes for lectures	Classroom Codes for prob.Session	Labrotory Code
(bx2 b)	(cx2 b)	(ax5 bytes)	(bx 5 bytes)	(cx5 bytes)

FIGURE 7-15. The Structure of the Scheduling File.

7.3.10 Classroom File

This file stores the capacities of the classrooms for lecturing and for giving exams. It contains the following information:

i. Classroom Code (5 bytes).

ii. Type of usage (1 byte). This is used to denote usage purpose of the rooms. "1" is coded for lectures and exams, and "0" is coded for labrotories.

iii. Room capacity for lectures (3 bytes).

iv. Room capacity for exams (3 bytes).

v. Room capacity for labrotories (3 bytes).

The structure of this file is shown in figure 7-16.

Classroom Code	Type of Usage	Room capacity for lectures	Room capacitiy for exams	Room Capacity for labs.
(5 bytes)	(1 b)	(3 bytes)	(3 bytes)	(3 bytes)

FIGURE 7-16. The Structure of The Classroom File.

7.3.11 Course Relations File

This file is an (n x n) matrix file, where columns and rows represent the courses that are given in that semester, and each element of the matrix shows the number of students who take both of the courses (Figure 7-17).

COURSE RELATIONS FILE*

	1	2	3	n
1	a_{11}**	a_{12}	a_{13}	a_{1n}
2	a_{21}	a_{22}	a_{23}	a_{2n}
3	a_{31}	a_{32}	a_{33}	a_{3n}
.	.	.	. . . . .	.
.	.	.	. . . . .	.
.	.	.	. . . . .	.
n	a_{n1}	a_{n2}	a_{n3}	a_{nn}

*a_{ii} Number of students who take course i.

a_{ij} Number of students who take both the course i and the course j.

**Each elemant of the matrix occupies three bytes.

FIGURE 7-17. The Structure of Course Relations File.

7.3.12 Instructor File

This file is used when scheduling the courses and the final exams. Its main purpose is not to schedule more than one course for each instructors to the same hour. It contains the following information:

i. Instructor Number (4 bytes).

ii. First and the Last Name (20 bytes).

iii. Part - time / Full - time (1 b): This record is used to specify the part - time or full-time situation of

instructors. For part - time instructors "1", for full - time instructors "0" is coded.

iv. Available days for part - time instructors, (5 bytes): The first letters of the days, in which the instructors may lecture, are coded.

7.3.13 Creating and Entering the Data to The Files

In the previous subsections, the structures of the files were explained. In this section, creating and entering the data to the files are explained.

a. Student Master File: The data are fed into this file in two ways. Student identification part is created by transferring the following information from the registration cards.

i. Student Number.
ii. First and the Last Name.
iii. Birth place and Birth year.
iv. Sex of a student.
v. Marital status.
vi. Faculty.
vii. Lycee.
viii. Date of Graduation.
ix. Address.
x. Phone Number.

In addition to the above information,"Date of Leaving"

record is entered by an offical, whenever a student leaves the University. Until that time this record has a value of "00000".

The other information that should be stored in this file are cumulated by transferring the information stored in the "Student Semester File". Besides, "Semester Number" record is increased by a computer program whenever the above information are transfered to this file.

b. Student Semester File : This file is created by transferring the information from the registration cards and by entering the letter grades. The following records are directly created from the registration cards;

i. Student Number.

ii. First and the Last Name.

iii. Residential Situation.

iv. Courses that are taken in the semester.

"Number of Courses Taken in the semester" record is created by counting the courses in the registration forms. Credits Attemped and Credits Completed records are created from the related records of the Master File. The letter-grades may be fed into this file by one of the following two ways;

1. Each instructor enters the grades to his "Lecture File". This file contains the names of the students taking the course and the space for giving letter grades

to these students. The structure of this file is not designed in this study, but it can be created from the Student Semester File.

2. The instructors send the grades to the Registrar's Office and officials at this office enter the grades.

c. Course File: This file is created during the implementation phase by collecting the necessary information about the courses from the faculties. When a new course is offered, the officials at the Registrar's Office enter the necessary information. Since this file is sorted according to the course codes, the faculties should not use the same codes for two or more different lectures.

d. Semester Course File:This file is created at the middle of each semester, after all courses, offered at the next semester are collected at the Registrar's Office. The data about the courses are entered by the officials at this office.

e. Class File : This file is created once. The data is fed into the file at the implementation phase by consulting with the faculties and colleges.

f. Scheduling File : This file is created as an output of the Scheduling program.

g. Course File : This file is also created once, after the capacities of the classrooms are determined.

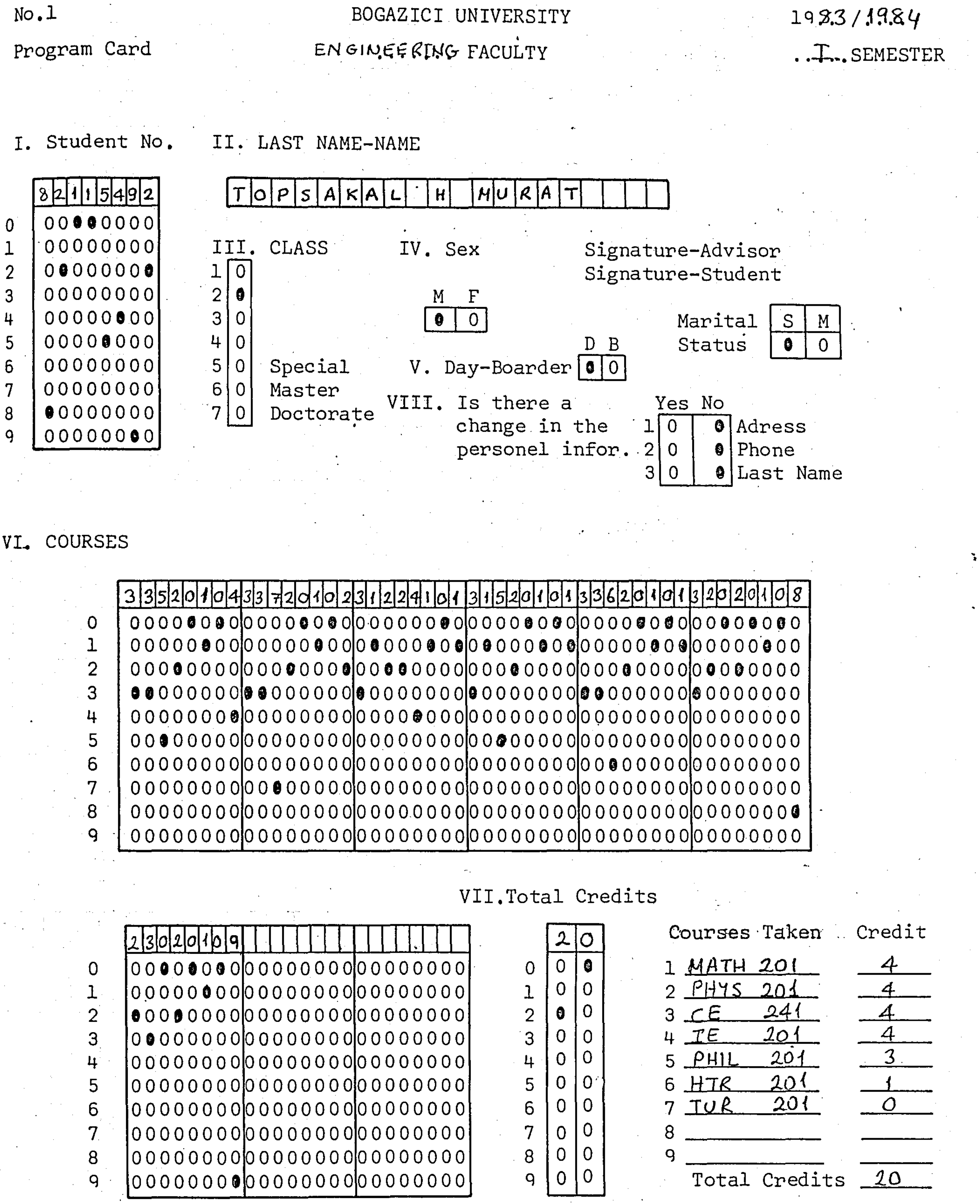
h. Course Relations File: This file is created as an output of the "Overlapped Course" Program.

As seen above, except for some records of the student Semester File, all of the information stored in the files are either entered by the officials at the Registrar's Office, or created as an output of some computer programs. The following example illustrates the structure of the Student Master File and Student Semester File.

Example 7-1 : Hasan Murat Topsakal has entered the university in 1982 - fall semester. He is a student in the Department of Industrial Engineering. He has taken the following courses and the letter grades in the previous semesters.

1982 - 1983 Fall Semester	1982 - 1983 Spring Semester
MATH 101 CB	MATH 102 BB
PHYS 101 BB	PHYS 102 CC
CHEM 101 BB	CHEM 102 CB
IE 101 BA	IE 102 BB
HTR 101 AA	HTR 102 CB
TUR 101 BB	TUR 102 CB
ENG'G 101 CC	ENG'G 102 BB

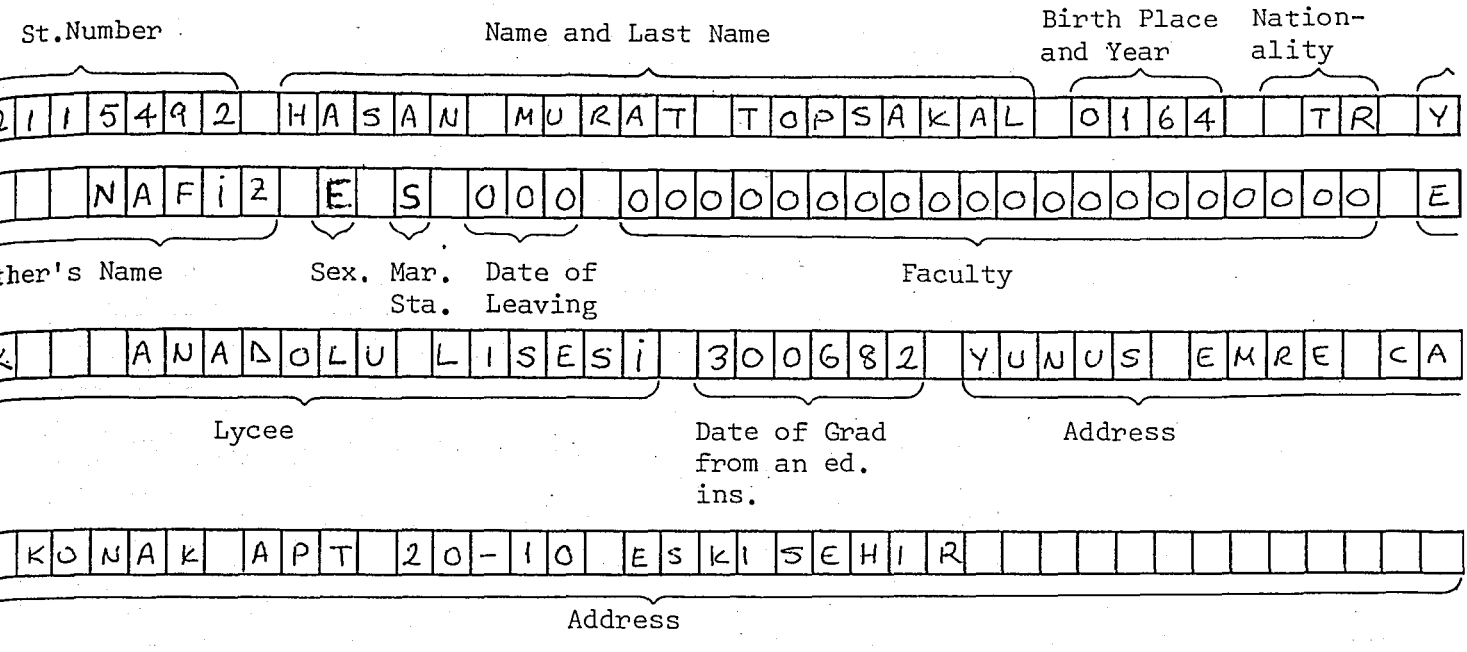
No.1 Registration card that he has filled out at the beginning of 1983 - 1984 fall semester is shown in figure 7-18. The structures of the Student Master File and the Student Semester File for him are as follows:



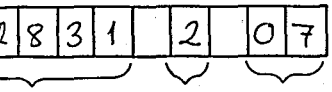
FIGUNE 7-18. No.1 Registration Card for Hasan Murat Topsakal in 1983-1984 Fall Semester.

STUDENT MASTER FILE

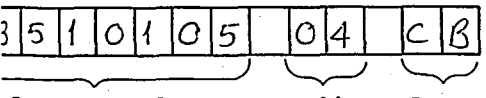
Student Identification Record

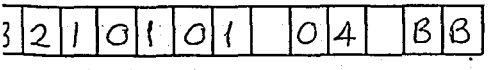


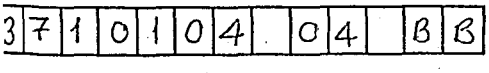
Semester Record-1

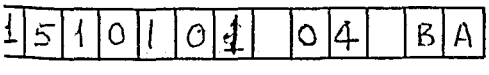


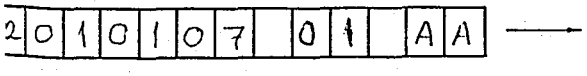
Course Record



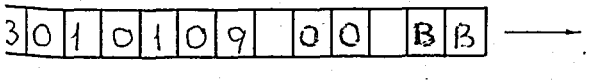




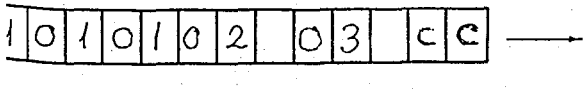




The code of History of Turkish Revolution is "20".

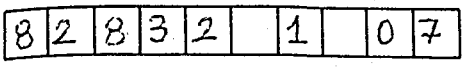


The code of Turkish course is "30".

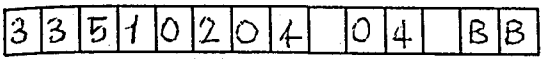


The code of Engineering course is "10".

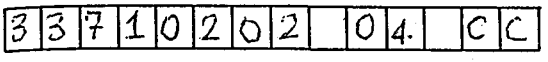
e. Semester Record-2.



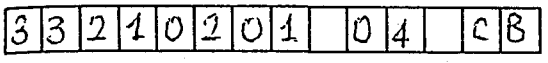
f. Course Record



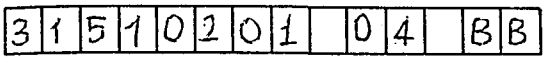
Math 102 Section 4



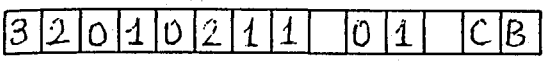
PHYS 102 Section 2



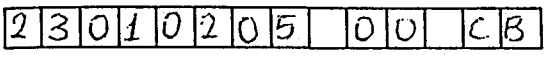
CHEM 102 Section 1



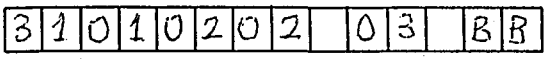
IE 102 Section 1



HTR 102 Section 11



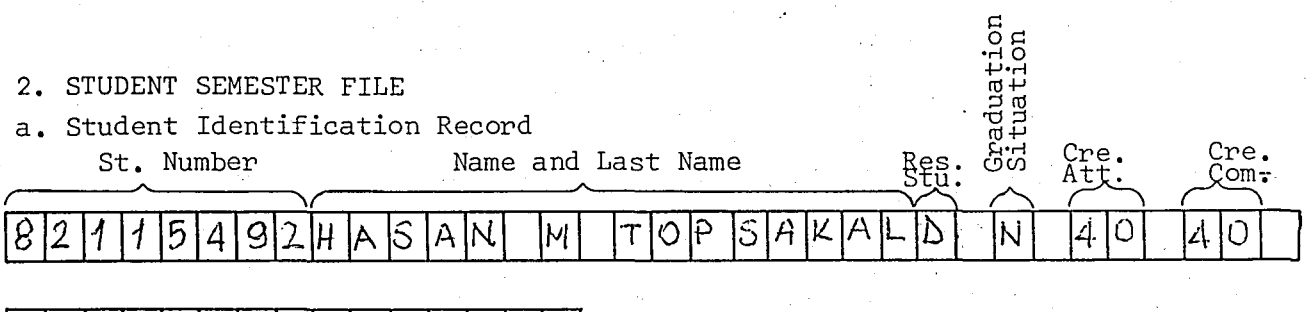
TUR 102 Section 5



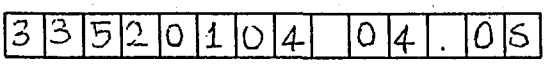
ENG'G 102 Section 2

2. STUDENT SEMESTER FILE

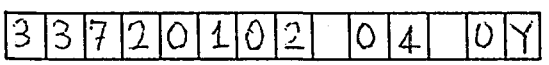
a. Student Identification Record



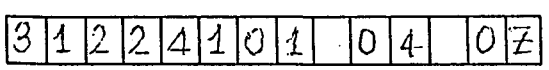
b. Course Record



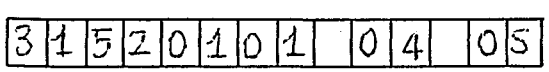
MATH 201 Section 4



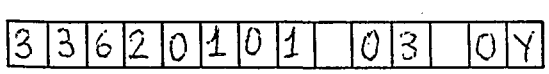
PHYS 201 Section 2



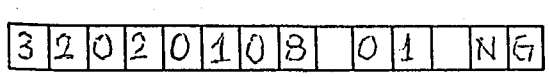
CE 241 Section 1



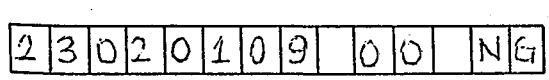
IE 201 Section 1



PHIL 201 Section 1



HTR 201 Section 8 (NGR)



TUR 201 Section 9 (NGR)

Note that some information which are not on No.1 card can be seen on the new designed files.

7.3.14 Memory Requirements of the Files

Memory requirements of the files are also important in the design of an Information System. It is important in the sense that, it gives an idea when the costs and benefits of using a computer are compared. Based on this comparison and the memory capacity of the new computer system, the designed system may be fully or partly (i.e., some of the files may not be created) accepted by the decision makers.

At this stage, it is not possible to give accurate memory requirements because of the uncertainities about the data which will be stored. For this reason, the memory requirements are calculated under the following assumptions.

i. Information about 10000 students are stored in the Student Semester File.
ii. On the average, each student spends 10 semesters until he/she leaves the university.
iii. Each student takes 7 courses per semester.
iv. There are 200 different courses offered at the university.
v. There are 80 different courses offered at each semester.

vi. There are 300 instructors who lecture at the university.

vii. The courses are assigned to at most three different times.

viii. Each problem session is assigned to one lecture - hour group.

ix. Each labrotory hour is assigned to one lecture - hour group.

x. There are 4000 students who are currently enrolled at the university.

xi. Among the seven courses, five courses are core - courses and each of them has one prerequisite course.

xii. There are 126 different student classes.

xiii. There are 200 classrooms.

Based on the above assumptions, the memory requirements of each file are shown in Table 7-2.

As seen in table 7-2, the total memory requirement of the files for the Registrar's Office is about 5.02 Mbytes. This requirement will increase as the time passes.

Files	Memory Requirements	
	Bytes	Mbytes
1. Student Master File	For each Student	Total
a. Identification Record	186	1.82
b. Semester Record	100	0.98
c. Course Record	98	0.96
Total		3.76
2. Student Semester File		
a. Identification Record	58	0.23
b. Course Record	98	0.96
TOTAL		1.19
	For each Course	
3. Course File	290	0.06
4. Semester Course File	68	0.006
	For each Class	
5. Class File	130	0.016
	For each Course	
6. Scheduling File	68	0.003
	For each Classroom	
7. Classroom File	17	0.003
	For each row	
8. Course Relation File	160	0.006
	For each Instructor	
9. Instructor File	33	0.009
TOTAL		5.043

TABLE 7-2. Memory Requirements of the files.

7.4 PROGRAMS(1)

As indicated before, efficiency of the Registrar's Office can be increased by well working computer programs and well structured files. Thus, together with the registration process designed in section 7-2, these programs and files complete the design phase of the Information System for the Registrar's Office. Seven programs are designed for this office, which are as follows:

i. Course Scheduling
ii. Overlapped Courses
iii. Exam Scheduling
iv. Academic Standing
v. Lists
vi. Statistics
vii. The programs for updating the files

7.4.1 Course Scheduling Program(2)

This program uses Class, Classroom, Semester Course and Instructor File to give place and time of all courses for a given semester. This program tries to find an optimal

---

(1) These programs are completely based on a study, made by a group of Graduate Students at the Industrial Engineering Department of B.U. Supervisor of this group was Dr.M.Akif Eyler who is an Associate Professor at this Department.

(2) To schedule the courses manually may be easier, than the computer program. If it is so, this program is eliminated.

schedule, with the objective to minimize total penalty, by giving penalties to undesired schedules of courses for regular students and by giving penalties to different kinds of course overlappings. This program assings courses to the lecture hour groups. Lecture hour groups are formed by dividing hours of week into groups which are shown in figure 7-19.

Hours / Days	1	2	3	4	5	6	7	8	9	10	11
Monday	1	2	3	4	5	6	7	8	9	10	11
Tuesday	12	12	13	14	14	15	16	16	17	18	18
Wednesday	19	20	21	22	23	24	25	26	27	28	29
Thursday	30	31	32	32	33	33	34	35	35	36	
Friday	37	38	39	40	41	42	43	44	45	46	47
Saturday	48	48	48	49	49	49					

FIGURE 7-19. Lecture hour groups in a week.

The penalties which are incurred when scheduling are as follows:

1. Undesired Schedule for Regular Classes.

i. Three consequtive hours of lectures are undesired for each class (penalty may be increased as much as the number of consequtive hours).

ii. Two or more lecture hours before a labrotory or a problem session hours are undesired. The penalty may

be increased in proportion with the number of lectures before the labrotory hours, or problem sessions.

iii. To have lectures at lunch hours for a class in any day is not desired.

2. Course Overlappings:

i. Overlapping of core courses of the same class (by the same class, it is ment the same class of a department including it's lab. or problem session).

ii. Overlapping of a mass course of the same class with an optional course which does not have any other alternative.

iii. Overlapping of a core course of the same class with an optional course which has another alternative.

iv. Overlapping of mass courses, labrotories, or problem sessions of the consequtive classes.

v. Overlapping of courses of different options of the same class.

vi. Overlapping of two courses of the same option of the same class.

vii. Overlapping of optional courses of different classes.

The amount of penalty given to the above situation is decreased from (i) to (vii). That is the most penalty is given to (i) and the least penalty is given to (vii). There may be some decrease in the penalty if a course and a problem

session, or two problem sessions are overlapped.

To assign courses to lecture hour groups also depends on the capacity of the classrooms. Besides, it is not possible to assign a classroom for two or more courses at a given lecture hour. Thus, for lecture hour group a set of classrooms must be created and when a course is assigned to a room, that room must be eliminated from this set. In order to make maximum use of classroom capacity, classrooms in each set must be sorted in ascending order of their capacities. Thus, all courses are assigned to proper classrooms based on the expected number of students who take that course.

When courses are assigned to the lecture hour groups, also the instructors are taken into consideration.

The aim of this program is to schedule all courses in a simple way so that after it is printed, students make use of this schedule in selecting courses while they are registering. This program produces List of Course Schedules and Course Scheduling File as shown in figure 7-20.

7.4.2 Program of Overlapped Courses

The aim of this program is to inform those students whose courses have overlapped (By overlapping, it is meant to have two or more courses at the same lecture hour). As a rule, any student whose courses are overlapped must either drop one of his course, or a penalty must be given to him.

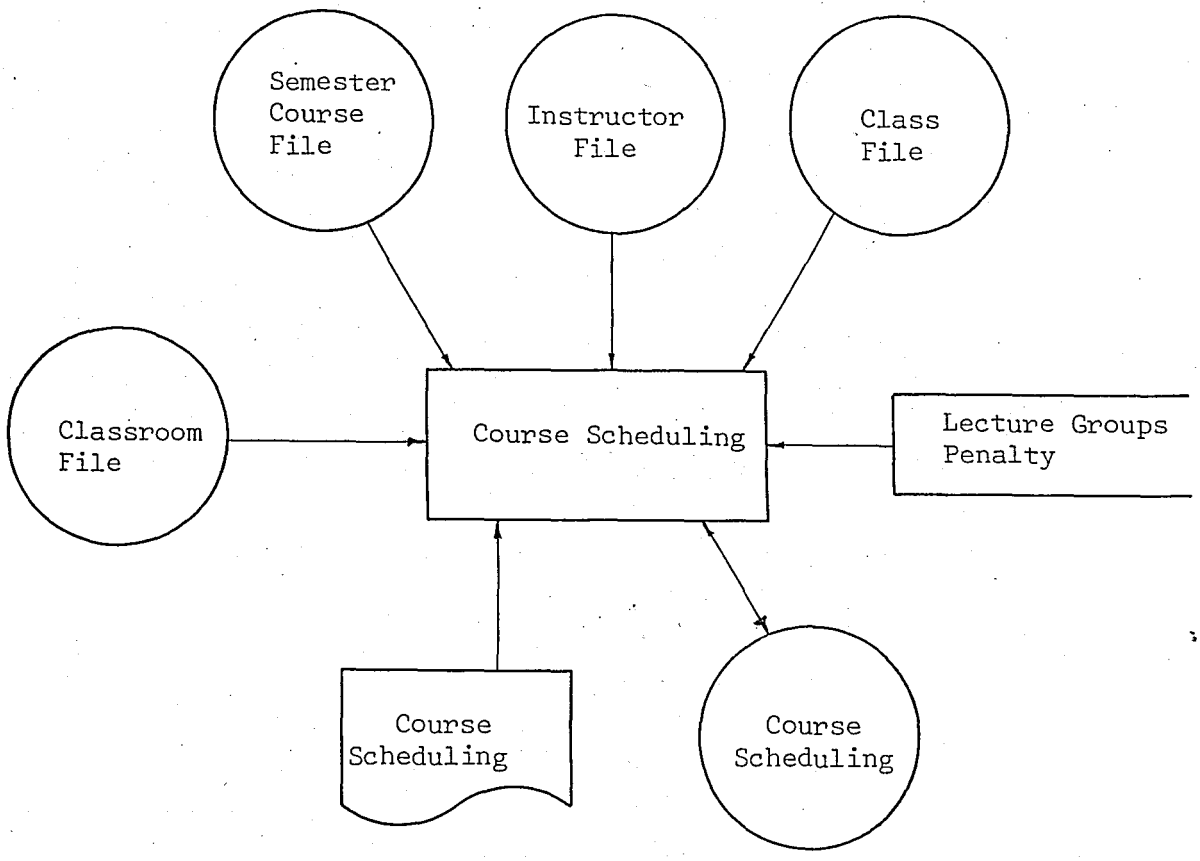


FIGURE 7-20. Flow of Course Scheduling.

The Registrar's Office and/or the advisors are responsible to prevent such situations. They can not control these situations, because it is almost impossible for them to check the programs of each students.

Program of Overlapped Courses controls the programs of each student and lists the names of students whose courses are overlapped. This list has the following information:

i. Student Number

ii. Student's Name and Last Name

iii. His Department and Class

iv. Code and Name of Overlapped Courses

v. Time and Place of Overlapped Courses.

This program also produces Course Relation File which is used by the "Exam Scheduling" Program. The flow of this program is shown in figure 7- 21.

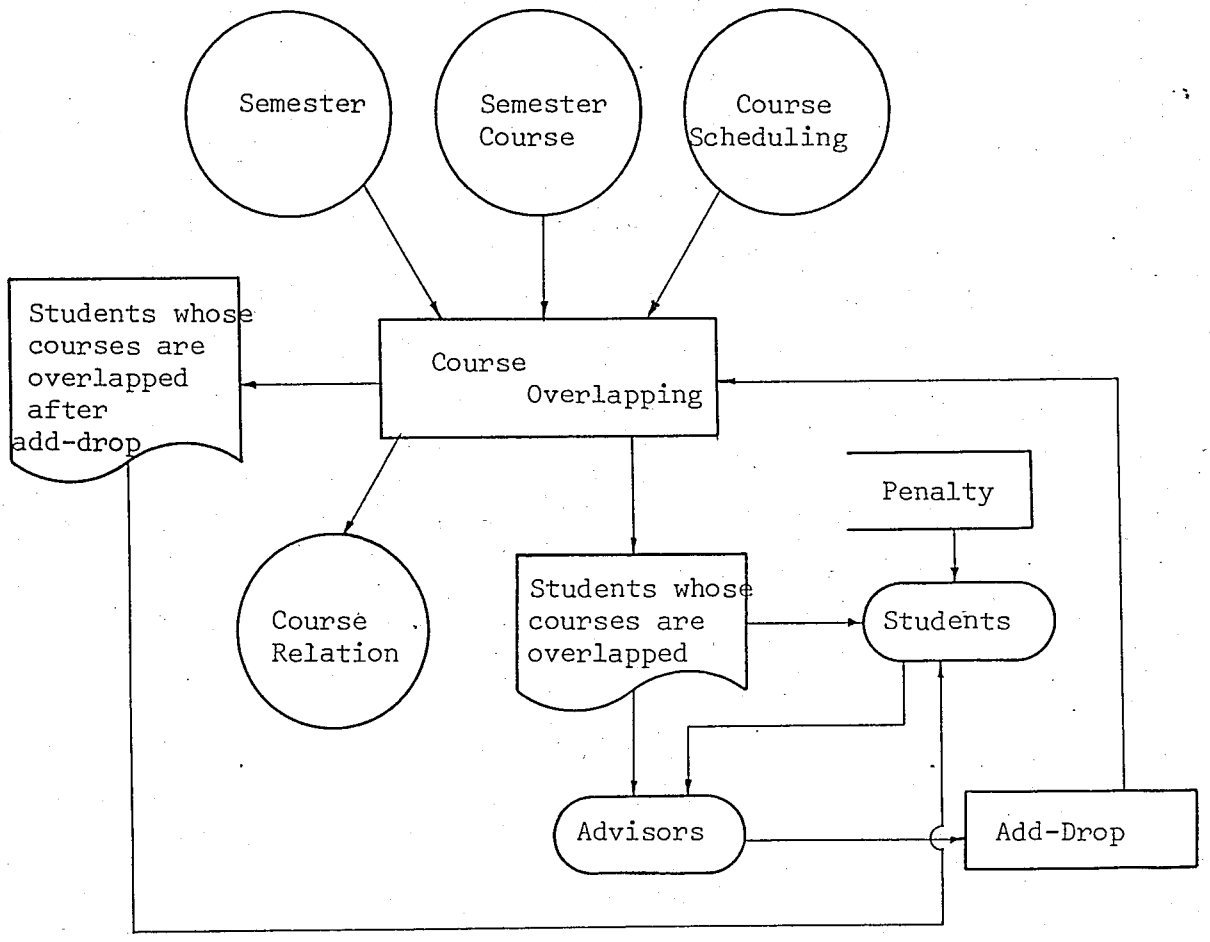


FIGURE 7-21. The Flow and The Use of Course Overlapping Program.

7.4.3 Program of Exam Schedules

This program has similar functions as that of Course Scheduling Program, that is it schedules final exams and gives lists of overlapped exams. This program uses Classroom, Semester Course, and Course Scheduling File and produces final exams schedules and list of overlapped exams (Figure 7-22).

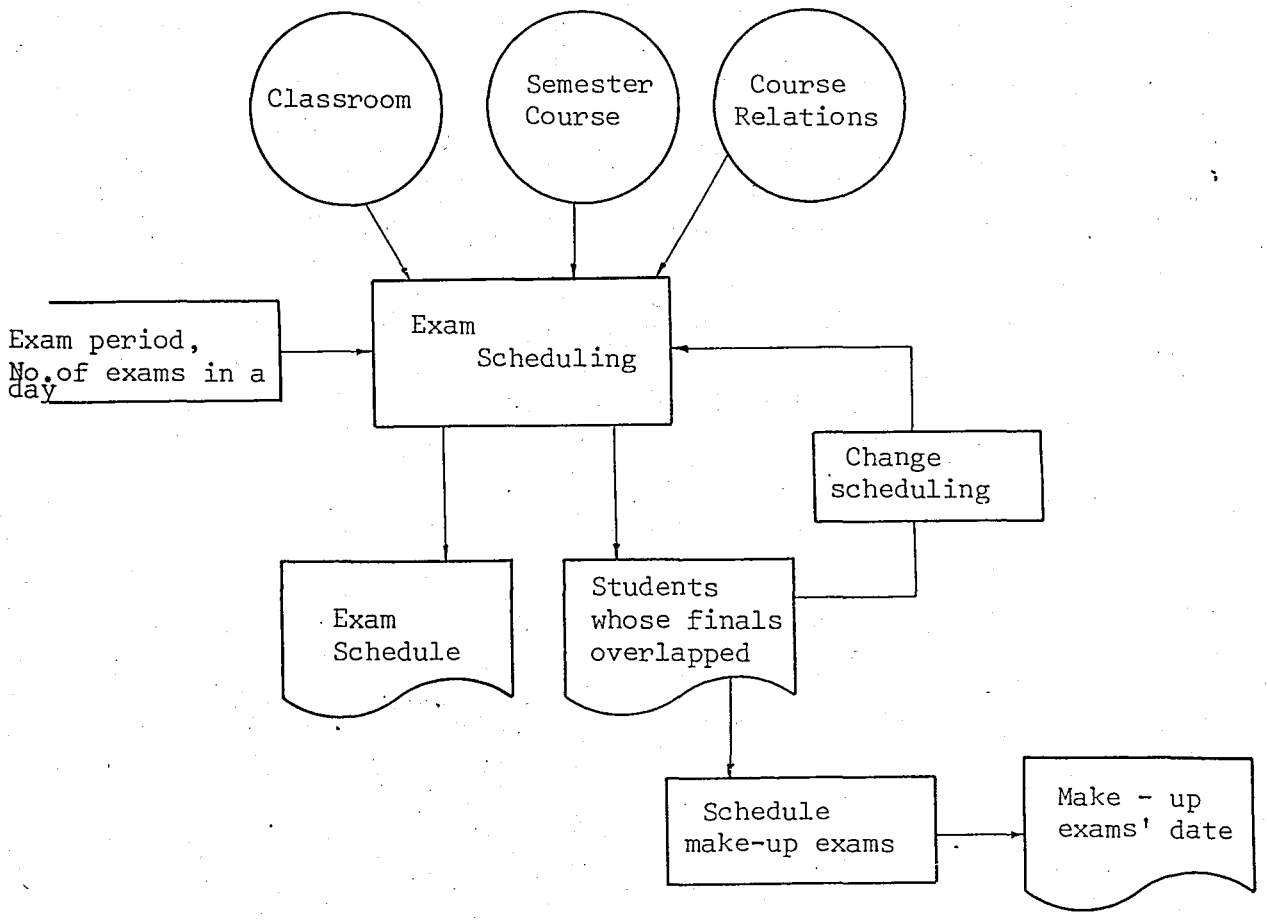


FIGURE 7-22. The Flow and The Use of Exam Scheduling Program.

As an input to this program, number of days in an exam period and the number of exams that may be given in any exam day are given. During the week days, there are three exam sessions and on Saturdays there are two exam sessions, in a given exam day.

This program tries to minimize the overlapped exams and tries to make optimal schedule, that is uniform distribution of exams. In order to minimize overlapped exams, heuristic approach is selected with the same penalty criteria as given in the Course Scheduling Program.

Penalty is given when the following situations occur for courses which have relations.

i. To assign exams at the same hour.

ii. To assign exams at the same date but at different hours.

iii. To assign courses at consequtive hours.

(i) has the most undesired situation; therefore, more penalty is given to it than others. Also, the number of students whose exams are overlapped is another criterion. For that reason, this number is multiplied with a penalty and is summed then. The program tries to find a schedule, which minimizes the weighted sum.

Exam Schedule is a matrix where each column shows exam days each row shows exam sessions. Number of students, which take each course and the capacities of classrooms

are known beforehand. Algorithm first assigns exams to sessions, then it assigns these exams to classrooms. The assignment is made on the weight of course relations. Courses are sorted according to their weights. These sorted courses are used, when exams are scheduled. The exam dates of the courses which have the most relations are assigned. Penalty for these assignments are calculated and the capacity of the elements of the metrix, in which the above exams are assigned are reduced by the number of students to whom the exams are assigned. And the procedure continues until all exams of the courses are assigned.

7.4.4 Academic Standing Program

This program is used to produce grade reports, lists of possible students who are going to graduate, lists of students who are not eligible for registration, ranking of students, and transcripts. This program is composed of several subroutines which sorts the files and prints the outputs in the desired formats. The structures are summarized as follows:

a. Grade Report Subroutine: This subroutine uses the Student Semester and Course files and prints mid-term and final grade reports in a desired format (figure 7-23).

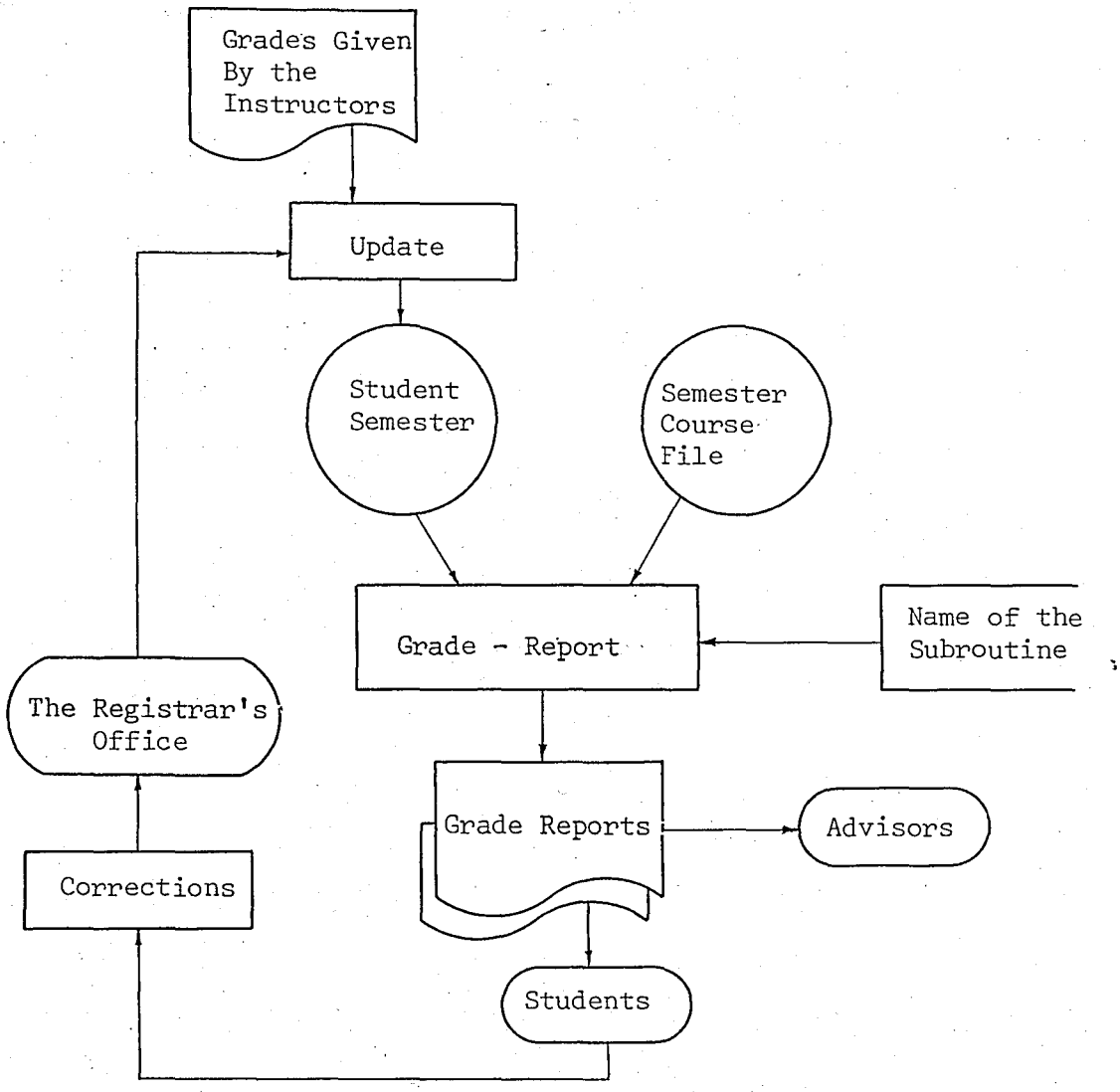


FIGURE 7-23. Flow Diagram for Grade Report Subroutine and the Subsystem It Communicates with.

b. List of Graduated Students: This subroutine first checks the credits completed on each student's record. If his total credit, including the current semester, is sufficient for graduation, the program updates the graduation record of his Semester File and prints a code such as "G"

on his record indicating that he will possibly graduate. Such students are then printed as a list headed "Students who will possibly graduate". At the end of the semester after final grades are given, this program checks the letter grades of students. If there is an "F", then that student can not graduate. Thus, Semester File is updated and he is discarded from the list, accordingly. On the other hand, if there is an "E", he is "conditionally graduated" and this condition is denoted in the list. Otherwise, the revised lists are sent to the boards of departments. The use and the flow of this subroutine is shown in figure 7-24.

c. Lists of Students who are not eligible for Registration: This subroutine makes the lists of students who have E, Yk, NGR grades or who are dismissed at the end of each semester. This program checks the criteria and lists the names, and the numbers of students who do not meet these criteria. The detailed explanation about such students are also printed.

d. Ranking: Ranking is done for each classes of departments and faculties based on GPA. This is done either by the office in advance, or by a request. This ranking may also be done after graduation. The logic of this subroutine is to rank GPA of students whose student number match with respect to the first five digits (Note that the first five

digits show the enterance year, faculty, and the department).

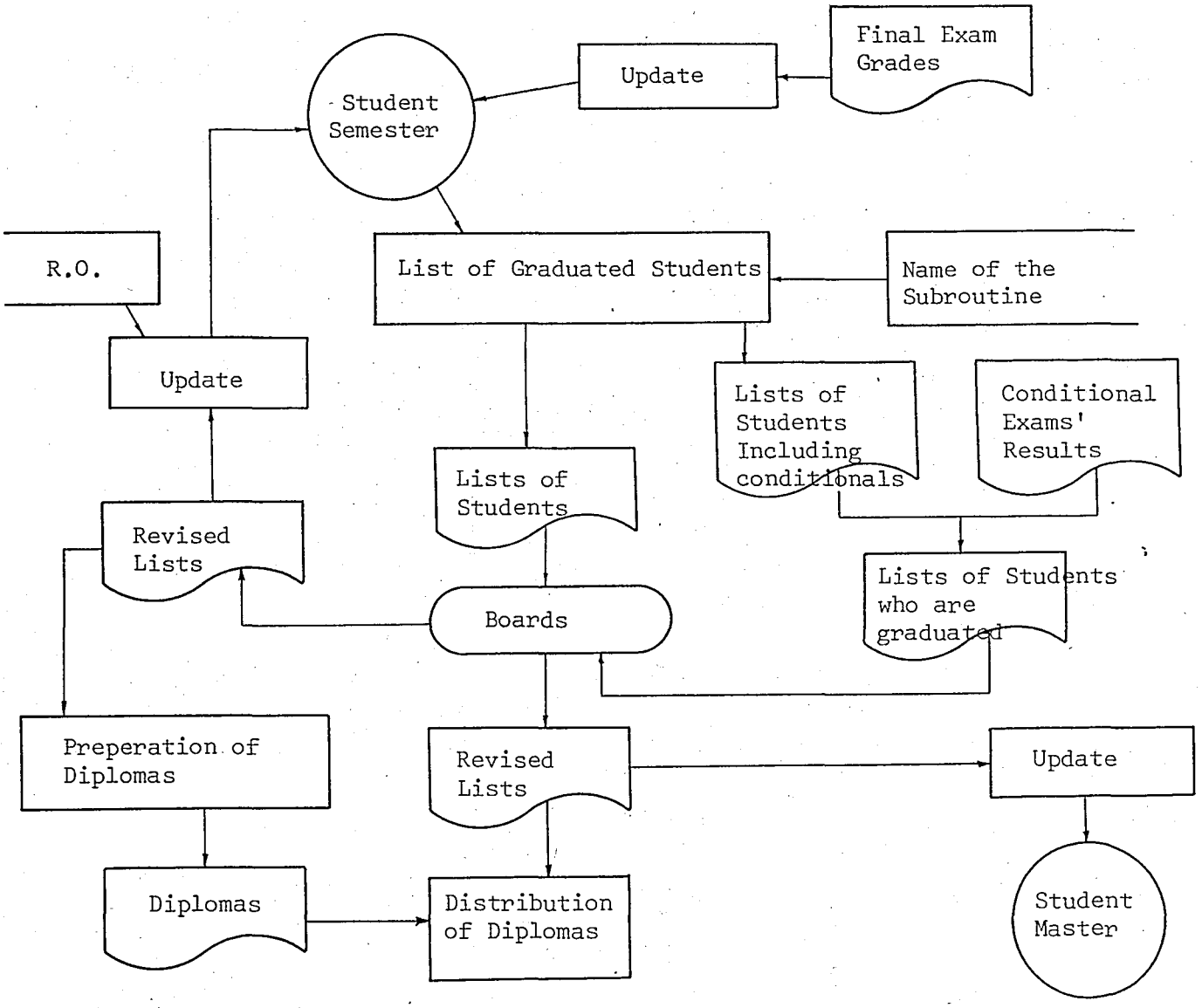


FIGURE 7-24. The Flow Diagram for List of Graduated Subroutine and the Subsystem It Communicates with.

e. Transcripts: This subroutine uses Student Master File and the Course File, and produces transcripts in a desired format.

The Acedemic Standing Program is made up of

subroutines (figure 7-25). The desired lists can be obtained by entering the names and the names and the options of the subroutines.

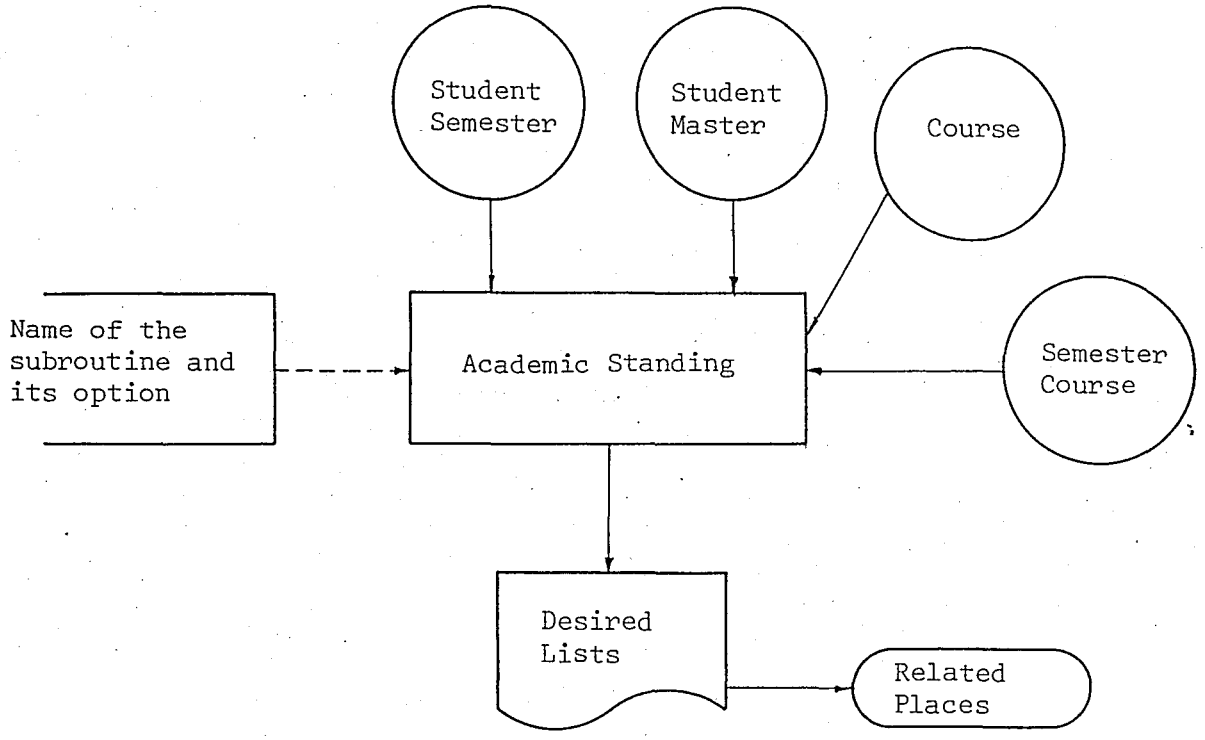


FIGURE 7-25. The Flow Diagram of Acedemic Standing Program.

7.4.5 Lists

This program sorts the files in a desired way to obtain the following lists:

a. Lists which are obtained from the Student Master File:

i. Foreign students List.

ii. List of students based on their lycees.

iii. Addresses and the phones of students.

b. Lists which are obtained from the Student Semester File:

i. Lists of the students according to the faculties and departments (In alphabetic or student number order).

ii. Lists of graduate students according to institutions and departments (in alphabetic or student number order).

iii. Prep. School students' list (In desired order).

iv. Lists of day and boarder students (In desired order).

v. Lists of students according to their sex.

c. List which is obtained from the Student Semester File and the Semester Course File:

i. Course lists of students.

7.4.6 Statistics Program

This program uses Student Master File and Student Semester File, and produces the following statistics. These statistics may be obtained either by the office in advance, or by a request.

i. Distribution of grades for each course.

ii. Distribution of GPA for foreign students.

iii. Distribution of GPA for day and boarder students.

iv. Distribution of GPA for male and female students.

v. Analysis of educational background of the undergraduate students.

vi. Summary reports about students.

7.4.7 Programs Which Update The Files

Almost for each file an update program is needed. The necessary updates are as follows:

i. If a student transfers from one faculty to another, or from one department to another his number must be updated.

ii. The number of students who have passed Prep. School are updated.

iii. Student Master File is updated at the end of every exam period.

iv. Student Semester File is updated whenever a student adds, drops, or withdraws from a course.

v. Student Semester File is updated after grades are given.

vi. Course File is updated whenever a new course is offered.

vii. Student Master File is updated whenever changes occur in the personal information of the students.

7.5 DESIGN OF OTHER JOBS

After the new registration process and after the files and the computer programs are implemented, there will be minor changes in the other tasks, which should be done by the Registrar's Office. In the following steps these tasks are explained.

1. After the registration process is completed, No.1 cards are sent to the Computer Center and the "Student Semester File" is created. The list of this file is obtained by a computer program. These lists and No.1 cards are controlled for catching the errors. This control may be either a random control or a 100 % control. For random control the probability of having errors must be estimated. Hence, 100 % control should be done for at least two semesters. The Student Semester File is updated, whenever an error is detected.

2. A computer program, which lists the changes in the personel information of students (These may be the adress changes, phone changes, or marital status changes) is run and Student Master File is updated, accordingly. Library is also informed of these changes.

3. Program of Overlapped Courses is run to obtain the names of students whose courses are overlapped. Such students should drop one of the overlapped courses until the end of add-drop period. For this reason, students and

advisors are informed.

4. Add-drops are done during the add-drop period. Optical reader is used for this purpose. A sample add-drop form is shown in figure 7-26.

5. At the end of add-drop period, add-drop forms are sent to the computer center for updating the student semester file. After this file is updated, program of Overlapped Courses is rerun and lists of students whose courses are overlapped are obtained. These lists are then distributed to the advisors.

6. Course lists are obtained by running the list' Program, and these lists are distributed to the related instructors. By means of these lists, instructors control the names of the students who take their courses and inform the Registrar's Office in case of any error. The necessary updates in the student semester file are done, then. These lists are also used when instructors take attandance.

7. Mid-term grades are collected from the instructors, and these grades are entered to the Student Semester File. Then, mid-term grade reports are obtained by a computer program. These reports are distributed to the Office of Student Affairs and advisors.

8. At the end of withdraw period, Student Semester File is updated. For on leave students a code is entered to their Semester File and Master File.

ADD - DROP FORM DATE _____

STUDENT NUMBER COURSES WHICH ARE ADDED

0	00000000	00000000	00000000	00000000
1	00000000	00000000	00000000	00000000
2	00000000	00000000	00000000	00000000
3	00000000	00000000	00000000	00000000
4	00000000	00000000	00000000	00000000
5	00000000	00000000	00000000	00000000
6	00000000	00000000	00000000	00000000
7	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000
9	00000000	00000000	00000000	00000000
Signs of The Instructors	Signature	Signature	Signature	

Signature of the Chairman _____

COURSES WHICH ARE DROPPED

0	00000000	00000000	00000000	00000000
1	00000000	00000000	00000000	00000000
2	00000000	00000000	00000000	00000000
3	00000000	00000000	00000000	00000000
4	00000000	00000000	00000000	00000000
5	00000000	00000000	00000000	00000000
6	00000000	00000000	00000000	00000000
7	00000000	00000000	00000000	00000000
8	00000000	00000000	00000000	00000000
9	00000000	00000000	00000000	00000000
	Signature	Signature	Signature	Signature

Signature of the Advisor _____

FIGURE 7-26. An Add - Drop Form.

9. At the middle of the semester, courses that will be offered in the next semester are collected from the faculties and colleges. Semester Course File is created, then. A computer program looks for the courses which are not in the "Course File". If there are such courses, they are added to the course file.

10. Course Schedules are done by running a "Scheduling" program. These schedules are printed and distributed before the end of the semester.

11. Final exam dates are scheduled by means of an Exam Scheduling Program. These schedules are printed and announced to the students at least ten days before the exams start.

12. Lists of students who will probably graduate at the end of the spring semester are obtained by a computer program and distributed to the Boards of the Directors of the Faculties.

13. At the end of the finals, final grade - reports are obtained and distributed to the related places. Also conditional - exam dates and make-up exam dates are scheduled.

14. After the conditional and make-up exams, Student Master File is updated. Also, lists of the students who are not eligible for registration in the next semester are obtained. These lists are distributed to the boards of the

directors of the departments for modification. After these lists are modified, final lists of such Students are prepared and distributed once more.

15. When the modified lists of students, who will possibly graduate at the end of the semester, are sent back to the Registrar's Office from the faculties, the diplomas are prepared. During the Graduation Ceromony, these diplomas are distributed.

16. Student Master File is updated for students who have left the university.

17. Transcripts, other documents and rank reports are prepared when they are requested.

18. Statistical analysis is done whenever requested.

7.6 ANALYSIS OF MANPOWER REQUIREMENT FOR THE REGISTRAR'S OFFICE

After the designed Information System is implemented, there will be two different types of works which should be done at the Registrar's Office. They are computer operations and the other works.

Computer operations are, as stated before, conversion from source documents,creating and updating the files, and running the computer programs. These tasks need some specialization. These tasks require a coordination within the departments and within the Registrar's Office. Since

the new system is highly dependent on the computer operations and the officials at this office are not used to these kinds of works,these tasks should be done by a subdepartment at least for sometime. This department is responsible for executing the programs, updating the files, and developing the files and the programs. After the traditions are settled and the efficiency of the system is justified, other departments and/or persons may use the files and the programs under the control of this department. Updating operation should be done only by this department. A professor, who is preferrably from the Computer Science department, should be consulted for computer operations.

Other tasks are, execution of the registration process, preparing the requested lists and the reports, and establishing the informal and formal information flows within the Registrar's Office and outside the office. These tasks should be done by the rest of the officials who work at the Registrar's Office.

As a result of the seperation of the tasks, organizational change at the Registrar's Office is necessary. The proposed organizational chart is shown in figure 7-27. As seen from that figure, Head of the Registrar's Office is responsible of the officials working there. She controls all the jobs to be done and prepares the work schedule at the beginning of each fall semester. She looks for developments in the techniques used by this office. Also,

if unexpected changes happen, which the designed system can not handle, she makes the necessary adjustments.

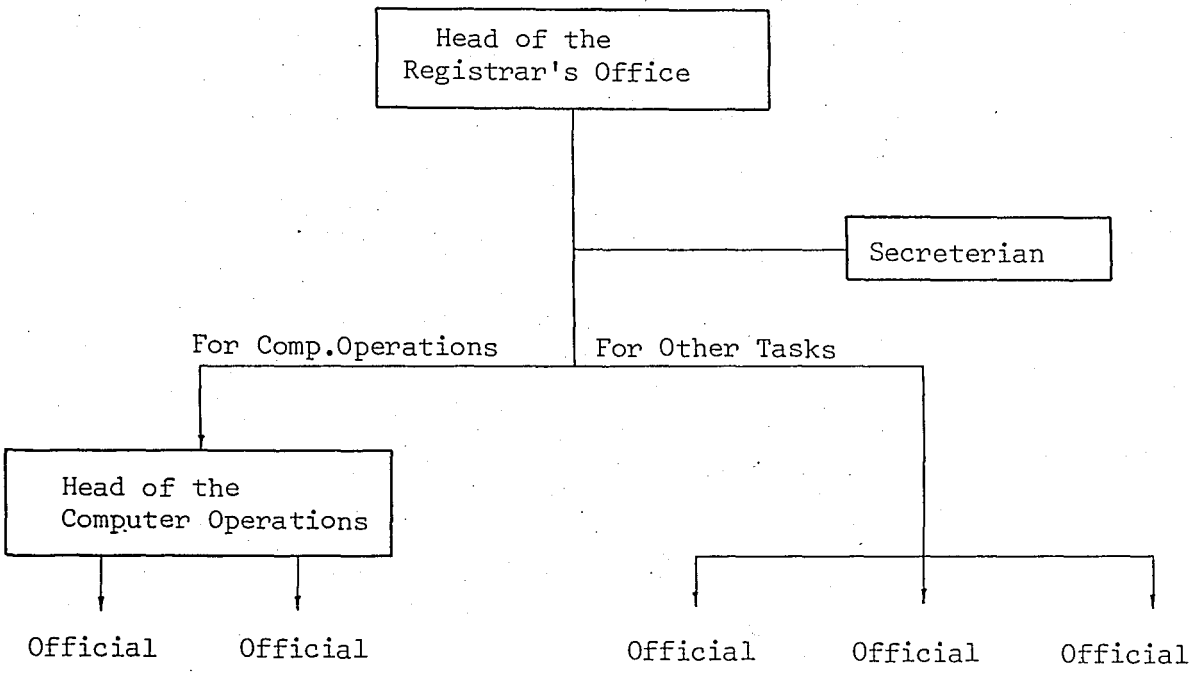


FIGURE 7-27. Organization Chart for the Registrar's Office.

The number of officials for other tasks depend on the workload of the Registrar's Office. Thus, this number may be increased or decreased. For execution of computer operations the number of officials seems to be sufficient but not justified. This number will be accurate after the files and the programs are written.

7.7 CONCLUSION

The information system designed in this chapter, has advantages and disadvantages over the existing one.

Its advantages are as follows;

1. Information processing time is less than the existing system,

2. Personnel requirement is minimized,

3. Registration process is easier than the existing one,

4. Tasks are going to be done on time,

5. Complaints will be minimized,

6. Most of the routine tasks are handled by a computer,

7. Number of errors that may result during information processing is expected to be less than that of the existing system.

Its disadvantages are as follows;

1. This system requires an optical reader which is a sensitive device. Thus the forms, which this machine reads, should confirm the standards. For that reason, these forms must be produced from special paper which increases the cost of registration process. This increase in cost can be companseted by increasing the registration tution fee, after making a cost analysis.

2. The security of the files must be preserved. This problem must be solved by computer specialists, who are in charge of writing the programs.

3. Information is a political power within the organization. By this information system computer seems to "know more than anybody in the office", which may create some problems within the personel. In order to prevent these problems to occur, the system must be well - explained and the officials must be satisfied within the system.

When these disadvantages are eliminated, the Registrar's Office will perform its tasks in a more effective way than before. In table 7-3 a guideline for the tasks is developed. This guideline may help the Head of the Registrar's Office to schedule and control the tesks.

Time	Things to be done
At English Profiency Exam day and the following days until and including the Registration date.	1. Registration of New Students a. Collect all documents, and put them in students' file. b. Give No.4 cards and sign the related places on these cards.
During Registration Period	2. Registration of New and Old Students. Control the No.4 cards, check the receipt of tution fee and idendification card fee. If everything is completed, stamp related places and give identification cards to them.

TABLE 7-3. A Guide Line For The Registrar's Office.

Time	Things to be done
During Registration Period	3. Send the No.1 cards to the Computer Center for creating the Student Semester File.
	4. Enter the necessary information to the Student Semester File.
At the first day of a semester	5. Obtain the lists of students who are not eligible for registration and send them to the departments.
	6. Obtain the lists of students whose courses are overlapped and send them to the advisors.
During the first week of a semester	7. Control No.1 cards and list of the Student Semester File, and make necessary updates.
	8. Obtain the list of students whose personel information change and make the necessary updates in the Student Master File.
	9. Obtain the lists of students who will posibly graduate at the end of the next semester.
After the end of Add-Drop period	10. Send add-drop forms to the Computer Center and make the necessary updates in the Student Semester File.
	11. Obtain the lists of students whose courses are overlapped and give them a penalty.
	12. Obtain the course lists and send them to the advisors.
	13. Correct the errors in the Student Semester File.
After the first mid-terms	14. Collect the mid-term grades from the instructors and update the Student Semester File.
	15. Obtain the mid-term grade reports and distribute them.
Deadline for withdraws and on leave	16. Update the Student Semester File and Student Master File.

TABLE 7-3 Continued.

Time	Things to be done
At any time during the semester (deadlines for these tasks are indicated in the paranthesis).	17. Contact with the Boards of the Faculties for getting information about the courses that will be offered in the next semester.
	18. Create the "Semester Course File" and update the Course File, if a new course is offered.
	19. Schedule the courses for the next semester and print a booklet(This task should be finished before the end of the semester).
	20. Schedule the final exam dates and announce the dates to the related places (This task should be finished at least ten days before the finals).
	21. Obtain statistics.
At the end of final exams	22. Collect the final grades from the instructors. Update the Student Semester File. Obtain the list of students who are supposed to take conditional exams.
	23. Schedule the conditional and make - up exam dates by contacting with the instructors.
After conditional and make - up exams	24. Obtain the final grade reports and distribute them to the related places.
	25. Obtain the lists of students who are graduated and send them to the faculties.
	26. Distribute the diplomas.
	27. Update the Student Master File.
	28. Obtain the lists of students who are not eligible for registration in the next semester.

TABLE 7-3 Continued

VIII. DESIGN OF AN INFORMATION SYSTEM FOR THE PERSONNEL OFFICE

8.1 INTRODUCTION

In Chapter 5, it was concluded that it was impossible to make any changes in the system. Instead, processing of information may be improved by making use of a computer. For this purpose, the files and the computer programs are designed in this chapter.

All of the manual files stored at the P.O. must not be demaged or destroyed by any means. For this reason, the files that are designed in this chapter will be used just for proccessing information faster. These files contain information about personnel, which are needed frequently for performing the tasks. These files are designed in such a way that, they will be elastic to the changes in the system. Hence, they contain unnecessary information about the personnel at this stage.

The computer programs devoloped for this office are designed such that, they will help the office in doing the routine tasks and they will produce the necessary information for manpower planning and requirements.

At this stage because of the legistlations, the files and the programs are used in producing reports. The produced reports must be typed on the standard forms prepared by D.M.O. Also all of the manual files stored by this office must be produced manually and stored forever.

8.2 THE FILES

Seven files are designed for the P.O. They are as follows;

i. Administrative Personnel File I.
ii. Administrative Personnel File II.
iii. Academic Personnel File I.
iv. Academic Personnel File II.
v. Cadre File I.
vi. Cadre File II.
vii. Scientific Specialization File.

Administrative Personnel File I is used to store the necessary information about the administrative officials who are currently working at B.U.,and Administrative Personnel File II is used to store information about the officials who had worked previously.

Academic Personnel File I is used to store the information about the academic personnel who are currently working at B.U., and Academic Personnel File II is used to store information about the academic personnel who had worked previously.

Cadre File I and II store the available cadres given by the laws for the administrative and academic personnel, respectively.

Scientific Specialization File stores information about scientific specializations. This file is designed mainly for three purposes. On them them is to minimize the memory requirement of the Academic Personnel Files. The second is to specify the specializations of the academicians and the third is to specify the subjects of the printings written by the academicians.

In order to minimize the memory requirements, codes are used instead of "Type of School Graduated", "Foreign Languages", "Names of the Offices", and "Academic Titles" in the files. The coding system and the structures of the files are explained in the following subsections.

8.2.1 Coding System

a. Type of School Graduated: This record is used in the personnel files to store information about the last school, in which an official was graduated. Two digits are used for indicating the school. The codes are shown in Table 8-1.

b. Foreign Language:This record is used in the personnel files for storing information about the foreign languages that the officials know. One digit is used for indicating the foreign languages (Table 8-2).

Codes	Type of the School Graduated
01	Primary School
02	3 years - Secondary School
03	4 years - Secondary School
04	3 years - Lycee
05	4 years - Lycee
06	Technical Lycee
07	2 years - Technical College
08	3 years - Technical College
09	3 years - University
10	4 years - University
11	5 years - University(Masters)
12	6 years - University(Masters)

TABLE 8-1. Codes Of The Schools.

Codes	Foreign Languages
0	None
1	English
2	German
3	French
4	Spanish
5	Italian
6	Russian
7	Arabic
8	Ottoman Turkish Language

TABLE 8-2. Codes Of The Foreign Languages.

c. Offices : This record is used to specify the office at which the officials work. Two digits are used for indicating the offices. They may be coded either in alphapetic order or in hierarchical order. The codes are not specified here because the offices are suggested to be changed.

d. Academic Titles: One digit is used for indicating the academic titles which are shown in table 8-3.

Code	Academic Title
1	Full Professor
2	Associate Professor
3	Assistant Professor
4	Lecturer
5	Research Assistant
6	Instructor

TABLE 8-3. Codes of the Academic Titles.

8.2.2 Administrative Personnel File

This file contains the following information for each official working at B.U.

1. Register Number (5 bytes): Register Number is given to each official when he starts to work at B.U. This number is made up of five digits and is given to officials according to their enterance order.

2. Name and the Last Name (20 bytes).

3. Birth Place and Year (4 bytes): The same coding system, which is explained in chapter 7 is used.

4. Father's Name (10 bytes).

5. Sex (1 byte).

6. Citizenship (3 bytes): The same coding system, which is explained in Chapter 7 is used.

7. Military Service (1 byte): If an official has done his military service 1, if he has postponed, 2 and if he is excused, 3 is coded.

8. Marital Status (1 byte): 1 is coded for married officials, 2 is coded for single officials, 3 is coded for seperated officials.

9. Job position of sponsor (1 byte): If she/he works 1, otherwise 2 is coded.

10. Number of children (1 byte).

11. Last school which was graduated (2 bytes).

12. Knowledge of foreign language (10 bytes): Each of two bytes indicates one foreign language. Thus an official is assumed to know at most five foreign languages.

13. Date of Start of Work (10 bytes).

14. Date of Start of Work at B.U.(10 bytes).

15. Cadre (2 bytes): This record is used to indicate the degree of an official that he should be, but not promoted because of the lack of empty carde. If there is no such a case, "00" is coded.

16. Degree (2 bytes).

17. Echolon (2 bytes).

18. Date at which he has promoted to the last degree (10 bytes).

19. Total months and years that he has worked (4 bytes): The first two bytes show the months and the last two bytes show the years.

20. Total vacation he may use in the current year (2 bytes).

21. Total vacation he has used (2 bytes).

22. Total excuse vacation he has used (2 bytes).

23. Proffession (6 bytes): This record is used to indicate the profession(s) of the official which has been gained either by experiences or by graduating from a school. Two bytes are allocated for each profession. Thus an official is assumed to have at most three different profession. The professions must be coded by a comitee whose members must be from the Office of Administrative Affairs and the Personnel Office.

24. Job (2 bytes): This record is used to indicate the job of an official. The job codes might be in accordance with the profession codes.

25. Office (2 bytes): This record is used to indicate the office of an official.

26. Register number for retirement (10 bytes).

27. Adress (50 bytes).

28. Phone (7 bytes).

All of the information for this file must be entered by the officials who are working at the P.O.209 bytes of memory are required for each official. Assuming that 600 officials are working at B.U., Administrative Personnel File I occupies 122 Kbytes of memory.

Administrative Personnel File II is used to store information about the officials, who had previously worked at B.U. This file contains the same information with that of Administrative Personnel File I. There are about 500 officials whose information must be stored in this file. Thus, this file occupies about 102 Kbytes of memory. Administrative Personnel File II is an optional tape file, that is it may not be created in case of bottlenecks in the memory. Because, to store information about such officials in the computer memory does not significantly affect the efficiency of the system.

8.2.3 Academic Personnel File

This file is used to store personal and academic information about academicians. This file contains the same information, which are stored in the first twentysecond records of Administrative Personnel File. In addition to those, the following information are stored in this file for each academician;

23. Name of the Lycee at which he has graduated (20 bytes).

24. University at which he has recieved a B.S., or B.A. degree (50 bytes): This record is used to store the following information;

i. Name of the University (20 bytes).
ii. Name of the School (10 bytes).
iii. Name of the Department (10 bytes).
iv. Date of Graduation (10 bytes).

25. University at which he has received a M.S., or M.A. degree (50 bytes): This record contains the same information with that of the previous record.

26. University at which he has received a Ph.D (50 bytes): This record also contains the same information with that of previous record.

27. Books that are written by him: This record contains information about the books that are published by him, and it is composed of two parts. The first part is an identification part and is used as a counter. This part occupies two bytes in the memory, which shows the number of books written by him. The second part is repeated until the number in the first part is reached, and it contains the following information;

- Name of the book (40 bytes).
- Publishing Company(20 bytes).

- Publishing Date (4 bytes): Only the month and the year is indicated.

- Subject/Subjects Code(s): This record is used to indicate the subjects of the book, that is the main concerns of the book are coded at this field. The subjects are coded in section 7.2.4, and nine bytes are allocated for each subject. It is suggested to allocate 36 bytes for this record. Thus, at most four subjects can be entered in this field, which is a reasonable allocation.

- Name(s) of the Co-author(s) (60 bytes): This record is used to store the names of the co-authors. 20 bytes are allocated for each co-author.

28. Papers that are published: The structure of this record is the same as that of previous record. The following information are stored in the second part of this record;

- Name of the paper.
- Name of the journal at which the paper is published.
- Publishing Date.
- Subject/Subjects code(s).
- Name(s) of the Co-author(s).

29. Academic title (1 byte): See Table 8-3 for coding system.

30. Date at which this title was gained (10 bytes).

31. Nuber of commisions to which he is a member (2 bytes).

32. Code/Codes of the Commision(s) to which he is a member: This record is repeated as many times as the value of the previous record. The commisions must also be coded. Two bytes are used for each commision.

33. Code of the faculty and department at which he works (3 bytes): See the coding system devoloped in chapter 7.

34. Register Number for retirement (10 bytes).

35. Address(50 bytes).

36. Phone (7 bytes).

Assuming that on the average an academician wrote four books, published ten papers and is a member of three commisions, 2690 bytes of memory is required for each academician. There are about 450 academicians working at B.U. Thus, this file occupies 1.18 Mbytes of memory.

Academic Personnel File II contains the same information with that of Academic Personnel File I, for academicians who had previously worked at B.U. This file is also optional and may not be created in case of bottlenecks in the memory.

8.2.4 Cadre Files

Cadre files are also designed for academicians and for the administrative personnel seperately, both of

which have the same structures. Cadre File I is a file used for administrative personnel and II is used for academicians.

This file is a matrix file where the columns show the academic titles for the academicians and offices for the administrative personnel, and rows show the degrees. Each element of the matrix show the number of available cadres allocated for B.U.

8.2.5 Scientific Specialization File

This file stores information about the specializations. The structure of this file is shown in figure 8-1, and it contains the following information;

A. The Main Specialization: This record stores the names and the codes of main specialization and contains the following information;

i. Code of the main specialization (3 bytes).

ii. Name of the main specialization (40 bytes).

iii. Number of its subjects (2 bytes): This record is used as a counter and the next record will be repeated as many times as the value of this record.

B. Subject : This record is used to denote the subjects of the main specialization. For example Operations Research is a main specialization and Linear Programming is one of its subjects.The following information are stored in this record;

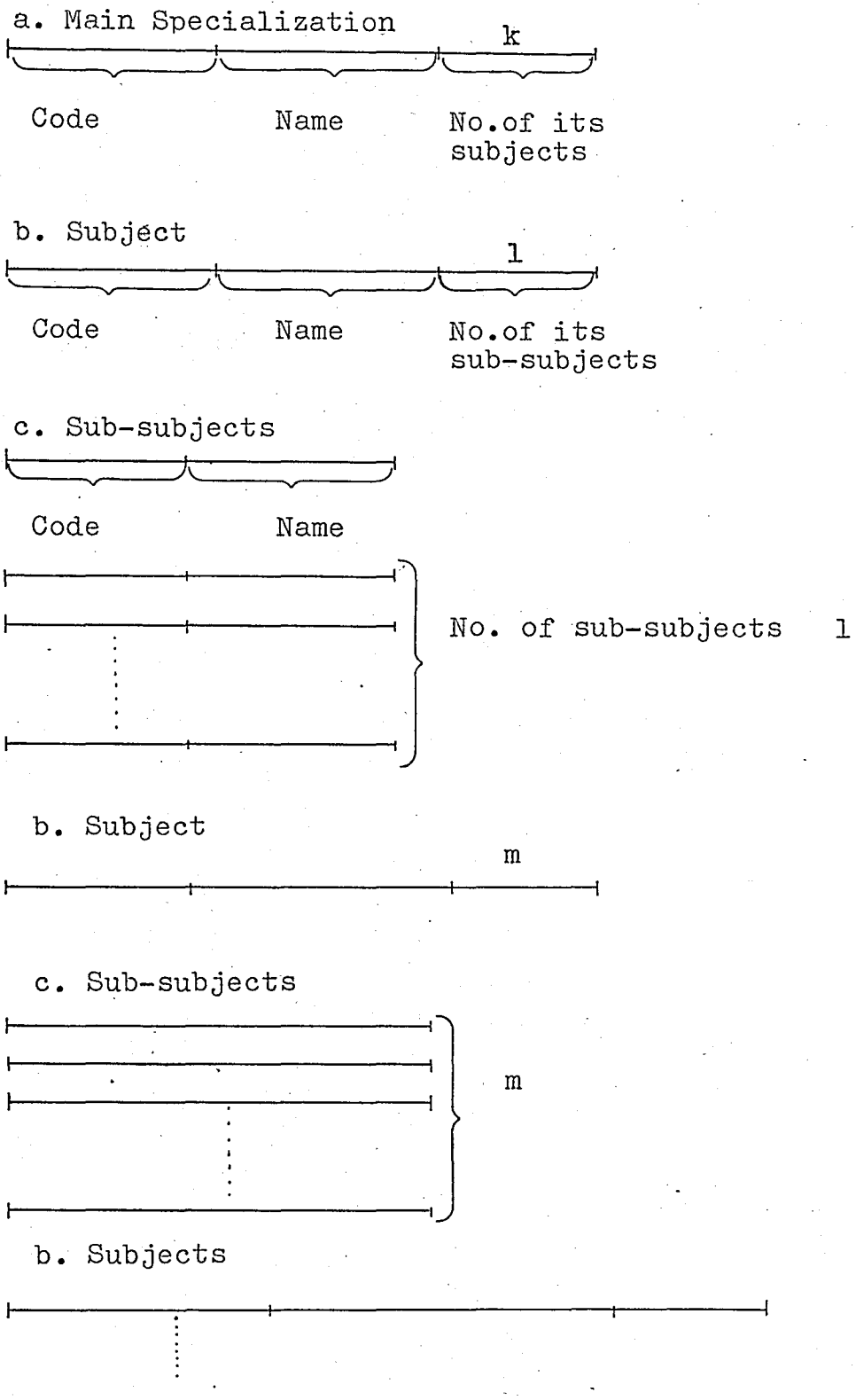


FIGURE 8-1. The Structure of Scientific Specializations File.

i. Code of the subject (2 bytes).

ii. Subject Name (40 bytes).

iii. Number of its sub-subjects (2 bytes): This record is also used as a counter as explained before.

C. Sub-subjects: This record is used to store the sub-subjects of the main specialization and contains the following information;

i. Code of the sub-subject (2 bytes).

ii. Name of the sub-subject (40 bytes).

The codes for scientific specializations must be devoloped by a comitee whose members are academicians from different departments. The level of detail must be decided also by this comitee. For example, if a paper was written about "Solution Procedure for a Transportation Problem", then the subject of this paper is coded as 111.11.11. Here the first three numbers show that the paper is about Operations Research (assuming 111 is coded for OR) and its subject is Linear Programming (assuming 11 is coded for LP) and the last two numbers show that the paper is about Transportation Problem (assuming 11 is coded for TP). For a book about linear programming, 111.11.00 is coded.

All of the information about officials should be entered to the personnel files by the officials who are working at the P.O. The Cadre File and the Scientific Specialization File must be created once during the

implementation phase.

8.3 COMPUTER PROGRAMS

Two programs are devoloped for this office. One of them lists the necessary information in desired format and the other is used for updating the files. These programs are explained in the following subsections.

8.3.1 List Program

Since the main task of this office is to store and to report the necessary information about personnel, this office must process lots of information with a limited number of personnel in a limited time. The list program devoloped in this section reports necessary information. With this respect, this program supports the processing task of the office, considerably. Hence, the monpower requirements of the office will be minimized. This program contains a set of subroutines which can be run by an option code. The following lists are produced by this program;

1. Lists of the officials working at each office: This program sorts the officials in hierarchical order according to offices and reports the following information for each offical and the office;

- Register Code.
- Name and the Last Name.
- Job.
- Degree and echolon.
- Qualifications.
- Date of promotion to the next echolon.
- Date of promotion to the next degree, if there will be an empty cadre.

This subroutine also prints the total number of officials, working at each office, at the bottom of the report.

2. Quality of the officials working at the offices: This program classifies the qualifications and then gives summary report about the qualifications of the officials. The format of this report is shown in figure 8-2.

3. List of the officials who will be promoted to the next echolon at each month: This program checks the "Date of last promotion to the next degree" record of each official with the current month. If they match, he is taken into the list.

4. List of the existing cadre situation: This program uses personnel files and the cadre file, and produces the maximum number of officials at this cadre and the number of officials at this cadre. This program also reports the names of the officials who can not be

QUALIFICATION REPORT

Office : _____ Date : _____

Office Code : _____

Number of Officials : _____

Name of the Qualification	Code of the Qualification	Number of Officials
⋮	⋮	⋮

⋮

Office : _____

Office Code : _____

Number of Officials : _____

⋮	⋮	⋮

SUMMARY REPORT Date : _____

Qualification Name	Number of Officials
⋮	⋮

FIGURE 8-2 Qualification Report.

promoted to the next degree because of lack of cadre. Such officials are sorted in ascending order of their promotion date.

5. Remaining vacation days of the officials: This program subtracts the value of the "Total vacations he has used" record from the value of the "Total vacations he may use" record and prints the results for each official and for each office.

6. Publications of the Academic Personnel: This program uses the Academic Personnel File I and Scientific Specialization File and prints the results as shown in figure 8-3.

7. List of the officials who are eligible for retirement: This program checks the retirement criterian with that of the value of "Total months and years worked" record of the personnel files for each official and if he meets the criterion, he is taken into the list.

8.3.2 Updating

The following information in the files must be updated by a computer program.

1. When a new official is appointed, the necessary information about him must be entered to the related file.

2. When an official retires or resigns, his file is transferred into the inactive personnel files.

Name and Last Name : _____ Date : / /

Title : _____

Faculty : _____

Dept : _____

A. BOOKS

Title of the Book	Publishing Company	Publishing Date	Names of the Co-authors	Subjects
1.			1. 2. 3.	1. 2. 3. 4.
⋮	⋮	⋮	⋮	⋮
n.			1. 2. 3.	1. 2. 3. 4.

B. PAPERS

Title of the paper	Name of the Journal	Publishing Date	Name of the Co-authors	Subjects
1.			1. 2. 3.	1. 2. 3. 4.
⋮	⋮	⋮	⋮	⋮
n.			1. 2. 3.	1. 2. 3. 4.

FIGURE 8-3 Publication Report for the Academicians.

3. The sixteenth record of the personnel file for each official is updated at every third year of his work, if there is empty cadre.

4. The seventeenth record of the personnel file for each official is updated at each year.

5. If an academician publishes a book or a paper, the related records must be updated.

6. Cadre File is updated, whenever any changes occur.

7. Scientific Specialization file is updated, whenever any changes occur.

8. The programs which are used in updating the 7, 8, 9, 10, 11, 12, 15, 21, 22, 23, 25^{th} records of the personnel files, must also be written. These updates are done whenever any changes occur in the information stored in the related records.

8.4 CONCLUSION

If the devoloped system is implemented, it will bring a lot of advantages. First of all, it will decrease the processing time of the tasks that should be done by this office. Thus, it will minimize the workload of the officials at this office. Secondly, the quality and the quantity of information produced by this office will be increased by the devoloped system. Thirdly, it will minimizes the dependency of the system to the officials. In the existing

system information processing techniques are devoloped by the experiences of the officials who are currently working at this office. If the officials resign or retire for any reason, the coming officials should devolop their own techniques.

One of the main disadvantages of the devoloped system is that; it requires to store information at two different files (i.e.,the manual files and the computer memory), because of legislations. The second disadvantage of this system is that, it stores unnecessary information about personnel in the computer memory. For this reason, some of the records may be deleted.

IX. IMPLEMENTATION PHASE AND FURTHER REMARKS

9.1 INTRODUCTION

In the previous chapters the Office of Student Affairs, the Registrar's Office and the Personnel Office were analyzed, and information systems for these offices were devoloped. The implementation phase of the information system devoloped for each office is discussed in the following sections.

Since the files and the programs, which will be written by the computer specialists and will be used by these offices, are highly based on this study, and since writing the files and the programs are part of the system design phase (Note that in literature this phase is called as Interior System Design, and most of the authors suggest that this phase should be done by the computer specialists), suggestions on implementation phase are also made in this study. It is suggested that the tasks during this phase should be done in the following sequence;

a. Writing the programs and the files.

b. Validating the programs.

c. Training the officials.

d. Running the devoloped system in parallel with the existing one.

e. Validating the devoloped system.

f. Running the system.

In the following subsections suggestions about the implementation phase for each office are done.

9.2 IMPLEMENTATION OF THE INFORMATION SYSTEM FOR THE OFFICE OF STUDENT AFFAIRS

After the files and the programs are written, the programs must be validated with the sample data. This task must be finished by the end of May,1984.

During 1984 - summer months, information to the files must be entered. During this period, manuals must be prepared and the officials at this office must be trained. By the end of summer period, the programs must be ready to use. Meanwhile, an official who will be responsible to use the programs and to update the files must be trained. At the end of the training, he must also demonstrate the system.

By September 1984, the system must be run in parallel with the existing system. For this purpose, the applications for the dormitories and scholorships must be evaluated both by a committee and by a computer program. The

	Performers	Performers	(Month,year)	(Month,year)
1. Writing the programs and the files	Comp.Spec.	2	Feb. 1984	May, 1984
2. Validation of the prog.with sample data	Computer Spec.	2	May, 1984	June, 1984
	System Analyst	1		
3. Preparation of the forms for entering the input data	Officials from the O.S.A.	1	June, 1984	June, 1984
	System Analyst	1		
4. Training the officials for entering the data	Comp.Spec.	1	June, 1984	June,1984
	System Analyst	1		
5. Coding the clubs and rooms in the dormitories	Comp.Spec.	1	June, 1984	June, 1984
	System Analyst	1		
6. Entering tha data to the files	Officials	2	July, 1984	August, 1984
	Students	4		
	System Analyst	1		
7. Training the officials for using the programs and files	Comp.Spec.	2	July, 1984	August, 1984
	System Analyst	1		
8. A seminar about the new system	Comp.Spec.	2	Sep.1984	---
	System Analyst	2		
9. Evaluation of the applications to the dormitories(by a program).	Committee	3	Final date of the applications	---
10. Evaluation of the applications to the dormitories(by a program).	Committee	3	Final date of the applications	---
	Trained official	1		
11. Comparison of 9 and 10	Comitee	3	Oct, 1984	---
	System Analyst	1		
	Trained official	1		
12. Modifications	System Analyst	1	Oct, 1984	Oct, 1984
	Comp.Spec.	1		
13. Training the boards of the clubs	System Analyst	1	Oct, 1984	Oct, 1984
	Comp.Spec.	1		
14. Evaluation of the applications to scholorships	Committee	3	Deadline for application	---
15. Evaluation of the applications to scholorships (by a program).	Committee	3	Deadline for application	---
	Trained official	1		
16. Comparison of 14 and 15	Committee	3	After evaluation	---
	System Analyst	1		
17. Implementation of the whole system	All related officials	-	Nov, 1984	June, 1985

TABLE 9-1. Scheduling of the tasks in the implementation phase for the O.S.A.

results of the two evaluations must be compared and if necessary, modifications on the new system should be done.

In October 1984, the boards of the clubs must be trained. During 1984 - Fall Semester, the clubs must be controlled both with the reports produced by the programs and with the manual reports prepared by the boards of the clubs. If needed, necessary modifications should also be done.

The devoloped system should be examined througout the first year. The performance of the system should be compared with the existing system. The necessary modifications should be devoloped in this period.

Assuming that there will not be any constraint on manpower, the suggested schedules of the tasks in this phase are shown in table 9-1.

As shown in table 9.1 the implementation phase starts in March, 1984 and ends in June,1985. During this period, all of the officials should be trained and they should work effectively. The manuals should be as simple as possible so that any person who does not know programming, should be able to understand the manuals and should easily use the programs just with the aid of manuals.

9.3 IMPLEMENTATION OF THE INFORMATION SYSTEM FOR THE REGISTRAR'S OFFICE

In chapter 7 a new system was devoloped for the

Registrar's Office. The devoloped system offers a radical change in the organization of this office. This radical change must be approved by President, before this system is implemented.

Writing the files and the programs is the first stage of implementation. Since the files and the programs designed for this office are more complex than those of other offices, validation of the files and the programs should be done with a large sample data. After they are validated, information must be entered into the files.

The new system can not be run in parallel with the existing system; because almost all of the forms, which are used in obtaining input data for the Registrar's Office, are changed. Hence, to measure the relative effectiveness of this system is not easy. The performance of the new system may be compared with that of the existing system after it is implemented. This is done by measuring the performance of the new system and comparing it with the performance of the system, which was applied in the previous years.

If the files and the programs could be ready to be used by September 1984, the system could be implemented in 1984 - Fall Semester. For this reason, optical reader should be available and the registration forms should be prepared before that time. During the registration process, students must be trained in using these forms and they must

Name of the task	Quality of the Performers	No.of Performers	Starting Date (Month,year)	Ending Date (Month,year)
1. Writing the programs and the files	Comp.Spec. System Analyst	4 2	Ock.1983	May, 1984
2. Validating the programs and the files	Comp.Spec. System Analyst	4 1	May, 1984	June, 1984
3. Preparation of the forms for entering the data to the files	Comp.Spec. System Analyst Officials	2 1 1	June, 1984	June, 1984
4. Filing information into the forms	Officials	4	June, 1984	July, 1984
5. Entering data into the files	Students Officials	10 2	July, 1984	August, 1984
6. Training the officials	Comp.Spec. System Analyst	2 2	---	September,1984
7. Preparation of the manuals	Comp.Specialist System Analyst	3 2	---	September,1984
8. Preparation of the Registration Forms	Comp.Specialist Designer	1 1	---	September,1984
9. A seminar about the new system(to the advisors, and officials).	Comp.Spec. System Analyst	3 2	---	September,1984
10. Preparation of Course Schedule Booklet(by a comp. program).	Trained Official	1	---	September,1984
11. Training the students	System Analyst Official	2 4	During Registration Period	During Registration Period
12. Implementing the system	Related Officials	-	October,1984	June,1985

TABLE 9-2. Scheduling of the tasks in the implementation phase for the Registrar's Office.

be informed of the process. The penalties which will be given to them, if they do not obey the rules must also be stated.

The suggested schedule of the tasks which must be done in the implementation phase is shown in table 9-2.

As seen from Table 9-2, the implementation phase starts in October, 1983 and ends in June, 1985. During this period the whole system must be examined carefully and the modifications should be done, if necessary.

9.4 IMPLEMENTATION OF THE INFORMATION SYSTEM FOR THE PERSONNEL OFFICE

As stated in chapter 8, a new system was not devoloped for the Personnel Office. Only the files and the programs were devoloped for this office. For this reason during the implementation phase the files and the programs will be written first. Then the necessary information will be entered into these files. After they are entered, the files and the programs will be validated. Finally the manuals will be prepared and the officials will be trained. The schedule of these tasks is shown in table 9-3.

9.5 CONCLUSION AND FURTHER REMARKS

In this study, an information system was designed for the Office of Student Affairs, the Registrar's Office and Personnel Office. The designs were based on increasing

Name of the tasks	Quality of Performers	No. of Performers	Starting Date	Ending Date
1. Writing the files and the programs	Comp.Specialist	2	March, 1984	May, 1984
	System Analyst	1		
2. Preparation of the forms for entering the data	Comp.Spec.	2	May, 1984	May, 1984
	System Analyst	1		
	Official	1		
3. Entering the data into the files	Official	2	May, 1984	June, 1984
	Comp.Spec.	1		
4. Validation of the programs	Comp.Spec.	2	June, 1984	June, 1984
	System Analyst	1		
5. Training the officials	Comp.Spec.	2	June, 1984	July, 1984
	System Analyst	1		
6. Preparation of the manuals	Comp.Spec.	2	July, 1984	July, 1984
	System Analyst	1		
7. A seminar about the designed system	Comp.Spec.	2	---	July, 1984
	System Analyst	1		
8. Implementation of the whole system	Related Officials		August, 1984	January, 1984

TABLE 9-3. Scheduling of the tasks in the implementation phase for the Personnel Office.

the efficiency of the offices; by introducing a computer as an information processing mechanism, and by introducing new procedures for some of the tasks of the Registrar's Office and the tasks of the O.S.A. These changes in accordance with the computer as a tool will increase the efficiencies of the offices and will decrease manpower requirements of these offices.

To write the computer programs and the files is beyond the scope of this study; because first of all they should be written by a group of computer specialists, who know the capabilities of a computer better than the author of this study, and secondly a new computer system (CYBER 170) is going to be implemented in the near future in B.U. CYBER 170 has a different operating system and data base possibilities from that of UNIVAC 1106, which is presently in use in B.U.

Optical reader was selected as a conversion device. This device increases the speed of tranformation as well as decreases the contribution of manpower in the transformation process. This device has also some disadvantages. First of all, it increases cost of information. Secondly, the forms must rigidly confirm the standards and they should carefully be filled out by the students.

The designed systems do not only bring efficient information flow, but they also change the roles of the officials at their work. For this reason after it is

implemented, there may be some resistance to the new systems. The reason for resistance may be as follows;

1. Information is a political power such that power of any man is proportional with his knowledge. Changes in the information flow channels will change the structure of information. Consequently, it will change the distribution of power.

2. The roles of the offices in the system will change in relation with the new system, and the accecibility to the information is also accelerated by the new system. These two important facts decrease the dependency of the whole system to the individual offices.

3. During the implementation phase, the workload of the officials will be more than before, which might cause some complaints among the officials.

4. Since most of the officials, do not know computer and its capabilities, there may be some adoptation problems.

In order to solve these problems, the new system should be implemented carefully. Especially training of the officials must be done both by teaching them "their new roles" and by teaching them "the capabilities of a computer". Trainings must be supported with workshops, and the easiness of their new roles must be explained. Manuals should be as simple as possible so that the users can answer all of the questions about the new system, just by

reading the manuals. Finally, the designed system must be run in parallel with the existing system as much as possible for solving the adoptation problems.

Besides, at least one official must be responsible for computer operations during the implementation phase, and advisory comitee should consult with the offices during that phase.

This study is part of a large project. The aim of this project is to computerize the routine tasks executed by the offices. In order for this project to be successful, a team work must be done. An advisory comitee should support the team in which industrial engineers should work as system analysts and computer specialists should work as programmers.

Design of an information system for the Library is the next most important design in the sense that,it completes the design of academic tasks, that is it completes the computerization of the tasks which are directly related with students, academicians and their needs. The design of such a system will not be difficult, because radical changes in the processing of the tasks of this office will not be needed. On the contrary, implementation phase will be difficult because, information about 200.000 printed matters should be entered to the files.

Until the university gets acquintance with the new system, it is suggested to establish an office which will be responsible for managing the data base system. This office

should do the following tasks;

1. Management of the Data Base System.
2. Training the related officials.
3. Preparing the manuals.
4. Maintenance of the data base.
5. Devoloping new computer programs.
6. Controlling the security of the files.

That concludes the design of an information system and the suggestions as to how it should be implemented in B.U. The author hopes that this study will be an aspiration or a guide to those who will hopefully try to bring about a new information system to the offices of the B.U. in the near future.

REFERANCES

1. ACKOFF, R.L., "Management Misinformation Systems", Man.Sci.Vol. 14, pp. B147 - B156, 1967.

2. ALTER,S.and M.J.GINZBERG, "Managing Uncertainity in MIS implementation", Sloan Man.R., Fall 1978, pp. 23 - 28.

3. BARROS.O., V.PEREZ, and A.HOLGADO, "Structured Logical Design of Information Systems: A Methodology, Documantation and Exparience", Information Systems, Vo. 4, pp. 13 - 21, 1979.

4. BOULDEN, J.B., Computer Assisted Planning Systems, Mc Graw Hill, Inc., New York, 1975.

5. BUFFA, E.S., Basic Production Management, Second ed., John Wiley and Sons, Inc., New York, 1975.

6. BURCH Jr., J.G., F.R.STRATER, and G.GRUDNITSKI, Information Systems: Theory and Practice, Second ed., Hamilton Publishing Company, California, 1979.

7. DAVIS, G.B., Management Information Systems: Conceptual Foundations, Structure and Development, Mc Graw Hill Kogakusha Ltd., Tokyo, 1974.

8. DEARDEN, J., "Can Management Information be Automated?" Har.Bus R., March. April 1964, pp. 128 - 135.

9. DEARDEN,J., "MIS is a Mirage", Har.Bus.R., Jan.Feb. 1972, pp. 90 - 99.

10. DOĞRUSÖZ, H., İ.ŞAHİN, and M.PARLAR, Bütünleşik Sistem Tasarımı ve Kuruluş ve Gelişme Stratejisi, TŞE YBS Araşt.Projesi, Cilt 1, ODTÜ, Ankara, 1974.

11. DONOVAN, J.J., "Database System Approach To Management Decision Support", ACM SIGBDP Data Base, Vol. 1, No. 4, Dec. 1976.

12. EDSTROM,A., "User Influence and the Success of MIS Projects: A Contingency Approach", Human Rel., Vol. 30, pp. 589 - 607, 1977.

13. EILON, S., "Five Approaches to Aggregate Production Planning", AIIE Trans., Vol. 7, pp. 118 - 131, 1975.

14. GINZBERG,M.J, "Early Diagnosis of MIS Implementation Failure", Man.Sci., Vol. 27, pp. 459 - 478, 1981.

15. KANTER,J., Management Guide to Computer System Selection and Use, Prentice - Hall, Inc., Englewood Cliffs, N.J., 1970.

16. KEEN,P.G.W., "Adaptive Design for Decision Support Systems", ACM SIGBDP Data Base, Vol. 12, pp. 15 - 25, 1981.

17. KEEN, P.G.W., "Information Systems and Organizational Change", ACM Comm., Vol. 24, pp. 24 - 33, 1981.

18. LANGEFORS, B., "Informations Systems Theory", Inform. Systems, Vol. 2, pp. 207 - 219, 1977.

19. LANGEFORS, B., "Infological Models and Information User Views", Inform. Systems, Vol. 5, pp. 17 - 32, 1980.

20. LUCAS, Jr., H.C."Performance and the Use of an Information System", Man. Sci., Vol. 21, pp. 908 - 919, 1975.

21. LUNDEBERG,M., G.GOLDKUHI, and, A.NILSSON, "A Systemmatic Approach to Information Systems Development-I. Introduction", Inform. Systems, Vol. 4, pp. 1 - 12, 1978.

22. LUNDEBERG,M., G.GOLDKUHI, and, A.NILSSON, "A Systemmatic Approach to Information Systems Development-II. Problem and Data Oriented Methodology", Inform. Systems, Vol. 4, pp. 93 - 118, 1978.

23. MADER,C., and R.HAGIN, Information Systems: Technology, Economics, Applications, SRA Inc, 1974.

24. MASON,R.O., and I.I.MITROFF, "A Program for Research an Management Information Systems", Man. Sci., Vol. 19, pp. 475 - 487, 1973.

25. McFARLAN, F.W., "Problems in Planning the Information Systems", Har. Bus.R., March. April 1971, pp. 75 - 89.

26. McRAE,T.W., "The Eualuation of Investment in Computers" in Management Information Systems by T.W.McRAE (ed.), Penguin Middlesex, 1971.

27. METHLIE, L.B., "Data Management For Decision Support Systems", ACM SIGBDP Data Base, Vol. 12, pp. 40 - 46, 1981.

28. MOORE,J.H., and M.C.CHANG, "Decision Support Systems", ACM SIGBDP Data Base, Vol. 12, pp. 8 - 14, 1981.

29. ORILLA,L.,N.B.STERN, and R.A. STERN, Business Data Processing Systems. Jon Wiley and Sons, Inc., New York, 1972.

30. POWERS,R.F., and G.W.DICKSON, "Mis Project Management: Myths. Opinions, and Reality", Cal.Man.R., Vol. 15, pp. 147 - 156, 1973.

31. SENKO,M.E., "Information Systems: Records, Relations, Sets, Entities, and Things", Inform. Systems, Vol. 1, pp. 3 - 13, 1975.

32. SENKO,M.E., E.B.ALTMAN,M.M.ASTRAHAN, P.L.FEHDER, "Data Structures and Accessing in Data Base Systems I Evolution of Information Systems", IBM Syst.J., Vol. 12, pp. 30 - 44, 1973.

33. SWANSON,E.B., "Management Information Systems: Appreciation and Involvement", Man.Sci., Vol. 21, pp. 178 - 188, 1974.

34. UÇKAN,Y., and H.FIŞEK, Alt Sistem Tasarım Metodolojisi, TŞE YBS Araştırma Projesi, Cilt 2, Ağustos 1974.