DESIGN CONSIDERATIONS OF THE INTERNAL SHELL OF AUTOMATED OFFICES IN BANKS

A THESIS
SUBMITTED TO THE DEPARTMENT OF
INTERIOR ARCHITECTURE AND ENVIRONMENTAL DESIGN
AND INSTITUTE OF FINE ARTS
OF BİLKENT UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF FINE ARTS

By
Mahmut Celâleddin Gencelli
February, 1992

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts.

Assist. Prof. Dr. Halime Demirkan (Principal Advisor)

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts.

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tarafından [illegible].

ABSTRACT

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Mahmut Celâlettin Genceli

M.F.A. in

Interior Architecture and Environmental Design

Supervisor: Assist. Prof. Dr. Halime Demirkan

February, 1992

The technical requirements of bank offices to handle automation are examined within the scope of the study. Starting with the general historical background of offices, open office plan is chosen as the domain. Office technology and its related procedures are examined. Designer's concern to the technical problems are pointed out. Design problems are stated and related solutions are suggested. A checklist is proposed for the designers, that can be used for taking precautions and making the necessary alterations during the design phase

Keywords: Office, Open Office, Automated Office, Bank Automation

ÖZET

ELEKTRONİK BANKA BÜROLARININ İÇ KABUKLARINDA TASARIM ÖNGÖRÜLERİ

Mahmut Celâlettin Genceli

İç Mimarlık ve Çevre Tasarımı Bölümü

Yüksek Lisans

Tez Yöneticisi: Yrd. Doç. Dr. Halime Demirkan

Şubat 1992

Bu çalışmada, banka ofislerinin elektronikleştirilmeyi karşılayabilmesi için gereken teknik gereksinimler incelenmiştir. Büroların genel tarihsel bilgilerinden başlanmış ve açık bürolar ilgi alanı olarak seçilmiştir. Büro teknikleri ve ilgili işlemler incelenmiştir. Tasarımcının teknik sorunlarla olan ilgisi gösterilmiş, tasarım problemleri açıklanmış ve çözümler önerilmiştir. Son bölümde yer alan kontrol listesi yardımıyla tasarımcı tasarım aşamasında kendine gerekli olan bilgiyi edinip önlemler alabilir, değişiklikler yapabilir.

Anahtar kelimeler: Büro, Açık Ofis, Elektronik büro, Banka Otomasyonu

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1. INTRODUCTION

In the last 20 years electronics technology has shown such a development that if the same could have been achieved in the automobile industry, a car would speed 1000 km/h consuming 1 liter of gasoline for 1000 kilometers and probably will be as big as a matchbox. The development is due to new inventions of manufacturing methods and electronic component families. The new devices consume less power and require less space. Inevitably these developments should find their place in the office and the home environment alike. Especially office environments were heavily automated by the equipment manufactured using this new technology. Interoffice telephones, computers and their network equipment, electronic typewriters, electronic word processors, facsimiles, photo copiers, printers, electronic briefing and conference equipment, and many other fixed or portable equipment taken their roles in the office environment. Paperless office is a concept that is being talked about for a while now. With the new equipment, although it is not yet possible to eliminate paper, however, at least there can be an increase in productivity.

Banks, due to computational nature of their procedures, after the introduction of computers to the office environment, quickly adapted this new technology to their accounting services, first being in their main offices then to their branches. In Turkey the first introduction of computers to a bank is in 1960. Today 9% of the banks use computers for 26 to 30 years (Anon., 1992).

Computers, previously, have been set aside in special rooms and were being used by some experts; but today their wide spread application makes it impossible

to spare an extra separate space for them in the office environment. And it is neither practical nor useful to put them in such areas. Computers, therefore are inevitable part of a general office. The other equipment, although not as fast as computers, are also having their way in the plan of the office environment.

1.1. Problem Definition

All the automation equipment when gathered together in the office makes the environment more crowded and less pleasing, together with problems like lighting, space organization, cabling, power requirements, and storage all make the office more of a 'messy room' rather than a workplace. This inconvenience causes work efficiency of workers to fall and may cause psychological disturbances.

The crowding in the office plan is a real change in physical distribution. Automation, today, requires generated energy and this energy has to be supplied, then, to the immediate neighbourhood of the equipment. Apart from physical distribution changes, a radical change in the contents of the office work is also evident. People are convinced by saying "Routine works are almost taken over by computers". "Major daily duties are done at a glimpse". "Workers are doing more intelligent and creative work". "Work efficiency is increased". "Company benefits are peaking".... But as Mahnke states:

> It is important to recognize that business managers often overlook that employee efficiency and the work environment have a direct relationship. Worker–effectiveness studies have tended to concentrate more on industrial surroundings than on offices. That is understandable, because it is easier to measure the number of products coming off a production line than to establish and measure standards in office work (Mahnke, 1987; p.70).

Peoples' environment in which they work directly affects their work efficiency. The posture they have while working, the colors in the environment, lighting, the air they inhale, the room temperature, noise, furniture, social relations, and

almost everything that comes to mind has a role in one's work performance.

But can we establish conditions as to get the most performance out of offices? By buying equipment and 'wrapping' them around the existing conditions we only can make things go worse and not have anything positive to increase efficiency.

Automation in the eye of the management brings along problems such as educating people in the shortest possible time to get system working at its bare minimum. Management does not usually consider the environmental disorders that will arise after the introduction of automation equipment.

Mahnke's trying to warn management while stating:

> Those businessmen who are worried about dollars and cents must realize that no matter what the cost of an agreeable office environment, it is still a fraction of the cost of developing and keeping employees (Mahnke, 1987; p.71).

is a forewarning for those trying to get their office automated while spending every little penny for buying more of the equipment. And Harris's statement also assures the importance of design in a work environment:

> The value of comprehensive office planning is underscored by a look at the dollars spent over the life of a building. If the costs of equipment, construction of the building, maintenance, and replacement are added together, their sum will still be only one–tenth of the dollars spent on user salaries and benefits.(Harris, 1991; p.4)

Banks in Turkey are having a radical change in their automation plans after phasing out the first difficulties of automation, which were mostly problems of the sort going from manual to automated task manipulation. New Automated Teller Machines are being installed to branches. Computerizing and connecting branches to data networks, changing design of the branches in search for a corporate identity are common aims that every bank is trying to reach today.

It is role of the designer to establish those conditions that will meet both human and machine requirements alike. Designers are acquainted with the knowledge of human factors in their curriculum; but their bypassing of the technical issues, in the case of automated offices, is not escapable. Designing automated offices is a joint venture among many technical disciplines. Design being an ill-defined problem makes the situations hardest for the designer.

The question then arises to get the offices ready to face with the new technology. When offices are implemented, cables have to be laid properly out of sight, easy maintenance of the equipment should be considered, the noise generated by the equipment should be eliminated, proper wall, ceiling, and especially flooring materials should be used– as a precaution for static discharge and electric shock hazards– the extra heat, precautions should be taken against X–Ray radiation, electrical and radio interferences, walls should be cured for data security, air circulation in the room should be controlled for dust and moisture content.

The author being an industrial designer and having a technological inclination, aims to introduce designers a way to accomplish technical problems. Giving designer more time to design than losing himself in technical media.

1.2. Scope

The most recent developments in the office automation area are implemented in the bank offices. Today's banks in Turkey are competing with each other to attract customers with introducing fast services in designer planned environments. All the banks try to create a corporate identity that any of the branches should be distinguished from the ones that of the other banking companies. This trend at the root is more of an aesthetic one and needs attention on the technical side. The designs stand out with use of materials, with their interior look, their way

of launching the bank's identity. But at the back of all this fine looking images there lies a non–functional mass of machines. Automation is directly related with technology and it should not be set aside until the whole design evolves. Designing the whole office, then expecting that users to come up with smart ideas for their new power engines (i.e. computers) is not simply going to work. A modern bank depends on computers in almost every area, hence the data retention is the crucial design criteria that has to be taken into account. Therefore designing the office shell to accept automation should be the first question of planning a bank for automation. Then another important issue comes to scene: to interface automation equipment to people which is another question. In this thesis the requirements of a bank interior shell in between walls, floor and ceiling excluding the furniture will be discussed.

1.3. Methodology

In the first part of the thesis after giving the definition of the office and automated office, the development of the office in a time domain is examined, giving more attention to the offices of the recent years. Then, the future office expectations are mentioned accentuating on how fast the office technology develops. Different types of offices and their suitability for the bank environment is discussed, while explaining underlying concepts that generated them. For the other services of the banks the types of the offices that could be applicable are pointed out. Open office type is then found the most suitable for the automated bank environment

In the next chapter, the designer's role in the office planning is discussed. Discussion includes the position that a designer has to take in a team of different disciplines. The related disciplines involving office planning are then shown. And the initial preparation of the planning is reminded, with the information

pertatining the bank office procedures and paper–flow. The use of computers in bank procedures is listed. Coming eventually to storage requirements which naturally arise from the paper documents. The change in the storage requirements after the introduction of the electronic media is pointed out. This is followed by types of communication requirements in the automated office.

The fourth chapter is related to what concerns the automation process. The equipment as well as visual, psychosocial, health related, and environmental problems which may affect workers directly due to design decisions taken.

The fifth chapter starts with mentioning what a good office design should posses and goes on with explaining how to characterize the requirements of users. A typical bank branch space allocation is given and future plans of the banks are introduced, which follows a method for allocation the space and fit the plan efficiently and logically with the maximum possible scope. This follows requirements of the equipment: a discussion of how important their proper working conditions are. Then the technical problems concerning the automation is discussed in detail, starting with power requirements, the rules of thumb and power conventions are introduced. Next the cables and their distribution systems are explained and the properties of the distribution systems are discussed. Their applications and suitability in different office plans are evaluated. Followed by suggestions of the cable layouts for the chosen open office plan type. After cabling the different type of data communication systems and their applications are discussed. The ones that are easily changeable or the ones that are faster in data flow rate are pointed out which followed by a section about other communication needs, mentioning the new systems which can also be produced in Turkey. A section about heating ventilation and air conditioning is introduced, indicating the extra issues that have to be taken into account for the automated office. The importance of illumination is introduced, necessary measures

pertaining to an automated bank office are introduced, pointing out the contrast, direction and level of lighting. Color and texture section then is introduced to enable designer to avoid inconvenient color or texture selection for an environment where computers are used. Then the acoustic problems are discussed, methods for preventing noise are suggested. At the end of this section installation and maintenance warnings are given to designers not to create an non–maintainable office. After the technical requirements a resting and pausing place for the computer users is suggested for their psychosocial needs. Finally, briefly, the modular systems are mentioned.

2. AUTOMATED OFFICE DEFINED

According to Doswell: "Offices are where information is processed" (Doswell, 1983; p.10). The definition may or may not arise some arguments among different people in the field. By giving a more detailed definition one may be more specific to the function of the environment. As Stewart states: "Offices can be regarded as information processing systems comprising people, equipment and procedures which work together in an environment to perform a business function" (Stewart, 1984). This implies that an office has to be complete in itself, being a system. This system has to perform for processing information by utilizing people, equipment and procedures. The definition brings along the question "Why do we have to process information at all ?" Since the invention of writing, man has felt the necessity of writing things down for later reference. Things verbally passed may always have ambiguities; but written information is more direct to the meaning. The property just mentioned, afterwards has become a necessity for legal purposes. Giving an example of written versus spoken information and what could be understood by an addressed person may clarify the situation.

> "Send reinforcements I'm going to advance." statement could easily be understood as:
>
> "Send 3 or 4 pence I'm going to a dance." (Doswell, 1983; p.11)

The automated office is where information is processed by methods and machines which save human labor. For the automation Jarret states: "Offices are automated by systematically applying the appropriate technology to the office environment to increase productivity and effectiveness." (Jarret, 1986)

Office and automation are readily merged into each other. Looking at the past and the present one can have a picture of merging the office and automation in the time domain.

2.1. What was, what is, what will be

The change in offices is due to technological development. Most of the technical innovations that could save time were readily adapted to the office environment. Companies having the power to pay for these kinds of developments were the main interests of the inventors and producers. Even a battery powered pencil sharpener is something that found its place in the office, considering amount of time that was being lost while sharpening pencils by office workers, it really pays for its price. Some offices were even hiring people to do this pencil sharpening job. We can look at the offices roughly in a time domain as past, present and future.

2.1.1. Yesterday's Office

In yesterdays office there, usually, was a single person running after every possible work to be done. Lawyers, bankers, accountants were working in this fashion. Not much of a document was handled. And the time duration for every task was so spread out that one could say there were no timing limits for tasks to be completed. But when cities became more crowded and people in a province did not have a chance to know each other, the office procedures became more complex, time consuming, while at the same time they had to be fast, more documentation was required. Handling these documents required more people. Typing pools appeared (Figure 2.1). The spatial requirements of offices increased.

Galitz's view of the offices of 1800's may help us to visualize office environments

of those days.

> Most organizations were small and occupied a single location. The few employees located outside the office were usually agents marketing the company's products elsewhere. The bulk of written communication occurred between the company and the outside world. (Galitz, 1984; p.13)

Those days internal communications were oral, written documents in the office were not a wide spread application.

Figure 2.1. Typing Pools (Jarret, 1986)

Evidently storage of the documents was not a big problem. "Storage for written communications usually consisted of rolltop desks and boxes or drawers in which paper was stored flat." (Galitz, 1984; p.13)

It is, then, obvious that retrieving information from the storage is not a simple task to do. This also explains the apparent limitless time for a task to be done. Until 1876, according to Galitz, when vertical library card files were designed and followed by vertical office files where searching was done vertically without removing the contents of the file. Copying correspondences, before sending, as Galitz states: were then made by pressing dampened tissue leaves of a bound press book. With the invention of the carbon paper, copies could be

made and document indexing schemes could be developed for faster retrieval of the information.

These developments brought in some standardization as well, such as the sizes of the file cabinets and papers and most important office components. As Galitz states: "The design of the office components were standardized, reflecting primarily engineering and manufacturing considerations." (Galitz, 1984; p.14)

In yesterday's office there were typewriters, and telephone. For letters, the postal service was utilized. In the 1870's typewriters were mass produced, which followed shortly by the telephone (Galitz, 1984). The typewriting machine basically has not been changed since its first invention. Helping in transcribing information into written documents efficiently, usually utilizing a keyboard as human interface. Noise due to typewriters was inevitable. Although some innovations were made to decrease noise, not much attention has been paid to these developments since most of these machines–which were noise damped–could not produce copies. Besides noise postural, and muscular problems might arose. Telephone then, was not used as often. Later, telegraph replaced mailing for speed purposes (only for informal communications, keeping in mind the problem of being misunderstood by the other party on the telephone line). Type writers became electro–mechanical and then electronic. Telephones advanced and served more complex requirements. Some other machines were tabulation machines, teletyping machines, mechanical calculators, and money counting machines.

As stated earlier, the design of the office, when it started to get complicated, was left to the engineers and manufacturers of the time.

2.1.2 Today's Office

The space requirements of the office further increased. More efficient ways of interaction among workers were sought after. The plan of the office, then, changed from the conventional type to the open plan type due to inter office communication requirements. After the introduction of electronic communication, the office plan then started to incline towards more private plans. This occurred in two ways: one being towards the conventional office plan and the other being towards closing the open plan for more private spaces (Pulgram and Stonis, 1984).

The conventional storage spaces of the yesterday's office, although getting bigger, have not changed. With the introduction of electronic storage media, the necessity of storing every phase of a document became obsolete since most of those phases have been done on computers.

As regards the equipment, operations and their interfaces in the recent past's time domain Pulgram and Stonis classify them as follows:

> [1] First half of the 20th century:
>
> Equipment:Standard electric typewriter, teletype, duplicating machines, copiers, calculators, adding machines, tape recorders for dictation.
>
> Operations:Manual.
>
> [2] Mid-1960's #1:
>
> Equipment: Data-processing computers are introduced in to the conventional operations. Centralized mainframe computers are removed from general office and the "Computer Room" is initiated.
>
> Operations:Check issuing, storing, payroll data, inventory control, bill payments; engineering and scientific applications.
>
> Electronic Interface
>
> [3] Mid 1960's #2:
>
> Equipment: Introduction of terminals (display and keyboard) tied to mainframe, teletypewriters (no display), minimum peripherals,

that is, printers.

Operations:Electronic and manual.

[4] Late 1960's to mid-1970's:

Equipment: Minicomputers, stand alone terminals, distributed logic terminals linked to mainframe or a minicomputer integration of electronics into the typewriter; expanding peripherals, that is, printers, copiers, OCR's (optical character recognition), disk drives, photocomposition equipment.

Operations: Electronic technology becomes more applicable to office tasks with word-processor equipment and software, micrographic systems, developing telecommunications capabilities, electronic mail. There is more equipment to design and plan for the office.

[5] Late 1970's to early 1980's:

Equipment: Continued miniaturization of the equipment; introduction of microprocessors, integration WP/DP (word processing data processing) graphics software, briefcase terminals, and remote work stations; continued integration of smaller microcomputers in to the office; less space requirements.

Operations: Proliferation of small-scale microcomputers in the office; personal computers, cluster configurations, telecommunications linkage of remote terminals; networking concept linking all automated office equipment, local or remote; dissolution of the conventional office because of portable terminals equipped with appropriate software and communicating devices. (Pulgram and Stonis, 1984; p.18)

It is obvious that, this electronic trend will not stop developing, most developed installations being in the banks. The Automatic Teller Machines (ATM) in the banks are the restless workhorses handling most of the routine, time consuming, non–beneficial money withdrawing and investing. There are even machines which can do almost 99% of the banking tasks. Today's computers have more capabilities than their big brothers while occupying the space that is completely incomparable to their ancestors. But the number of different equipment also increased answering different tasks. Like paper shredder, in every office today, is a must for data security purposes.

2.1.3. Tomorrow's Office

Tomorrow obviously will be the days of electronic devices. And the paperless office dream will be realized. As Jarret states:

> The electronically automated executive will barely have to move. He or she (or it?) will sit at a console panel in front of screens, flashing lights, and touch–sensitive switches, in instant communication at will with other people in the office and with other offices around the world. The manager will also be able to converse with the system that controls the electronic desk–cum–secretary, addressing commands to it and discussing 'what–if business planning' with its built in calculator. (Jarret, 1982; p.1)

Following today's developments in technology and what Jarret stated in 1982's, the current situation shows that his futuristic dreams are almost realized. Now technologists are not even trying to make up fantasies about the future, but rather they realize.

Government policies should change to accommodate for paperless office realization. Storage media also should be developed for legal validity of the stored computer data. Banks are trying to get all their tasks be done using computers. The developments in computer software area will eventually automate the decision taking process as well. The result will be to decide just "what could have been" and the future investigations will be done immediately. Only new possibilities which is really a creative part of the work will be left to human beings.

2.2. Main Office Types

Offices exhibited different installations to achieve the varying functions of numerous business types. These changes are due to some trends in the business where business required a divergent sensitivity. Small companies enlarging by time, caused the architects or contractors of the time to make radical changes to the well known office plan. Throughout the evolution of the office, different plan types were used. These plans can be grouped as:

1. Conventional Offices

2. Landscaped Offices

3. Open Offices

The specific characteristic of these office types are discussed below:

2.2.1. Conventional Offices

Offices planned before 1950's, according to Pile, are considered to be conventional offices. The conventional office is derived from the old single room office building plan. They were designed taking official work as a form of study (Pile, 1978). The statement holds true if one considers official work load of those times. Companies, then, growing larger and requiring more space for office procedures, were resorting to hire more of the single room offices in an office building, hence, comes the conventional offices with a narrow ribbon type plan, characterized by narrow corridors with many small rooms leading to them. Access, as Pile states, is by a system of corridors that lead from entrances, stairs, elevators, and utilities to the individual offices. (Pile, 1978) (Figure 2.2)

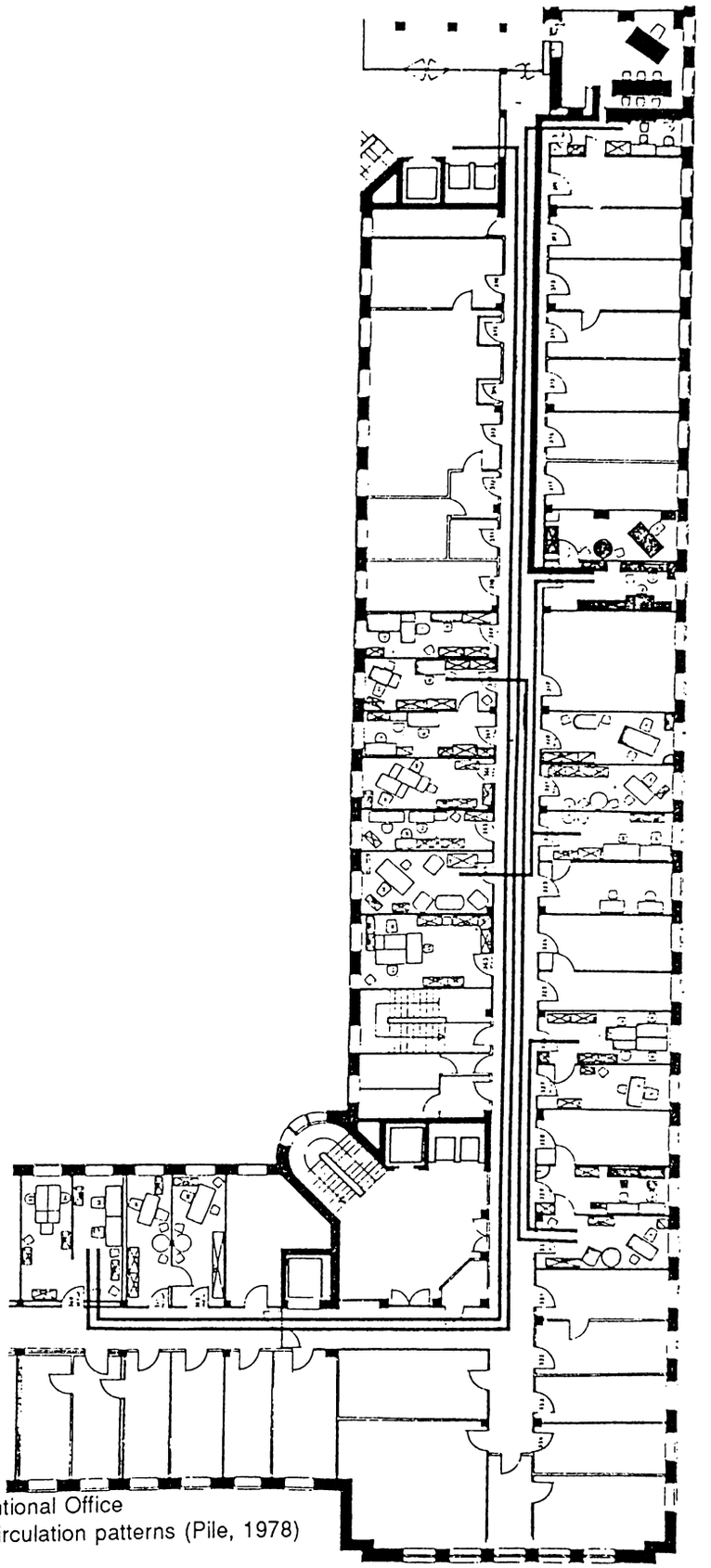


Figure 2.2. Conventional Office
Note the illogical circulation patterns (Pile, 1978)

The office layout is made by thinking sequentially about all the necessary tasks to be done. The plan is static. Any change to the plan requires time and it is costly. Since often walls has to be knocked down, floor height has to be altered, and might require many other changes depending on the program. Sometimes the change might not be possible at all. The spatial divisions are arranged according to the status of the officers. The biggest rooms are given to the managerial staff. Furniture likewise is attributed according to person's rank, directors getting the biggest desks. Rooms put around the periphery of the plan utilizes most of the windows for the office use. Communication and interaction among workers is at a minimum level. Hierarchy, dominating the relationships among workers, is very apparent. Team work is not an easy task to achieve.

A conventional office is the hardest one to automatize. The extra cabling required for the equipment can not be conveniently laid, electrostatic precautions can not be readily taken. Every attempt at a change or at an addition, due to static nature of this type of office, might conclude to a more chaotic situation as a result. The company's identity can not be reflected throughout all the office rooms since the appearance of rooms will depend mostly on their user.

Conventional offices are more private in acoustical and social aspects. The territory of worker is well defined in its four wall, whereas social relations are ill defined. The environment, being static, causes psychological disturbances among workers. Absenteeism occurs due to environmental boredom. Acoustical noise build up in a single room can be easily controlled.

Banks, however, do not utilize this type of a plan except in their main branches or in a branch where there are extra tasks being handled other than the ones in a customer based bank branch like personal credit account services.

2.2.2. Landscaped Offices

This type of office was first introduced in Germany in the 1950's (Pile, 1978). Most of the time this plan is confused with the open office plan. The layout of the plan is more systematically approached. Plants are introduced between desks. Walls are removed for more interaction and communication among workers. Replanning for a new organizational layout is less costly, and less time consuming.

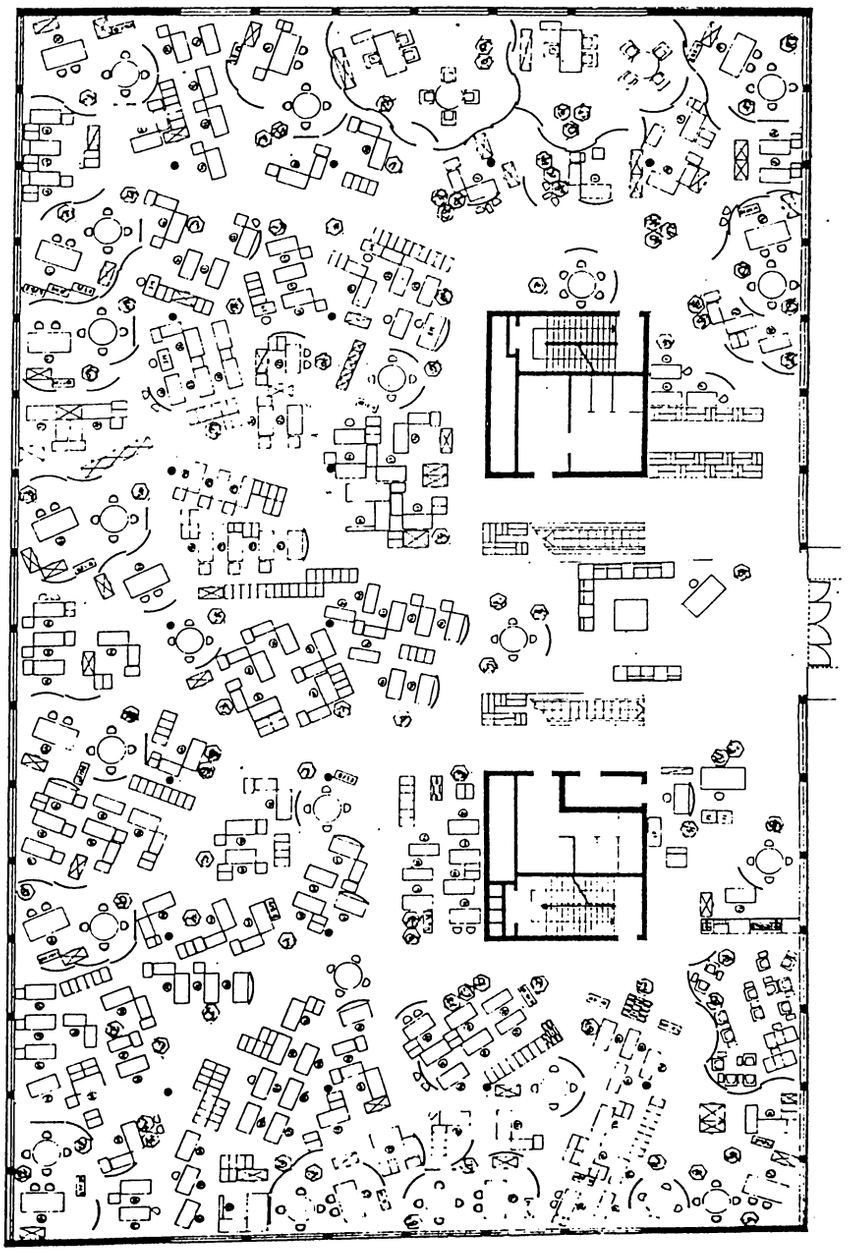


Figure 2.3. Landscaped Office first ones from Germany, 1963 (Pile, 1978)

The plan of these types of offices seem very irregular (Figure 2.3). But this approach is due to systematic arrangements of related parts of the office.

The key idea behind the landscaped office is that the organizational changes should not require any building effort. With these types of offices the individual requirements of people are considered. People can be made to work in teams. Sharing of ideas and collaboration among workers is easy. Interactions are less formalized. Office landscape could not supply the demands of ever growing office technology.

This type of a plan in a bank is perceived as disordered. Customers like to see a more ordered place, reflecting seriousness, in a bank. The banking business requires banks to have a serious identity. A seemingly disordered, which is the case for landscaped offices, plan would not have arose assurance on customers.

2.2.4. Open Offices

Open offices emerged from the necessity of replanning for an organizational change. In essence this type of office does not have much difference than the conventional office, except for not having heavy walls but rather partitions. Banks innovate on their services to attract customers in today's fast pacing competition among themselves, being forced to use systems which permit frequent changes in the organization. Today customer servicing banks utilize open office plans. Other banks such as wholesale banks where customer is searched and amount of money involved is too high in quantity utilize conventional offices. This type of banks being less in number and utilizing less people do not face a severe automation problem since their networks are not big either.

There are four different approaches to open office layouts:

a) Bullpen type plan

b) Single office type plan

c) Executive core plan

d) Open office plan

These can be differentiated as below:

a) Bullpen type plan

This planning type has executives spread around the periphery of the plan. The clerical desks are in the middle. Mostly transparent partitions are utilized for more light and interaction (Figure 2.4). Light could be used by executives as well as clerical workers.

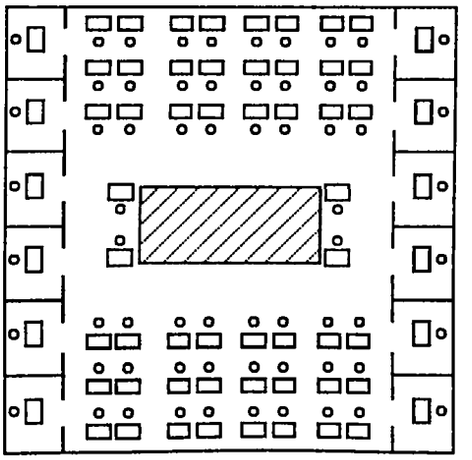


Figure 2.4. Bullpen Type Planing
(Erbuğ, 1987)

This type of a plan can be used in a bank, peripheral rooms being spared for services and director's room and/or for the work which require concentration, and privacy. The space would use maximum light present and installation of the automation equipment would also be easy. This plan has a slight difference than a executive core plan with less light for the clerical front office. For changing suitability, of this type of a plan, it can be said that it is not as efficient as open plan type but it is the easiest, sharing the same level, among

these four open plan types.

b) Single office type plan

There are different rooms of differing sizes. Some sitting 3 to 6 people. Again executive rooms are around the periphery. (Figure 2.5)

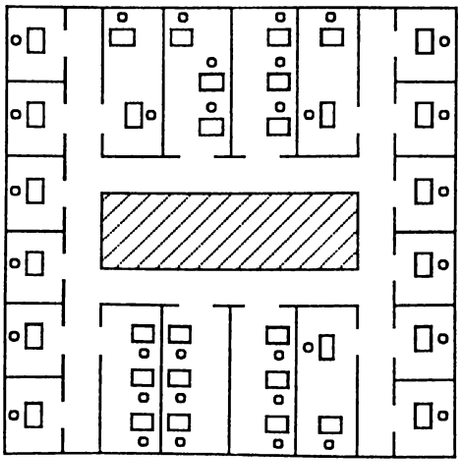


Figure 2.5. Single Office Type Planning (Erbuğ, 1987)

The plan introduced here is not very useful for a customer based bank but it may be well utilized for banks having other services in the second floor. Then, it can be used with a executive or open plan in the first floor, being used for customers and front office tasks, while other being single office type plan for the services and director's room. This plan is not very suitable for quick changes; but if modular panels, designed for the purpose–enabling utility lines be laid through them–are used, it may still be possible to have a quick organizational change.

c) Executive core plan

Executives are in the mid–core of the plan and clerical desks are put around the periphery (Figure 2.6). Most of the banks in Turkey utilize this concept in a different manner. The director's/directrice's room is situated at one side or against a blank wall. The front office and the rear office are laid starting from

the entrance respectively. The other services may be put around the far end of the office in the same manner as directors' offices. As stated earlier this type of plan uses more of the available light in the clerical area; but if there are going to be a large number of computers in the clerical area, and if front desk furniture is not going to have a shading provision it is better to use bullpen office plan with less light in the clerical area to lessen the glare problem, which will eventually take place.

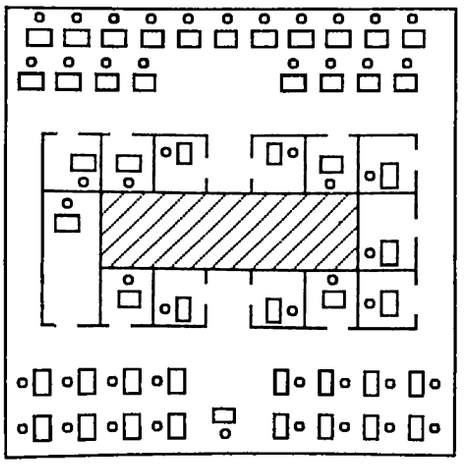


Figure 2.6.The executive core plan
(Erbuğ, 1987)

d) Open office plan

With this plan no divisions are made for different space allocations. This looks more like a landscaped plan but the systematic approach of the landscaped plan lacks (Figure 2.7); whereas a more ordered look can be achieved easily. By compromising some of the systematical approach of the landscaped offices in the open office one can still have a well balanced organizational allocation.

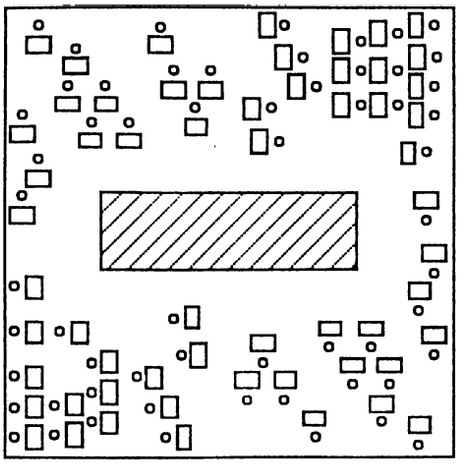


Figure 2.7.The Open Plan Office
(Erbuğ, 1987)

Open offices drew the attractions of many people and recent developments in this field eliminate the problems of this type of office. Then instead of having fixed heavy walls it would be possible to change the complete office layout in a very short time with these movable partitions. In the USA this type of offices were widely adapted. Whereas in the European countries open office planning is approached with fear, and was considered not answering personal requirements of the workers lacking privacy and territoriality. But these shortcomings for the general offices does not apply for the banks case, since most of the tasks require that procedures be done under less privacy. However, when required, modular panels may be used to implement acoustical or, depending on the height of the modules complete privacy can be achieved.

2.3. An Appropriate Plan For The Banks

The appropriate solutions answering dynamic structure of today's offices can only be met in the open office plans. When a bank branch is being modified for automation, or for the first time installations, the designer, then, before going too far into knocking down walls and making changes and continuing in this fashion for further adjustments, has to think that anything he designs today is

not going to be there forever. The dynamic nature of today's offices especially bank branches, therefore, naturally require choosing open plan office for implementing automation.

3. OFFICE TECHNOLOGY AND INFORMATION

Office technology and information deals with the office procedures for the processing of information. Office is a functional space where, while designing, a designer has to play the role of a conductor in an orchestra among many technical disciplines.

The designer, then, is the only person who can create and who is directly related to human senses in an aesthetic pronunciation. All the other people gathered in the process of designing, excluding the architect of the building, can only point out technical aspects of the problem. A managerial person might worry about the resulting output increase that will eventually take place at the end of the design phase or he might be interested in the amount that he must invest to set the office working with its bare minimum. He might be interested in the method which the payments are arranged, or the interest rate that the company has to pay to cover the mortgage. An electrical engineer might be interested in the way he/she could pass the maximum amount of cable through a tubing, or rather if he/she could pass a fiber optic cable through a cabling conduit so that: both electricity and telecommunication lines would pass through one single duct. A lighting engineer would only be considered about the amount of light that averages in an enclosed area. But only the designer would be the one to think about people's likes dislikes, the quality of the environment that will be realized, the physical and psychological condition of the workers in the environment, their probable relation to each other, the future possibilities of the design that henceforth will be brought by.

An office environment is a very complex environment depending on the type of business being held in it, a wrong decision taken in the design phase might cause uncountable problems that might not be evident before hand. A designer then has to be pre-warned of the possible malfunctions that might occur after the design is applied to an environment. Leaving all the technical jobs to be done by the technical staff and thinking that they will eventually end up in a functionally perfect solution should not be a credited understanding for a designer. The end product, done by isolated technical man, most probably will coincide in certain aspects to one another. The designer, in the process, being the conductor of the whole assembly should be in a position to compromise, to get the best possible result attainable under given circumstances.

It is, then, necessary to find out about the required interactions among disciplines (Figure 3.1). For large installations a planning team would be required for the design and planning process. Then, every entry in the given table becomes a person playing its role during the planning phase. For smaller installations the entries in the table may become only advises from the representatives of these disciplines, or if the designer has experience in the office installation process it should be his duty to accomplish requirements that would otherwise be proposed by these disciplines. In this thesis only the interactions related to office automation will be considered.

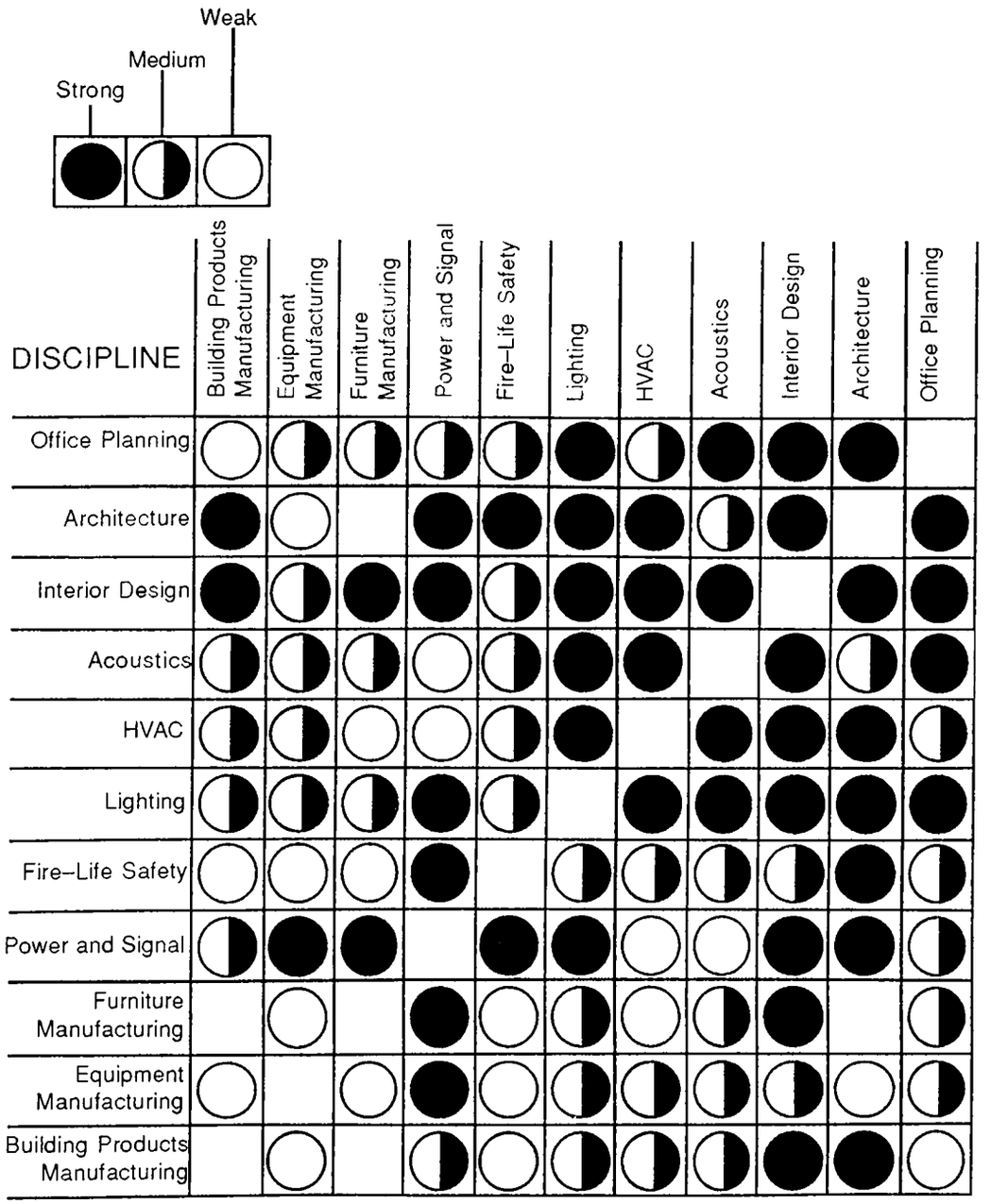


Figure 3.1. Matrix Of Interaction (Harris,1991)

While designing, as it is always done by the designers, the real problem must be identified. As previously stated offices are where information is processed. The information is mostly, unless some other means of storing documents is used, in the form of papers. The other form mentioned should be one which cannot be altered easily (i.e. they are legally valid for all times). Even if not in the form of paper, information in office is referred as papers. Then, the designer

first has to look at the flow of paper. Communication while attaining the paper work is another important issue that shapes the plan of the office. Communication being directly or being via a media in verbal or textual form with today's technology requires the plan of the office serve for the necessary utility lines for the media.

3.1. Paper Flow and Office Procedures

Paper flow constitutes letters, and documents. There are incoming and outgoing papers which have to be organized in a certain order for later reference.

It is getting harder, everyday, to find skilled employees who could answer all the requirements of the office procedures, while office procedures too, are becoming complicated. The scarcity of skilled people then forces employers to find newer methods to fulfil their needs. Due to complex procedures, need for a control mechanism increases. In today's offices a whole process of an office file without a minor error is almost impossible by manual methods. Hence, automation becomes an essential solution. But it is not without its drawbacks. Automation radically changes the regular office procedures.

The design of the office should start with a through document flow study as Harris states: "The document study may be electronic, paper or both, depending on the degree to which computers and electronic mail are utilized." (Harris, 1991; p.20). This study does not involve designer but directly concerns him since the mentioned flow shapes the plan of the environment. Among the managers and planners the flow of the documents should be reconsidered for automation. The study is not a too complicated but a time consuming one. It should be done by recording even the smallest movement of the document from one place to another, then, one has to streamline and smooth the process to a lesser number of movements. In one actual project, as Harris states, "the

processing steps in a particular document–flow network were reduced from seventy–three to three without alteration in the desired results." (Harris, 1991; p.22).

In USA reduction in mail service quality caused offices to search for different mailing methods (Price, 1979). Teletex was one of the methods the offices first applied to solve their mailing problem. Today's solution to this problem is to use facsimile which can send and receive graphical as well as text at the same time. The legal restrictions, which don't count facsimile outputs as valid documents, makes this type of paper handling a temporary one (just to gain time to put procedures on the go). All the banks in Turkey, soon are to be interconnected in a network which, then, may enable the electrically sent documents to be valid.

Author's interviews with banks showed that in Turkey, banks do not follow a fixed pattern of document–flow, except the documents sent to Central Bank. Therefore, it is left to the designing team to involve managerial staff to get a certain flow diagram.

Computers are being used in banks for tasks such as:

- Retail Operations: These are everyday tasks done for every customer of the bank, for any operation, like a customer's withdrawing money from his/her account. (This could be an ATM operation)

- Payroll Operations:Companies being the customers of a bank require that banks do the necessary payroll operations of their workers' accounts. Company deposits the of the salary of their workers into an account then the bank allocates this amount into the workers' accounts.

- Savings' Accounts:Any individual account that a customer puts his/her savings.

- Foreign Exchange Operations

- Money Market, Capital Market Operations

- Draft, Policy Collections

•Cheque Operations

•Reconciliation

•Treasury Positioning

•Financial Analysis, Credit Vertives

•Assessments

•Active–passive managing

•Document Routing (Anon., 1992)

Not all banks do the above tasks by computers. Some banks are still in the decision phase and some still are under–utilizing their systems or simply they do not have equipment which respond to these needs.

3.2. Storage Requirements

The paper–flow, eventually, gives rise to a necessity for storage, being electronic or conventional. Since the electronic storage is prone to malfunctions, storage of backup copies is necessary in case of any failure. The electronic storage in today's technology, does not require the same space that of the 60's and 70's computers required (There are no reel–to–reel tape drivers, nor their big storage closets) . Almost all of the data that a big bank's main branch requires can be stored on optical disks which do not require more space than a 45rpm. (revolution per minute) record. Today commonly used practice is to store data on data tape–cartridges. These also are not space hungry; but does not hold as much data as an optic disk. There are special boxes designed for data tape–cartridges and don't occupy more than 20x50x20 cm. volume. The essential point here is to have backup copies depending on the importance of data. Sometimes more than once and it should be made clear that all the backup copies are not in the same box. However, all of these would be rather convenient if legal restrictions did not require banks to keep paper documents beside electronic media. The

Central Bank of Turkey is trying to install a network that will eventually connect all the banks to the central bank, which will result in reduced paper documentation. Bank branches have to keep their paper documents until their inspectors give them a check, meaning a load of (depending on the branch's size and customer load) at most 6 months' documents being kept in the branch, which will force the designer to spare extra space for paper documents.

3.3. Communication

Communication in offices utilize mailing, facsimile, and telephone. Telephone communication can be oral communication and data communication.

3.3.1. Oral Communications

Oral communication is used for informal information transfer requirements. This mainly means the telephone and sometimes face to face conversation. The conversation may be among neighbouring workstations as well as among other units. There should be a possible acoustical barrier to avoid unintended hearing at the neighbouring workstation but also with a little effort, when necessity arises, one should also have the opportunity to converse with the neighbouring workstation. The acoustical precautions taken would also improve noise performance quality of the office.

3.3.2. Electronic Data Communications

Data communication in a bank is a crucial one. All the automation depends on this electronic communication. Local Area Networks (LAN) are utilized inter–office connections. This requires a cable, proper to the chosen network type. These LAN's are interconnected to Wide Area Networks (WAN), via telephone lines, then eventually to the main computer center of the bank. When computers were first introduced to banks in Turkey, data transfers were being done by using tapes, disks and the media of the like or via data lines which were not always on (Off–Line). Then, computers were only used for accounting. Branches were transferring data to the main center on a predetermined schedule. Today most of the banks utilize ON–Line Real Time (always on) systems, where the operation done at the terminal immediately is processed at the main branch. This system opens new opportunities for services and is more reliable for both parties. Using this system almost all of the tasks done in a bank are done using computers. PTT (Post Telephone Telegraph) in Turkey rents banks telephone lines having properties for data communication. In foreign countries many security problems occurred, like people tempering with bank telephone lines and abusing them. PTT's approach is more reliable and secure, since hired lines do not have external access. The ATM's are also a terminal of the LAN. Some of the banks which give ATM's a separate telephone line, put ATM's in a network among themselves. The decision is taken by the bank management, and depends on the speed and flow of data in a given bank. A hybrid installation is also possible.

4. AUTOMATION CONCERNS

In automated offices usually the power of machines is exaggerated to an extent which goes beyond increasing productivity; but rather causing irritation among office workers. The issue here is not one to be solved by the designer but rather has to be solved by the management, otherwise workers become illiterate and their work status decreases. Getting workers ready to face new technology is an important issue for the managerial people. Being too optimistic about the results of automation is not acceptable. The managerial staff and the designer has to think about the possible malfunctions which might occur as the design ends up in an installation. Thinking purely of the economics of the problem while implanting the office, at the end, mostly generates disastrous, unhealthy, fatiguing, and unpleasant work environments.

4.1. Equipment

Automated office equipment, everyday, is getting more in number and achieving more of the manually done tasks. This, then, makes one to think to get the most recent one that is available in the market. This situation is a serious one an unproven brand name or a series of equipment may cause having a dead equipment at the end without any support from the producer. One has to face that Turkey is a remote country and does not yet produce the technology being used in these equipment. A well established equipment with possible exclusion of minor luxuries may be a better choice. Banks in Turkey are backed up by the big computer manufacturers. Some of these manufacturers sharing the

biggest portion of the bank automation market are IBM, UNISYS, BURROUGH, NIXDORF, NCR, WANG (Anon., 1992). Many banks buy equipment directly and maintain with in–house team. These banks also produce their own required software. The others which cannot establish such a technical team, seek for functionality, reliability and service facilities.

Equipment being low quality and weakly designed might lead to many discomforts, time and energy consumption. If one tries to get ex–equipment (which is the case for some banks in Turkey) then one has to forget about most of the efficiency increments. These are like second–hand cars, they consume more energy, fail frequently, and eventually workers end up resorting to old pencil/paper methods, duplicating the same procedures increasing work load extraneously which evidently is not what was being tried to be achieved in the first place.

4.2. Problems of Vision

Problems of vision may arise due to environmental and equipment's quality. Untrained and/or unsuitable people using equipment may have develop visual problems. Like a computer operator with an uncorrected eye defect may have his/her eye defect increase due to poor display or lighting quality. The computer operators periodically should be checked for eye deficiencies. If any deficiency is found necessary corrections should be made. The color, texture, illumination and haziness in the air may multiply the visual problems.

Bank interiors, unlike other office interiors, require that the office be lit all the working hours. Otherwise, a dark bank interior would not arise confidence on customers. A lit environment depicts psychologically that there is nothing being hidden in the space. On the other hand computer terminals require that light in the environment be dim, to decrease glare problems. The design, however, is

required to solve both of these requirements.

4.3. Psychosocial Problems

Human nature cannot readily adapt itself to sudden changes in its environment. Especially if this change means to do things, which they are used to do for a long time, in radically different ways, like switching a typist from a typewriter to an electronic word–processor. In Germany trade unions required that a training permission should be given to the workers (without payroll decrimentation) who are faced with new technology (Rehbinder,1987). Also the work hours should be adjusted accordingly to lessen probable stress on workers.

The other problems of this issue, as Galitz states, are:

> Over simplified, repetitive, routine jobs.
>
> Lost sense of job meaning.
>
> Lack of control.
>
> Monitored performance.
>
> Disrupted social relationships. (Galitz, 1984; p.32)

It is very easy to abuse electronic equipment to monitor people's work performance; but this causes stress among workers. It is said that in Zurich among bank workers the use of tranquillizers has increased after the introduction of computers in the banks (Rehbinder, 1987). The stress of trying to increase work efficiency while racing with computer power is another cause of stress.

4.4. Health Hazards

Health hazards include people being exposed to electromagnetic radiation, background noise, and toxic substances in extreme doses.

This is exemplified by a pregnant operator being exposed to X–Ray radiation or constant noise from transformers, cooling fans or photocopying machines increasing carbon content of the air, etc.

People investigating effects of video display terminals on people are arguing about the radiation being emitted being as amount that could be harmful or not; but it is obvious that, be it the radiation or just about to be mentioned static attraction of VDT's, there is a harm on people, using these equipment.

It is said that there is an unseen attraction towards VDT's due to static electricity build up. The protective layer on human face is pulled towards screen making the skin of the face weaker against airborne particles, like pollens, bacteria and other host of allergens (Wilson, 1991). The author goes on saying that washing the face between each session would help getting rid of this problem until the problem is realized worldwide and be investigated by scientists.

Galitz also warns us about the noise oriented health hazards:

> Sound levels above 60 decibels in offices are generally considered noisy. High noise levels can cause such physiological and psychological effects as increased blood pressure, accelerated heart rate, increased metabolic rate and muscular tension, decreased digestive activity, tension, mental stress, irritability, and inability to think and work efficiently (Galitz, 1984; p.88).

Noise can be generated by impact printers, type writers and equipment cooling fans. Getting a more noise consciously designed equipment or cancelling the noise in its origin should be considered.

4.5. Environmental Quality

Office workers spending half of their waking time in the office are greatly influenced by the environmental quality. Environment directly imposes to the workers and the clients alike the identity of the work being done in that area.

These days searching for a corporate identity in furniture, in design, in graphics, letterheads etc. should also be reflected in the environmental quality. An aesthetically designed office environment, if not responding functionally to the same extent causes workers in that environment not to reflect the same aesthetic given back to the environment which in turn will make workers unhappy, disturbed but may be given only a surface to live with. A pleasingly coloured office room might cause another VDT user to have a disorder in his/her eyes because of the reflections and contrasts increasing to a very disturbing levels in the environment. An office not much thought of while designing can become, bothersome, disordered so the output from this environment might reflect the same kind of an approach to the job. As Manhke's states:

> 1.Drab offices are counterproductive. Off–white, buff, and gray surroundings offer little inspiration. Employers must reflect an image of caring for their employees, and this involves providing environments that will raise spirits, not suppress them.
>
> 2.Satisfaction with the environment is closely associated with job performance.
>
> 3.Office workers spend half of their waking hours on the job. A pleasant setting will positively reinforce their efforts to represent the company's interests.
>
> 4.Orderly environments inspire orderliness; chaotic surroundings may breed chaotic thinking.
>
> 5.Creating beneficial environments may have to go beyond visual experiences. Multisensory experiences may be introduced. This might involve moving from grand–scale public areas to personal–scale work areas, including a texture such as a rough stone wall in an incidental area (Mahnke, 1987; p.71).

Environmental quality decisions, as Harris states, are not design guidelines but necessities (Harris, 1991). And he further goes by saying "If they are not met, then the design process will have failed. Neither available technologies nor costs are considered; user needs are sole focus." (Harris, 1991; p.27).

5. DESIGN CONSIDERATIONS

A successful design of an interior system should be the one that has every subsystem and its components selected and designed to complement, interact and be compatible with each other.

An effectively planned system should have the following attributes (Harris, 1991):

•By defining the minimums for the level of performance of the design or environmental attributes designer should optimize costs with assured performance.

•Designs should be implemented by using the compatible subsystems within close tolerances, instead of losing time for redesigning or rebuilding to have two incompatible subsystems work together.

•Better or less expensive solutions answering the minimum performance needs should be sought after.

•There are always several probabilities to satisfy a given criterion selecting one which does not usually change the cost may yield other by–products enhancing some other physical or aesthetic attributes.

•A value analysis should be made carefully. The analysis only looking at the prices may be misleading. An item costing twice another could be less expensive solution because it lasts twice as long or requires less maintenance or energy to keep it operating.

•If a vendor is offering subsystems compatible with each other by which it is possible to implement most or all of the design requirements, this offer is a guarantee of the installed performance.

•Coordinating subsystems and trades by getting information from vendors about the systems compatible subsystems that mentioned vendor proposes decreases interfacing.

The design for the automation of a bank usually is done by a team of technical people and designers. Large bank corporations, have planning be done by their in–house team, other smaller ones prefer hiring designers, since full time hiring planners, may become too expensive, if the bank is not starting or redesigning too many branches in a year. In Turkey, banks have more branches than the ones abroad; but the number of different bank companies is lower than the ones encountered abroad. In the USA there are 3,000 banks where they have 23,000 branches. But in Turkey there are over 70 banks having 6,000 branches. This is more of a central system (Anon., 1992). The numbers shows that if designer is to design bank branches and has to keep a certain corporate identity the task, then, is a harder one to achieve.

5.1. Characterization of User Requirements

When automating an office, the requirements of users have to be characterized very carefully in a systematic order to avoid unnecessary work stress, unused equipment, extra economical and spatial load. The conventional data collection methods may be employed to determine the user requirements. This requires a close cooperation with the management. The nature of the office procedures for the given program has to be considered. The probable future expansion points considering the aims of the establishment should be foreseen. Current situations, as Harris (1991) states, and what will happen after two years and after ten

years should be considered. This ten years' consideration in Turkey should be cut down at least to five years considering the speed that developments are taking place. "The time is always inadequate, because we are trying to reach to a point, taking one third of time, where other countries have reached in 15 years." (Anon, 1992). Observation, as Pulgram and Stonis (1984) state, provides an overview of a facility. Photographic documentation also belongs to observation category. "Questionnaires and follow-up interviews are conventional methods of collecting program data." (Pulgram and Stonis, 1984; p.22). Only asking managerial staff or just the users might cause unwanted results both on users or managements side. Meetings should be arranged to discuss the resulting data for optimization.

When the design is to be implemented anew then this phase evidently is not applicable. In this case one is required to look at older implementations trying to get the best out of the existing solutions and adding onto them.

The tasks done by each worker, and the parts of the tasks performed using computers can be determined with the help of bank paper–flow study. There may be changes depending on which part of the bank the user is working in. Like being in the front office or at the rear office or in a semi closed area. Services show different functional organizations hence requirements of users change. The users may or may not have to have an access to a printer, or an extra typewriter may be necessary. The type of the printer also changes depending on where the user is working in, a front office user would require that his/her printer be a less noisy one, whereas a rear office worker may have an acoustical hood on the printer. In a service where business correspondences are being prepared the users may require that of a laser printer.

The keyboard types that the users are accustomed must be known. Typewriters and the computer keyboards should be ordered in accordance with these criteria.

Computer producer companies force the users to use English as a language and they offer QWERTY type keyboard, which has the top row of keys allocated as QWERTY, this should be avoided since most of the users in Turkey are accustomed to F–Type keyboard. If they have to use F–Type on their typewriters, and QWERTY on the computer they are slowed down and this situation increases stress as well.

It should not go without stating that a well conceptualized keyboard standard has to be produced by TSE (Turkish Standards Institute) and imports should be controlled for their compatibility with these standards. Apple® Computer company, since their policy forces them to do so, have standardized their keyboards for Turkish F–Type keyboards since their first introduction into the market.

5.2. Space Requirements

Every single detail requiring space in the office should be considered in the given office area. Any extensions out of the given area should be avoided or the program should be rescheduled. A typical bank branch in Turkey, with automation, requires mainly

1. A semiprivate or private room for the director/directrice of the bank.

2. Rear office where the accounting and other non–client related tasks are carried out. Some parts of it may be private or semiprivate. This area, depending on the number of services and given office area of the bank, may be spread into two stories.

3. Front office where counters for the clerical tasks and–depending on the bank's policies–tellers' kiosk(s) are situated (some banks do not have tellers at all; where all the front office workers double as tellers). This area depending

on the load of the bank should also contain a waiting area for the customers.

4. Entrance hall providing ATM(s) and/or–depending on the bank's policies–ATM's have to be put on the exterior walls of the bank branch.

5. Storage area for papers and safe. This area does not occupy too big an area since all of the banks have their paper storage in their main buildings. This area requires that its place should not be obvious to the incoming people.

The trend in today's bank policies is to automate almost everything in the front office and leaving workers only for advisory tasks where people will come and be advised about their investments, exploiting new services, new products for the bank clients. All of the routine tasks can be done by specialized computers–they are also called Automated Teller Machines additionally having a keyboard or touch sensitive screen for more functional usage. Cultural and educational problems do not let banks to implement these automated systems immediately. Anyhow, sooner or later all these systems will take their place, like in the case of ATM's, which we are used to, taking place, in a very short time, in many of the banks. Bank managers are optimistic about the future of these systems besides being a bit anxious about their being secure. When the above mentioned systems are installed, the spatial load of the interior will decrease, the waiting and front office counter area will diminish and probably will be replaced totally by the advisory desks.

A careful task study should be made, and this study should indicate if there are any inefficient points, on the way of the task being completed. For example clerical workers who can handle money as well as papers which in turn eliminated the long cues in front of the teller's counters, freed customer flow, decreased spatial load of people–waiting by the counters–leaving more space to allocate for workers. The same decision also eliminated the repetitive tasks of workers,

releasing unnecessary stress of the routine tasks.

Bubble diagrams may be utilized for different relations and scales to get the necessary adjacency requirements.

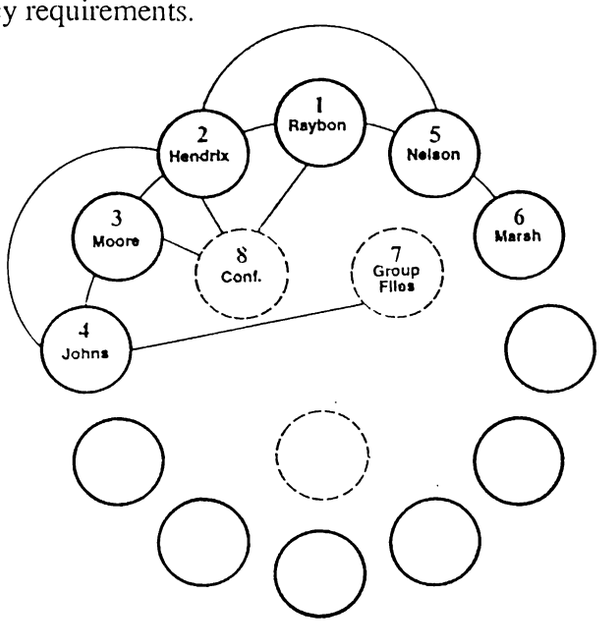


Figure 5.1.The Personal Bubble Diagram
(Pulgram and Stonis, 1984)

The Personal Bubble diagram is used for determining the relationships of the workers within a functional unit (Figure 5.1). The diagram aids in determining how close should workers be situated to efficiently communicate and interact with each other. The diagram can be derived from reduced paper flow diagram. This diagram is then attached to the Intragroup Bubble Diagram to have a bigger look at the picture (Figure 5.2) determining the functional group relations to subdivide the space for, again, more efficient space allocation.

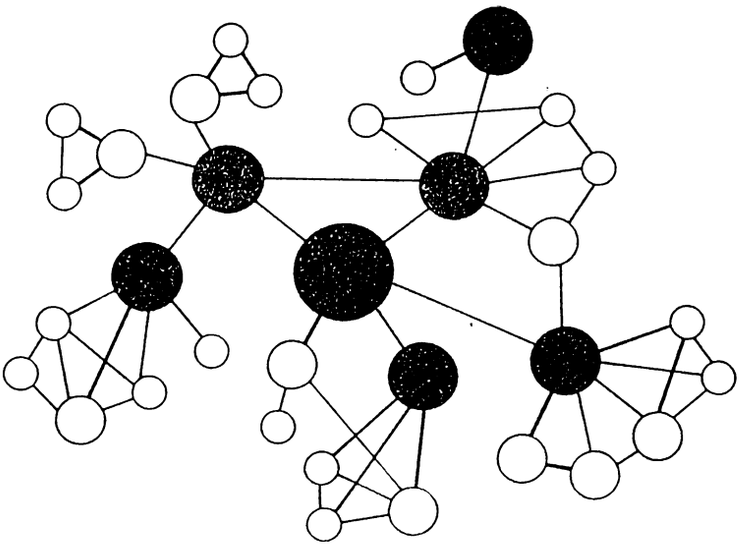


Figure 5.2.The Intragroup Bubble Diagram
(Pulgram and Stonis, 1984)

Then the Intergroup Bubble Diagram helps designer to see the relations of the total groups or divisions within an organization (Figure 5.3). This diagram, depending on the size and workload of the bank branch, may be external or internal to the denoted area.

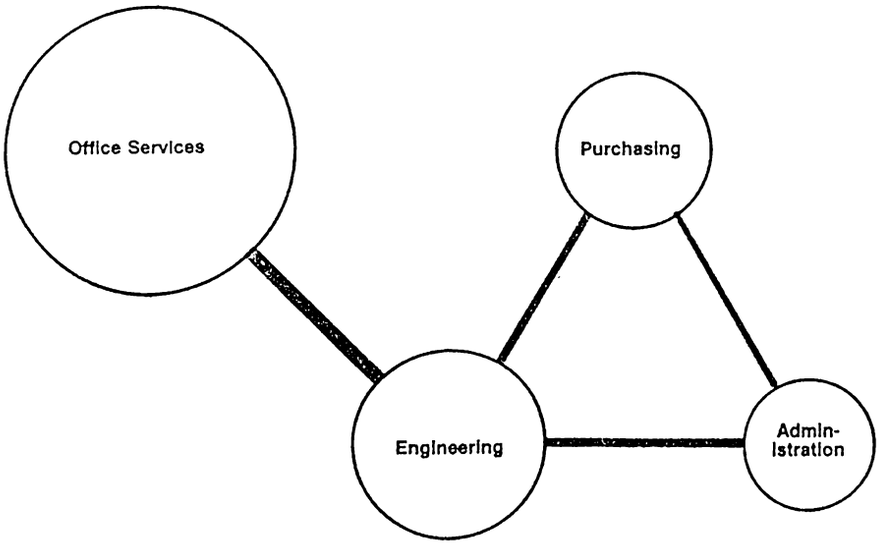


Figure 5.3.The Intergroup Bubble Diagram
(Pulgram and Stonis, 1984)

The area for any given workplace, as Harris states, is the area required for the

items of furniture and equipment, adding to this the area required for circulation within and out of the workplace. The interior circulation is determined by the size of the furniture chosen for the specific task. All these should be done by a team of interior designer/architect and a representative of the furniture company (Harris, 1991). After calculating the area requirements of each workstation, one must sum these up in between each subgroup, and add to these the special area requirements. As Harris states:

> Each work group's existing square–footage requirement is simply the sum of that group's individual and group workplace square footage. The organization's existing square–footage needs for office space equal the sum of all work group square footage, plus the square footage for all special workplaces or areas. In order to reflect any expansion projected for near future, square footage for projected workplaces should be added to appropriate work group calculations and to the calculations for the whole office (Harris, 1991; p.35).

Special area requirements for automation consist of the area for uninterrupted power supply (UPS), for the main server of the computer network (where there may be a system operator responsible for the house keeping tasks of the computer system), and if it exists, a data media storage area may as well be required.

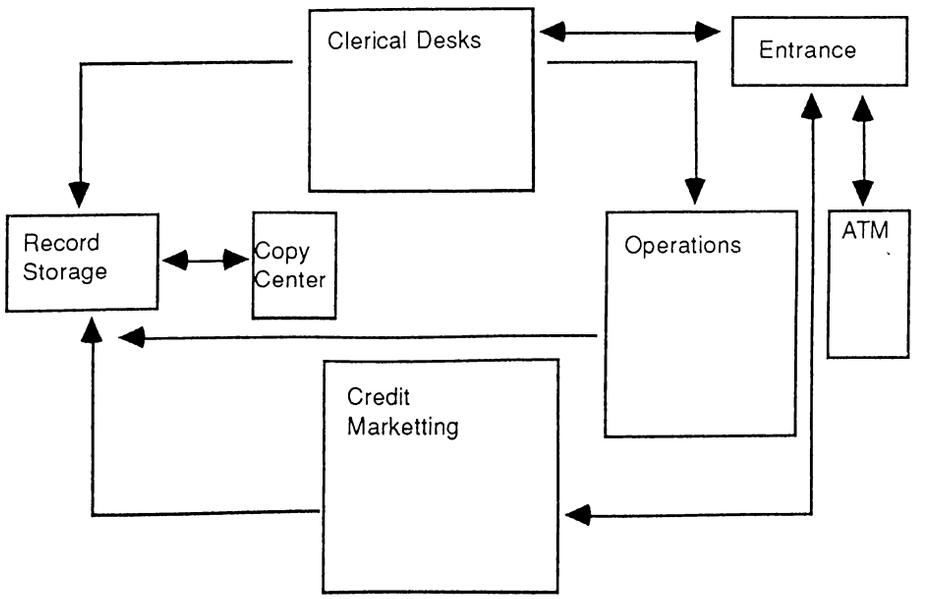


Figure 5.4 Correlation Diagram (Harris, 1991).

Figure 5.4 shows an example of calculated areas required for the workplaces and their relationships. This helps the designer to realize the office plan, while enabling him/her to minimize the circulation areas among functional units. The boxes for each sub–unit should be made to scale. Then, the plan of the office by forming zones between the given areas, keeping in mind the user relations, may be drawn to scale. (Figure 5.5).

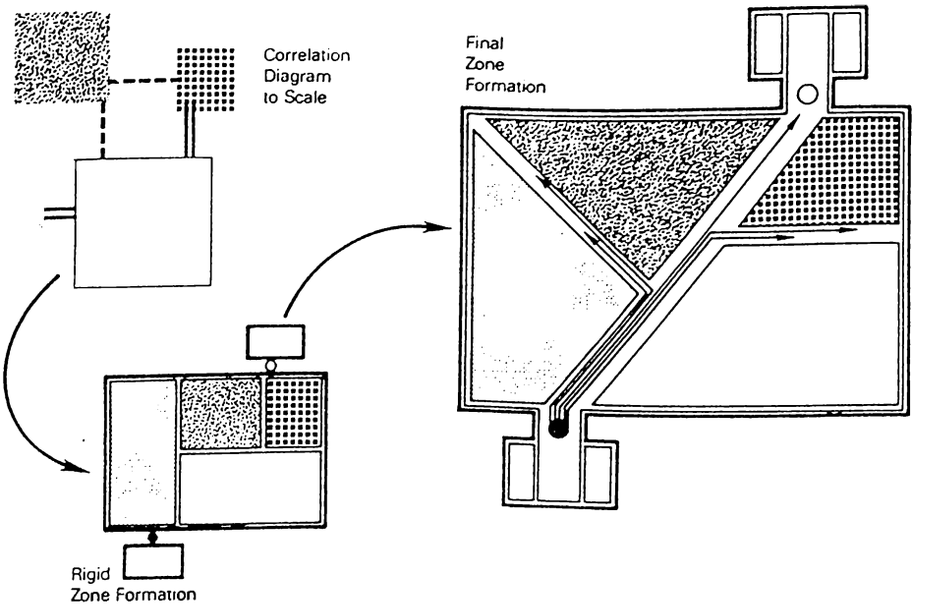


Figure 5.5 Zone Formation (Harris, 1991)

5.3. Equipment Requirements

Equipment if not properly installed, and its working conditions are not met as specified, might malfunction. This may be seen as equipment not answering as required, being prone to accidents, threatening human health. Office automation equipment are mostly of electronic devices, their installation involves all the precautions that has to be taken for any electronic equipment installation. The data, in the case of the computer, being the main source of all the work being done in a bank has to be protected from being lost by taking any possible measure.

When computers were first introduced to the office environment they required

a special air conditioned room to meet their working conditions. The conditions of these rooms were too cold for human comfort values. Thanks to the advances in electronic technology, today one can use computers under many different environmental conditions, particularly under human comfort temperatures. Today's widely applied Personal Computer technology requires a fan in power supplies of computers to cool their inner circuits. This air is electrostatically charged and should be exhausted from the room immediately before it is mixed with the fresh air of the room. Photocopying machines add carbon to the contents of the air, again the same air circulation principles apply to these equipment. While designing the allocations to circulate the air possible air traps must be avoided.

The extensions of the equipment must be considered for a possible future constrain of the valuable desktop space.

The most important of all, though it is going to be mentioned elsewhere under this topic, is the quality of the electricity fed to these delicate equipment. The electronic technology used in these devices is mostly digital electronic technology. This technology is very prone to malfunction when there are 'glitches' in the supply lines. When the equipment are used in a network these glitches may cause loss of a valuable data. In many cases the system might cease, loss of work hours and the work may cause chaotic situations in the corporation. In Turkey there are a lot of companies where automation runs along with manual procedures as duplicate since most of the systems have failed. The cause of these failures may be traced down to electrical supply quality. The supply precautions to a certain extent are taken by electronic equipment manufacturers; but these are not for the worst conditions. Think of a bank branch being in an industrial area in Ankara or Istanbul where there are large electric motors running, the proper retention of data may be a chance for the computers.

The solution is to install line filters locally and/or on the desktop furniture. There are companies offering built in line filters on the furniture. Choosing one that has this facility might be a positive approach.

The above electrical interferences can also deteriorate telephone communications which are also used for ex–office data transmission.

Electronic equipment does not like direct sunlight. Their usage, as well, becomes impossible under direct sunlight. The control panels on most of the photocopying machines have LED's (Light Emitting Diode) as indicators which would not be perceivable under direct sunlight. The plastic and the finishes used on equipment would fade and deteriorate for the same reason. The solution is to use tint film filters covered on the window glasses to decrease the effects of direct sunlight. This also helps controlling the natural light level of the environment.

5.4. Technical Problems

After the above requirements are met, the office has to be technically prepared to face the new conditions.

5.4.1. Power Requirements

All electrical or electronic equipment require some kind of a power supply, being portable or fixed. Portable ones while serve for some specific purposes are not feasible in the long run, since they require frequent maintenance.

Most electronic equipment in the office requires power to be continuous, thus, requiring uninterrupted power supplies. These supplies are bulky and radiate heat. Precautions has to be taken for these type of equipment. Mini or mainframe computers, although they seem obsolete for the time being, require their power supplies to be elsewhere, or outside the office. The heat emission consideration

applies to these as well.

Office telephone systems, for their power to be continuous, require lead acid batteries. These batteries, depending on the type of the equipment, may be bulky car batteries. If not maintained properly these batteries emit harmful gases, and leak acidic liquids. The dry batteries can be used instead; if there are no long mains failures. A utility area should be spared for these batteries. Probably the auxiliary supplies (i.e. Uninterrupted Power Supplies, Separate Power Supplies) as well as the telecommunication equipment can also be installed in this area.

An average personal computer being produced today, does not require too much of a power, around 100–300 watts at most, or the so called workstation models being at a rate of 1000 watts maximum. These values, with the developments in technology, laptop computers, and Liquid Crystal Display (LCD) screens, are getting less and less every day. Photocopying machines have a little higher requirement than this value, depending on the model of the equipment, around 400 to 1200 watts. While designing, one has to think about the required power deliveries. If the equipment are not yet purchased, and their models are not yet known, considerations should better be made regarding the one which dissipates the most. These equipment, depending on the make and technology being used in their power supplies, when first turned–on draw more current (power surge) than they do under normal operation. Therefore one also has to consider this turn–on increase in current as well.

Considering current rating there are some rule of thumbs not to forget as Hall states:

> The current rating of the cable and components must never be less than the protective device which controls it. A fused switch of 100 Ampère (A) rating can only serve a cable having a current rating of 100 A or more and the switchgear at the opposite end of the circuit must also be of a 100 A rating up to the next smaller

> fuse or miniature circuit–breaker. It is important that fuses or miniature circuit–breakers should provide discrimination, e.g. each subsidiary fuse or circuit–breaker should isolate a fault in its own section before the fuse or circuit–breaker one stage further back in the installation can operate. To ensure this, the ratings of two successive fuses or miniature circuit–breakers must differ by at least 30% and preferably 50%. To achieve this, it may sometimes be necessary to increase the cable and switchgear ratings so that the main fuse or miniature circuit–breaker cannot operate before a subsidiary one (Hall, 1990; p.27).

If the data in a computer is an important one, which is in the case of a bank, a failure in one terminal, should not effect any other terminals . It should be possible to isolate the malfunctioning part without disturbing the rest of the system.

5.4.2. Cabling

Cables are inevitable in the electronic office environment, being power lines, telephone lines, device interconnections, communication lines.

Cables have to be classified among themselves according to their function, load capacity, fire properties. Proper layout requirements should be met according to the use of cables. Visual field can very easily be crowded with cables. Users should not feel the necessity to add any extra cable staggering around the office floor. Enough outlets for every workstation should be provided. Furniture should be chosen so that they accompany in the same fashion, aiding passage and connection of cables.

To deliver power and communication to each workstation requires distribution systems be utilized. There are several of these systems each having their special application areas. These are: Power Poles, Underfloor Duct, Poke–Through, Underfloor Cellular/Access, Access flooring, Flat–wiring, and Screen wiring systems. They are discussed below for their properties, and suitability for the bank installations

Power Poles:

This system utilizes poles near the workstations to deliver power and signals. This method requires either a built in floor–ceiling sandwich or a suspended ceiling should be installed. In some cases power can also be taken from the floor as well. As Harris states:

> The main distribution source for power poles is typically installed within the ceiling plenum or in some cases in the floor system. Designed specifically for the open plan office, the power pole usually provides a quick connect to the main source. The name "power pole" today is a misnomer today, since most units have the capability to distribute signal wiring as well (Harris, 1991; p.216).

Since too much of these poles obstructs the eye line, designers do not favor this system. Figure 5.6 shows a power pole which uses suspended ceiling and the power is taken from the ceiling plenum. Pulgram and Stonis states that this system initially is a low cost solution and can be relocated with minimum disruption to the office activities and goes on by stating that their main objection is visual rather than functional (Pulgram and Stonis, 1984).

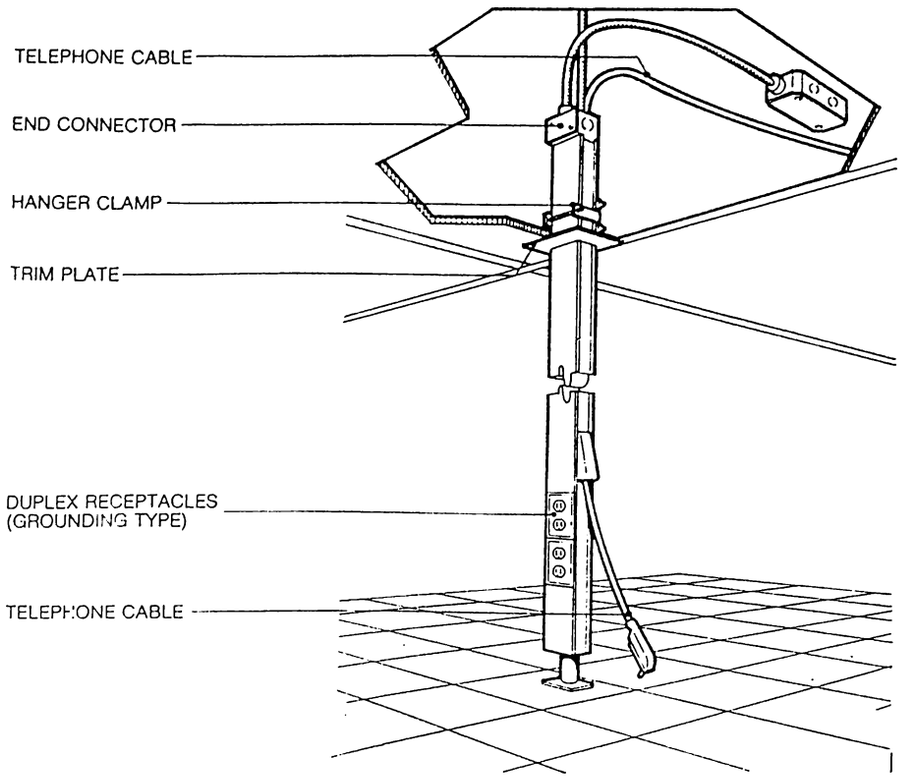


Figure 5.6. A Movable Power Pole (Pile, 1978)

Underfloor Duct Systems:

Another method of distributing power to the workstations is by using underfloor supply systems. This system can be applied, if the bank does own the office building or if there are no objections from the owner of the office or at the time of constructing the building. The system utilizes a deep fluted cellular deck system. This deck system was then turned into a formed metal deck which had tubular open cells (Figure 5.7)(Harris, 1991). It is possible to span about 3m or more with one unit. With many of the flutes and cells, separating different signals from each other and the deck being metal serves for a good ground insulation as well as eliminating signal interference. The initial cost is high whereas the life expectancy is long, and the maintenance requirements is low. Extra cables can be added with no difficulty. The space looks neat and tidy.

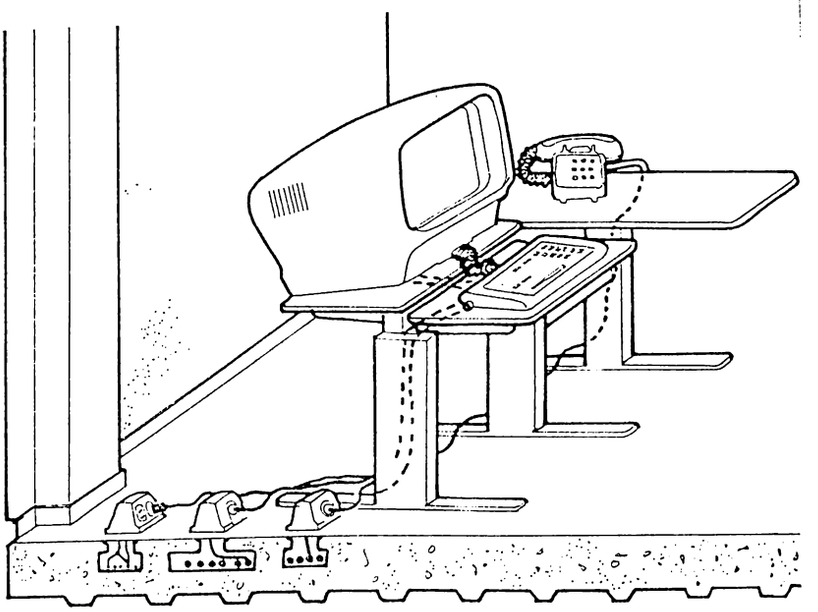


Figure 5.7. Underfloor Duct System (Pulgram and Stonis, 1984)

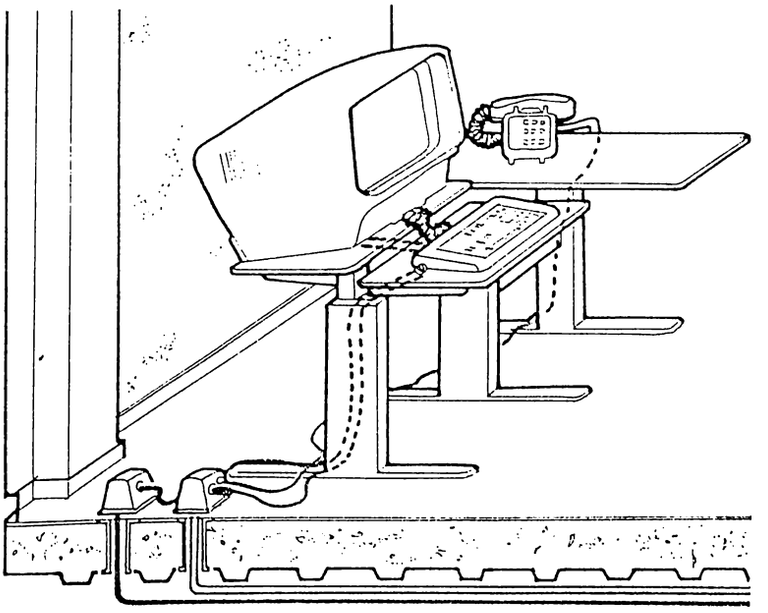


Figure 5.8. Poke Through Supply System (Pulgram and Stonis, 1984)

Poke–Through:

This system utilizes the installed suspended ceiling to carry the necessary lines to the upper floor. It is not useful if there is no second floor. It may be useful for bank branches where there is a second floor for the other services (See section 2.2.4 Open Offices) This system helps to reduce cost of the distribution

systems since, it utilizes most of the installations as common to both floors. This is the method used in most of the highrise buildings. (Harris, 1991). Installation of this system requires that holes are made in the floor to access the other side of the floor slab and this causes disruption, as Pulgram and Stonis states, within the workspace and the floor below. (Figure 5.8) They go on warning that excessive beam or slab depths can often be a hindrance when finding out receptacle points. (Pulgram and Stonis, 1984)

Underfloor Cellular/Access (raised floor):

This system is a state–of–the–art new development in distribution systems (Pulgram and Stonis, 1984). The floor is raised using specially designed units which can be removed for access relocating a new receptacle is quite easy. The system is originally designed for open office systems. The units can be of the size 45 to 75 cm. in square shapes. Height of the floor differs between 15 cm. to 45 cm. depending on which utilities are being passed through (HVAC ducts may also be passing through under the floor). Units may be made up of welded steel panels, reinforced concrete, wood or combination of materials (Harris, 1991) (Figure 5.9) A detailed raised floor with details is given in Figure 5.10.

Access flooring:

Was initially developed for computer rooms to let the passage of wires which are excessive in number. Short, adjustable pedestals can raise a modular system of panels 10 to 15 cm. (Pulgram and Stonis, 1984). This system is capable of providing all the service lines; but required ramp and differences in floor height may create a problem in a bank branch. This system is a costly system. The underfloor cellular/access system would be a better choice (Figure 5.11).

Flat wiring:

This system is a very efficient one but there are problems associated with it as well. It is made of flat wires and their junction elements like connectors, adaptors, boxes and tools. The idea behind it is to eliminate floor and ceiling changes. As its name implies this system depends on flattened wire strips of the same cross sectional area. The power or signal is drawn from a near column or wall outlet and it is delivered under carpet or any thing of this nature. Too many of these wires passing through or over each other creates thickness and interference problems. This system can be used for extensions but should not be used for big installations. In a bank branch if no other choices are left to place a certain terminal this method should be the last resort (Figure 5.12). This system is a closed one in itself, requires that all the details be compatible (connectors, adapters and the like) with the other parts–no other connectors found in the market can be applied to flat cables.

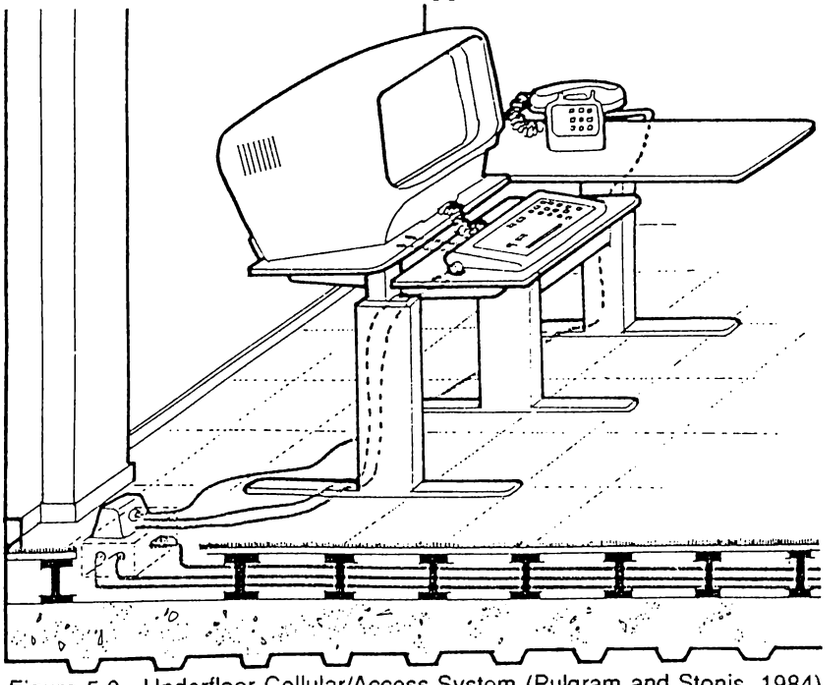


Figure 5.9. Underfloor Cellular/Access System (Pulgram and Stonis, 1984)

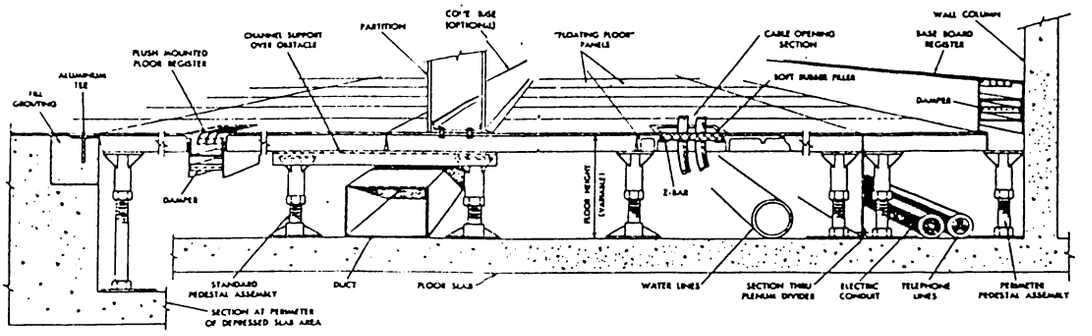


Figure 5.10. Details of a Raised Floor System (Pile, 1978)

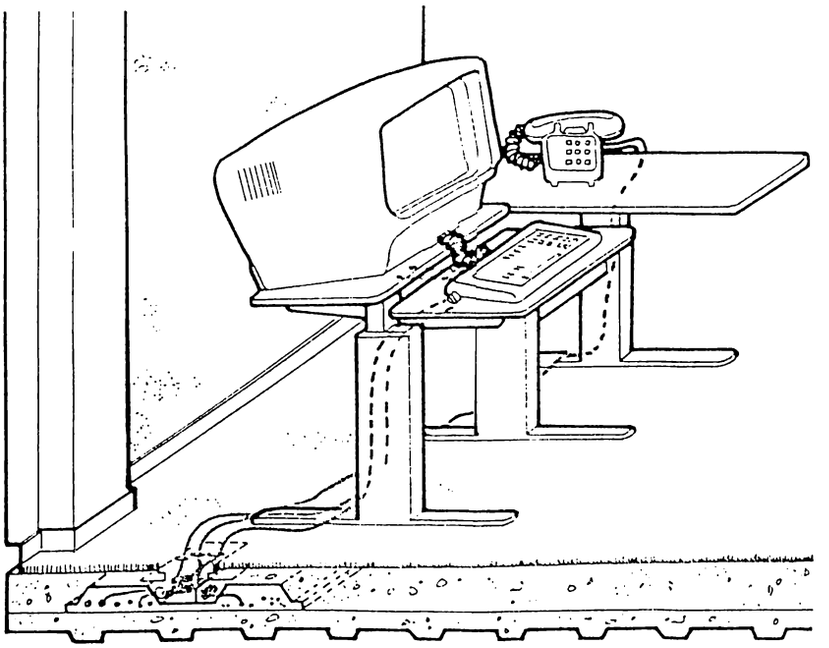


Figure 5.11. Access flooring (Pulgram and Stonis, 1984)

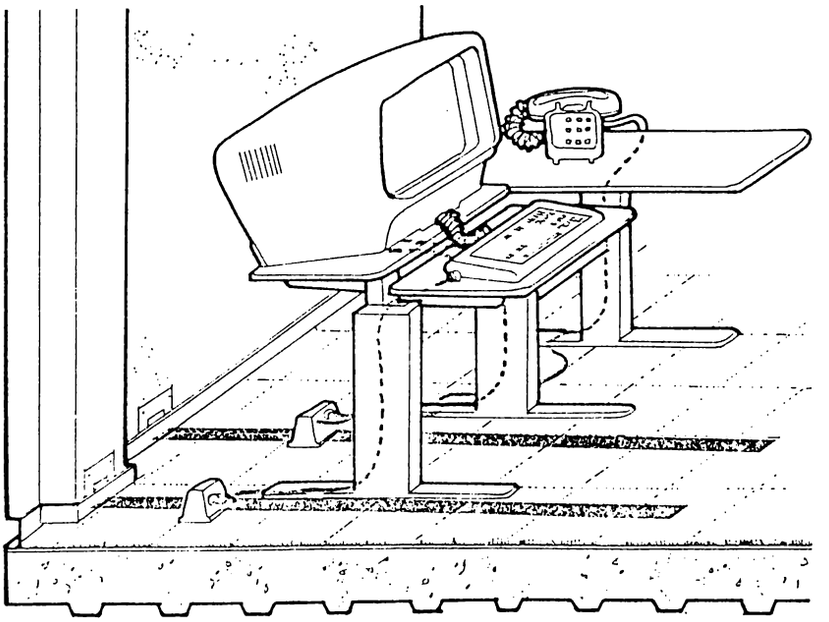


Figure 5.12. Flat–wiring (Pulgram and Stonis, 1984)

Screen wiring:

This system is applicable if there are going to be any partitions used in the bank office. Then by using modular panels which incorporate cable passages as well. It may be possible to solve all the distribution system. If the front office counters are made to incorporate the passage of utility lines , and if they are made to be attached to each other then all the lines can be fed from one end of the counter very efficiently. (See section 5.6. Modularity)

For the layout of the distribution systems Hall, proposes for the distribution systems to be as follows:

> Due to the higher electrical load large buildings such as hospitals, factories and office blocks, will require a three–phase supply. The loading in some large buildings may be too high for the local low–or medium–voltage systems to provide and a private substation must therefore be installed, fed from the high voltage cables from the Electricity Board's nearest switching station (Hall, 1990; p.27).

The above statements may apply to where there is a big branch requiring too much electricity or in the case of branch being in an industrial area and possibility of cleaning supply from glitches is not possible at all. Although the installation should not be made by the designer; knowing what to expect from an installation should be the duty of the designer, feeling the responsibility of the human life that might be in danger in these installations.

The layout for the cables in the open office plan differs depending on the type of office distribution system being used. One for the raised floor underfloor cellular access systems (Figure 5.13). This system is expensive; but lets any location change be made easily. One positive aspects of this system is that it eliminates power–on surge, since necessary current can be supplied from another path to the electrical device, (There are many paths where electricity can reach the device). Another positive aspect is that this system also lets the use of wires with less cross–sectional area for power distribution cutting down on the cable cost.

The next one (Figure 5.14) is less flexible and is more proper for partitioned areas. If the cost becomes a major criteria this system may be used with extensions using flat–wires.

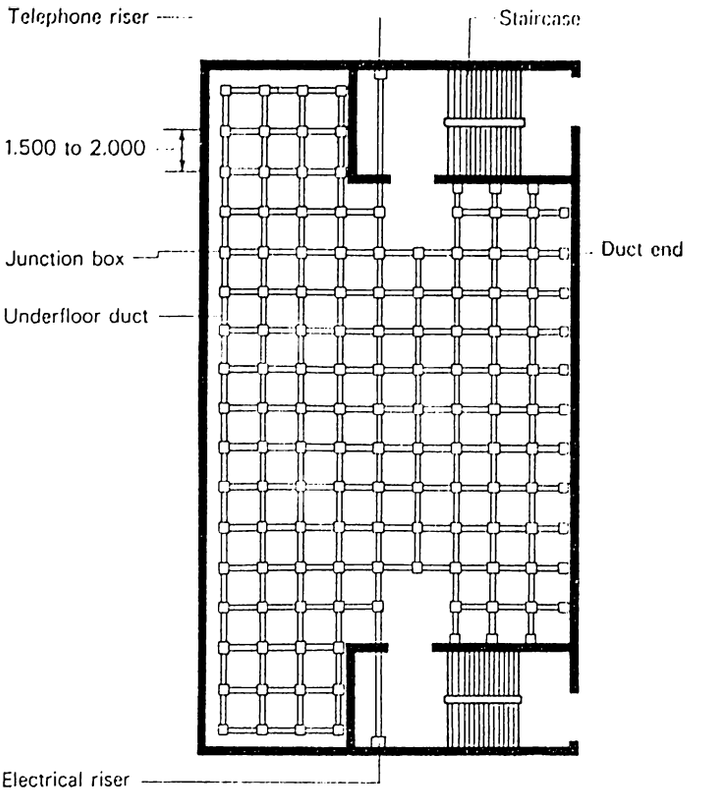


Figure 5.13. Grid Cable Layout (Hall, 1990)

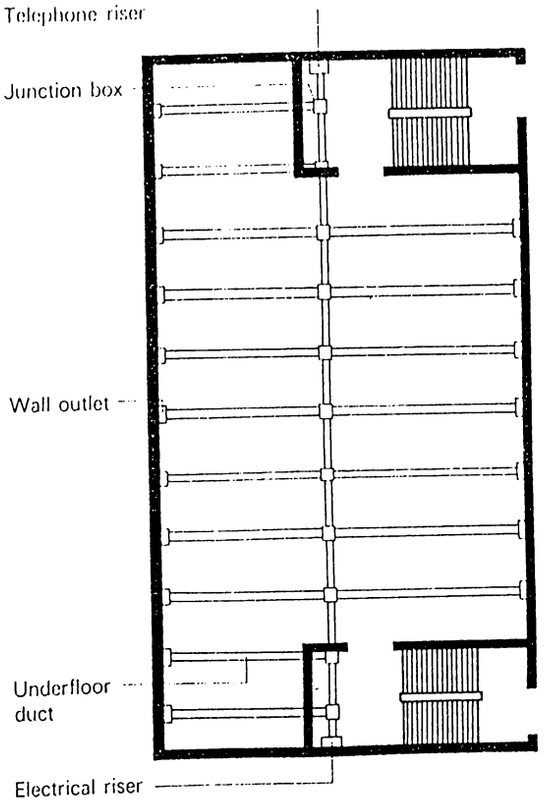


Figure 5.14. Branching Layout for Partitioned or Open–Plan Office (Hall, 1990)

For distribution in the building Hall further suggests:

> The electrical installation in a large building is similar to a small building, but is divided into sections. There may be one main intake panel incorporating large fused switches or circuit–breakers, each of which control a feeder cable to subsidiary distribution panels in different parts of the building, or each separate building in a group. The subsidiary distribution panels are smaller versions of the main intake panel and they control distribution boards for each subsection (Hall 1990; p.27).

The distribution units that the equipment's power will be fed then could have such qualifications as Hall states:

> The intake and distribution units may be either made up on site from separate components, or standard factory–made cubicle switchboards may be used. The manufactured cubicle switchboards have the following advantages over control panels made up on site:
>
> 1. quicker to install;
>
> 2. neater in appearance;
>
> 3. usually take up less wall length;
>
> 4. a locked door prevents unauthorized access to equipment;
>
> 5. safer (Hall, 1990; p.27).

While it is time for safety it should not go without mentioning about the safety of the electrical plugs. A recent research carried in England showed that "40% of the mains outlet installations in England have potential danger" (BBC Int. TV, 1991). Thinking of the safety of the English Electrical Plug Standards, which incorporates internal fuse and are nonreversible plugs just the contrary of the old European standard (except England) which we still utilize in Turkey. It is necessary after all these developments now to think about a safer electric plug system. European countries have changed their standards the electrical plugs and solved the reversibility problem. A likewise change should also be made in our country. This problem can be very dangerous while interfacing computers to each other in the office environment. The problem can be solved by either optically isolating communication cables of the network or by checking

the live wires of all the equipment for inter–equipment potential differences. The first method, at installation phase is an expensive method but is the most efficient and most safer method to utilize, while the second suggested method is a very cheap method (only requires someone to check plugs, and see if they are reversed or not); in the long run requires that none of the plugs be reversed. Reversing of the plugs depending on the situation might cause the whole system to cease immediately. These warnings apply only to our country where electrical installations are not still proper.

Grounding (earthing) the mains outlets are another potentially fatal problem to consider. As Hall states "The basic principle of earthing is that of limiting the difference in potential between live conductors and earth. If a person touches a live conductor that is correctly earthed, the flow of the electricity through the earth conductor should form a path of lower resistance than that of the person's body and person should not receive electric shock." (Hall, 1990; p.16). Most of the buildings in Turkey do not posses a proper electrical ground installation. Mostly used practice, to cut down cable expenses, is to short the ground terminals of the outlets to the neutral line. This automatically creates potential differences among equipment when plugs are reversed. Any leakage in the wall conduits or floor ducts will mean electricity going to the ground and putting walls and floors at a fatal potential.

The grounding is done by connecting the ground wire to the metallic cable sheath of the mains. The sheath is attached to an electrode which is inserted in to a hole in the ground, filled with coke, outside the building or substation (Hall, 1990).

5.4.3. Data Communication Requirements

Data communication requires optic or conventional cables, being multi–line or single core. These cables require special handling, like avoiding electrical noise induced onto them via the surrounding appliances.

For data communications there are different configurations each having negative and positive properties according to the use, like star–network, U–network, closed loop network. A suitable network configuration should be chosen. The network type, depending on the bank's policies, may be a fixed one; but locally a bank branch may have another system which is more proper to the plan of that certain office. Choosing of the network configuration should be worked out with the computer engineers who are responsible of the network installation part of the system. For proper distribution of network enough lines should be laid, any future additions to the system should be thought of, connectors should be provided on the furniture. Describing character of the network types should help which type of the network is suitable for certain conditions would help designer to draw a better picture of the problem.

The star network requires that every terminal have a line going to a main distribution device, mostly being network patch bay of the main computer of the network. We can resemble this to a star (therefore, its name) the main server or the main computer being at the center of the star, the terminals being at the prongs of the star. This network requires too much cabling but it is the fastest network attainable locally. The external modem connections can be thought as a star network, since every branch will be attached to the main office of the bank. (Figure 5.15) Adding an extra device to the network requires that new cables being added to the system or one, in the beginning, has to lay extra cables thinking that there is going to be more terminals added to the system. For small branches, this type of a network can be very useful by

utilizing its speedy data handling capacity.

U–Network is best suited when all of the terminals are personal computers and they can run a program individually without requiring a main machine. This type of network is slower; but if the machines are not terminals this speed problem does not create too much of a problem. A main machine can be put in between the machines; but in this type of a network it is not very efficient. Apple Macintosh® series, and IBM®s with Ethernet® network cards, utilize this type of networking (Figure 5.16). This type of network is the most efficient one for future expansion. Plan can be easily adapted to this network system by just running communication lines in parallel with the mains lines, connecting each computer to one another with one network line. At the end of the network there has to be a terminating plug that tells the network that there are no more machines.

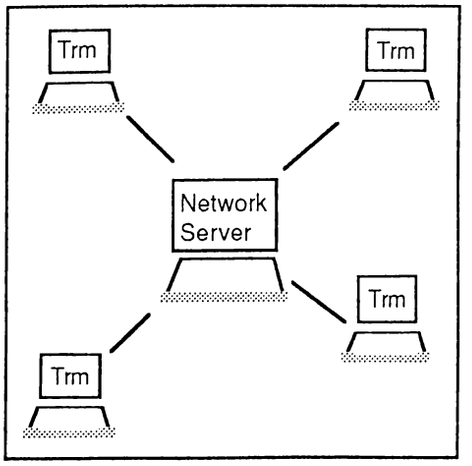


Figure 5.15. Star Network

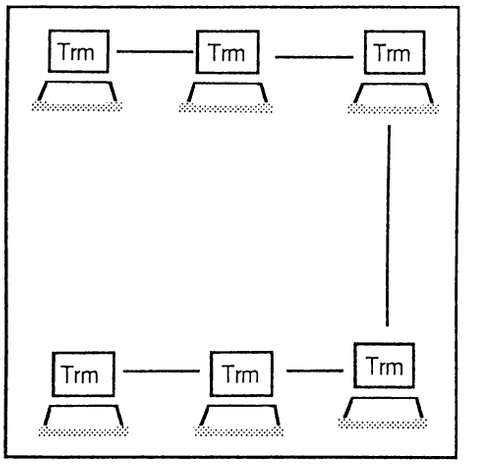


Figure 5.16. U–Network

Closed–loop or ring (token ring) network is not too different from U-Network where there is a connection between too arms of the U shape making a closed loop, not having the terminating plug (Figure 5.17). This only increases length of the cable a little more than U–network. Today this type of network usage is being completely replaced by the U–networks.

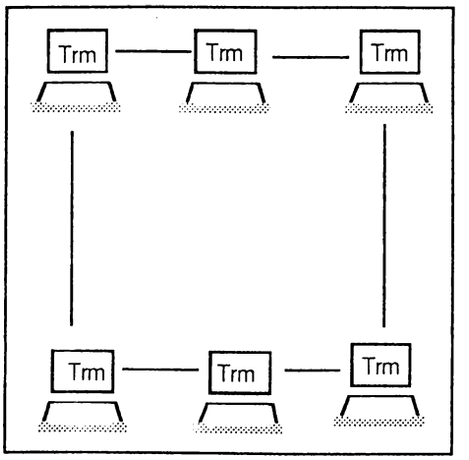


Figure 5.17. Closed Loop Network

Networks require that no electrical interference should be introduced in their cables. Therefore, separate metal ducts should be used to eliminate external electric fields.

A big installation may compromise all of the solutions mentioned above depending on the application. Figure 5.18 illustrates such a case. The network interfacing units are necessary for translation between one system to another.

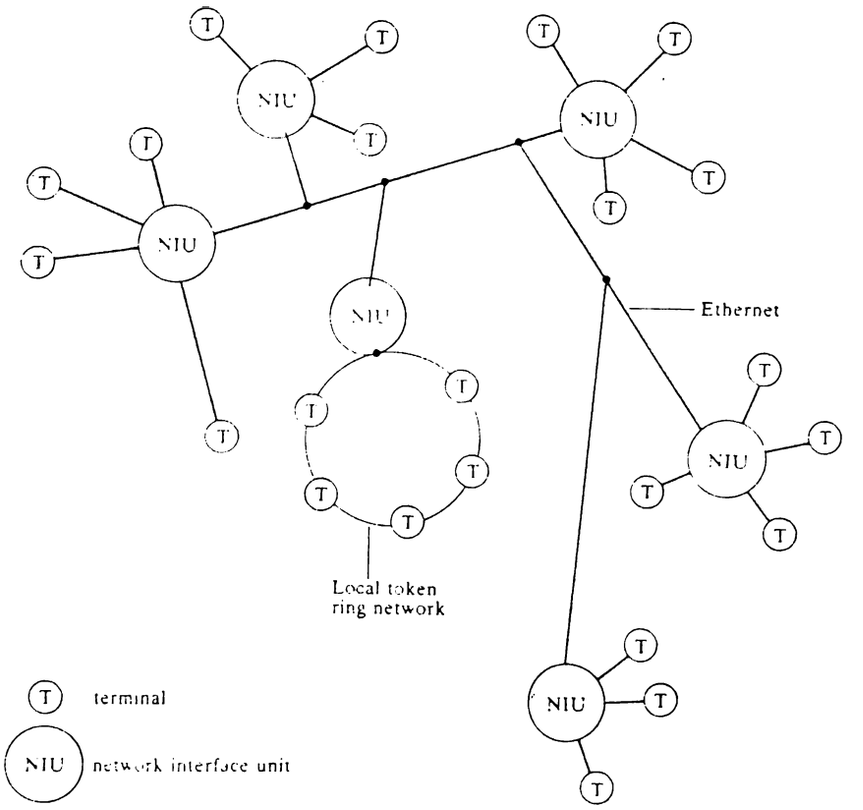


Figure 5.18. A typical local area network in a large organization (Clements, 1991)

5.4.4. Communication Requirements

Communication requirements mainly include telephone lines. There are again different configurations, like multiplexed, relayed. Relayed systems are becoming obsolete these days. Modern multiplexed microprocessor controlled digital telephone exchange systems are being produced in our country. Therefore the old relayed systems, which need frequent maintenance, should be avoided for new installations. The old relayed systems require multi–core cable which is expensive, at least ten times the cost of the other per meter, hard to install and the appliances are specially made for this purpose. The price per unit in these systems multiplies and becomes impractical when the number of units increases. These systems cannot serve more than a fixed number of telephone terminals and they cannot be practically cascaded. Whereas in newer systems up to a

certain number (being 2,4,8,16,32,64 terminal units) adding a new telephone for a user will only mean to add a mere ordinary telephone appliance and cable (only two lead cable is sufficient.). However, if the cables were laid aside the power lines the problem is reduced only to attach two leads of the telephone appliance.

Since today's open office will not be a static one, for a better flexibility, the design must include microprocessor controlled digital telephone exchange.

Other communication requirements are the fax machines and modems. These are extensions of the existing telephone system. Their signal quality should not be degraded by improperly installed telephone lines. Especially modem in bank branches is very important since any data loss may cause a scrambled message be received at the other party.

Installation should be done aside power cables and communication cables but necessary interference precautions should be taken. Using different compartments in the ducts for each different signal types. Telephone lines can pass alongside the communication cables through the same duct (They both have the same level of signals in them and are already shielded against interference from each other); but the power lines should be separated not to influence the other lines by magnetic induction. The distribution systems mentioned in the cables section should be utilized for passage of communication lines as well.

5.4.5. HVAC, Heating Ventilation Air Conditioning

The job performance of workers are directly affected by comfortable heat, air conditioning, and ventilation. Equipment should be investigated for their proper working conditions. The ones requiring special environmental properties (like a high–powered uninterrupted power supply, UPS, which generates a lot of

heat) should be separated. Extra heat built-up by human body, equipment and illumination devices should be balanced in the final result. Dust should be removed from the environment. Dust, when attracted by the electronic circuits of equipment, collect on the circuit boards of these devices causing electrical short circuits, and malfunctions, thus shortening life of the equipment. Exhaust air from the equipment should not be trapped somewhere in the office. Putting computer terminals on the work–surface of a typical counter, with its back facing to a vertical surface, causes the air coming out of the terminal be trapped in the workstation, causing headache complaints. A well designed workstation should provide facilities to exhaust the trapped air. This can be in the form of air ducts built in the furniture that can be interconnected to a common point where the air, then, is exchanged. The above statements shows that a widely applied practice in Turkey, which is to install air conditioners in the widows, is not a proper solution. In an open office trying to exchange air from a single point of the interior, is simply not possible with the excess numbers of equipment working all at the same time.

Humidity should be controlled not to cause static built-up. Too dry an air inside an office with vast amount of electronic equipment installed would increase the potential of static electricity built-up. This would create an electrified environment increasing allergic complaints among workers and possible damages to the equipment. As Harris states:

> Electrostatic charges have dramatic and damaging effects on electronic equipment such as personal computers. Special grounding pads may be needed at the computer, or grounded carpeting may be required. Further, an insufficient humidity level can dry the mucous membranes. High humidity, on the other hand, can create damp conditions when the surrounding surfaces are below the dew point of the air (Harris, 1991; p.145).

The above also shows us the danger of the fungal growth in a poorly air conditioned areas, where there is also the danger of corrosion in the equipment.

People, and plants being sources of moisture, increase the humidity of the air in the interior. As Harris states, the air supplied into the environment should be dry enough to absorb this moisture. (Harris, 1991)

For the required humidity levels Harris proposes "for a 100,000 (approx. 9300 square meter) square foot office area, 230 pounds (104 kilograms) of moisture per hour must be removed with 90,000 cfm (cubic feet a minute) air movement through the space." (Harris, 1991; p.146)

The air conditioners used should be installed in such a way that their maintenance and cleaning could be done easily. Vischer states that in USA people are having allergies because of the air filter being suffocated with fungi and bacteria (Vischer, 1989).

The materials of the partitions used in the office environment may diffuse toxic compounds. The properties of the materials should be well investigated for their toxic ingredients. (Rand, 1988)

Plastic plants, as well, are yet another cause of toxic compounds being introduced into the environment. They should completely be avoided. An artificial plant introduced in aid to solve an aesthetic question might create bigger problems than plant itself resolved. Natural plants, if properly chosen, would also refresh the air. Watering natural plants should not be as hard as dusting off the plastic ones (plastic plants collect dust since mostly they are staticly charged).

5.4.6. Illumination

Illumination in an office is determined by tasks and equipment in the office. The illumination of the offices without computer terminals is a known solution. But when the VDT's are introduced to the environment this solution does not work due to the almost upright and spherical nature of VDT. Reflection of the lamps, which usually have higher illumination levels than the VDT screen, called glare (figure 5.19) occurs making characters on the screen unreadable. This occurs if light is coming at as in Europe 50° or as in USA at 60° (Grosslight, 1990) (figure 5.20). Actually this depends on the height of the ceiling sitting height of the user even the tilt angle of the VDT. To avoid this, users first try to increase the brightness of the screen which is very harmful to the eye and wears out the phosphorous coating on the screen and makes characters less and less readable.

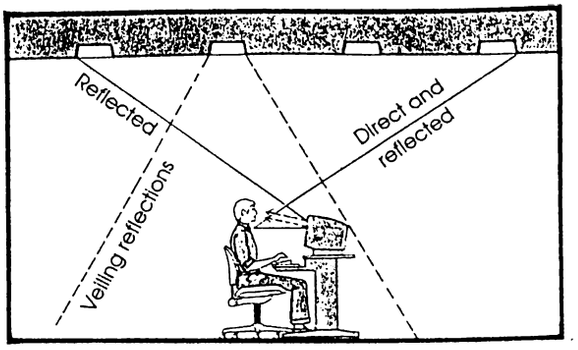


Figure 5.19. Glare (Grosslight, 1990)

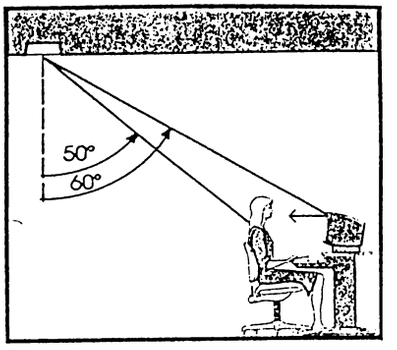


Figure 5.20. Angles that cause glare (Grosslight, 1990)

Birren also shares the same idea stating:

> Illumination fell adequately and comfortably from overhead. Now the computer terminal screen is in an upright or near–upright position. There are mirror images of overhead recessed lighting fixtures, of white walls that veil the screens, bright shirts or blouses that are reflected back into the eyes. And in numerous cases there is far too much illumination that "washes out" screen images–like trying to watch TV out in open on a summer day (Birren, 1988; p.104).

The illumination level in a computerized room is subject to discussion among many people in the field. In an office with many VDT's, microfilm, and other light emitting devices the illumination levels should be kept low as Birren states:

> It is unfortunate, however, that where suggestions are made and specifications submitted for computer room lighting, those writers concerned identified with public utilities or lighting equipment tend to favour high levels of artificial illumination, whereas those writers concerned with visual, ophthalmic and optometric matters, and with human factors, tend to recommend low levels. Just how much light does the eye need in order to see clearly and comfortably, computer or not? Frankly not much (Birren ,1988; p.104).

Giving the numbers for light levels as Birren states:

> Before the days of fluorescent lighting an International Congress on Illumination, in 1924, recommended five footcandles as a minimum for school library tables. By 1941, and with fluorescent lights available, experts were declaring the need for 250 footcandles! Still later, however, recommended levels dropped to more reasonable limits. Illuminating engineers have set recommended levels for various visual tasks that are much too complex to discuss here. What is significant is that with the introduction of computers, the high light levels of recent years are rapidly coming down to half or less than half of what many technicians once thought necessary (Birren, 1988; p.104).

Armbuster's suggestions has the values as follows: In an office with artificial lighting, 300 to 700 lux(lx) is recommended for VDT's, with an optimum of 500 lx, although variations from 100 lx to 1000 lx have been suggested for other equipment. An illumination as high as 1000 lx. would be acceptable only if there are no VDT's, microfilm or other light emitting devices (Armbuster, 1983).

But the actual problem is not how much light is given to the environment but rather how it is directed. The conventional office with overhead troffer fixtures with plastic lenses should be modified or changed (Birren, 1988) not to have bright spots on the computer screen. One could change these or install in the first place the fixtures with "egg crate" type fixtures which direct the light

below and the sources like bulbs can not be seen from sides. To avoid direct glare, the light source should have natural-white fluorescent lamp and should be shielded with grid or Louvre patterns; prismatic or smoked glass shielding may also be suitable. The VDT workplace should be parallel to light sources and windows (Armbuster, 1983).

For the open office, Grosslight states that (since open offices have a dynamic nature).

> Open offices have partitions that can be changed, usually needing but not getting light fixtures repositioned. Lighting for open offices can come from ceiling–hung sources (direct) yielding uniform illumination, from task located positions yielding nonuniform illumination, from widely spaced ceiling sources and furniture (under cabinet or shelf–mounted) sources (both direct), or from furniture mounted or freestanding uplight sources (indirect) for the space and the furniture–mounted (direct) for the task (Grosslight, 1990; p.190).

Grosslight's statements show us that there is no single way of illuminating open offices. But we should think of adjustable systems, and show specific positions where the designer can put these fixtures. The light levels of these devices should also be adjustable.

The contrast is also another factor that is related to reading and perceiving documents. The paper is a white surface over which print is made with black ink. But the computer screens, that are mostly used, have amber or green over black screens. Once a user is trying to read and perceive the paper copy and the screen, the eye trying to adjust itself to both of these extremes will fatigue in a very short time. The cause of this problem is too much contrast. The contrast levels for these type of task must be kept low. The solution here, is to use VDT's with screens like that of a paper which are called page–white screens. This will eliminate the eye fatigue and increase worker efficiency (Figure 5.21)

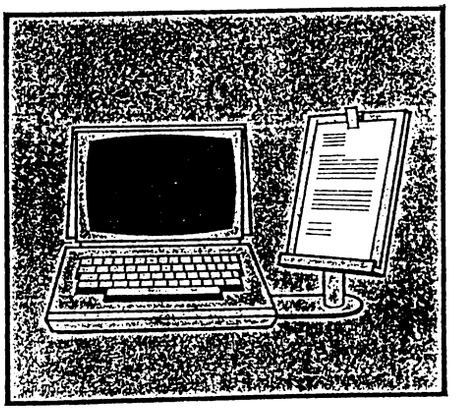
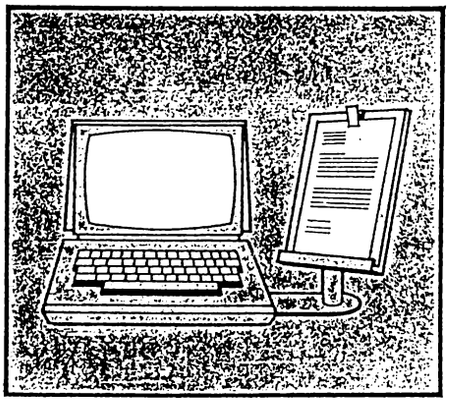


Figure 5.21.Too much contrast
(Grosslight, 1990)



Monitor and copy are equal

5.4.7. Color And Texture

Besides lighting reflectional properties of walls, ceilings and floors should be considered. The psychological properties of different colors and textures should also be considered. Colors should be chosen to help maintaining necessary contrast levels for tasks. Furniture should also be chosen to accommodate color.

Color if not carefully controlled and chosen at will, might cause the afterimages which occur after long sessions of computer screen use.

The reflections of walls, partitions, furniture finishes in the environment should not compete with each other. The eye will fatigue in a short time if there are too many bright colors in the environment (Grosslight, 1990).

To determine the textures to be used in the environment one must look at the reflection values suggested. Reflection values as Armbuster (1983) states should be as follows:

Curtains between 50% to 70%

Ceiling should not exceed 70%

Walls between 50% to 70%

Floor about 20%

And suggests external or internal window blinds and louvers help to reduce the glare and control the room climate.

5.4.8. Acoustics

Equipment originated and environmental noise should be considered. Proper precautions should be taken for noisy equipment. Choosing better designed equipment might ease the problem. Noise in the environment directly affects the work performance. When necessary, acoustical privacy should be provided. Permissible noise levels are lower for creative works. Walls can be cured to aid in noise reduction. Addressing music can enhance the work performance.

There is a direct relationship between workers' concentration on their jobs and the presence of noise and other distractions (Galitz, 1984). Galitz also states that "how we perceive noise depends upon our attitudes as well as on decibel level" (Galitz, 1984). Peoples' reaction to noise depends upon how predictable the noise is and how necessary it seems to be. Evidence also suggests that noise can reduce a person's sociability and sensitivity to the needs of others (Galitz, 1984).

Galitz further gives examples of other people in this field while giving numbers:

> While the effects on work performance are not fully established, the annoyance characteristics of some sounds and their ability to disturb concentration are well known to anyone working today's offices. The sound generated by human speech approaches 80 decibels. Most teleprinters, word processors, and typewriters produce sounds in the 60–to–80 decibel range. Each doubling of a noise source increases the noise level by three decibels. A collection of machinery operating in a single office can quickly

> raise the noise level to unsatisfactory limits. Relaxed conversations become difficult about 55 decibels, and one has to shout to be heard at 80 decibels (Galitz, 1884; p.87).

One of the sources of noise in a computerized office is the printer. They are grouped as Armbuster states:

> There are two main techniques for creating hardcopy output, impact and non impact. Impact printers create images by making a physical impression on paper, such as with a manual typewriter basket or a golfball or daisywheel element. Non-impact printers create images on paper in different ways. For example Ink Jet printers squirk ink droplets at high speed. Electrosensetive and thermal printers require special paper to create impression using principles of static electricity and heat. Laser printers create character patterns using laser beams. Impact printers tend to be lower speed (typical about 30 to 40 characters a second) but of higher quality (Armbuster, 1983; p.185).

To keep noise in more reasonable levels one should better choose laser printers although their prices are very high. Another approach is to use a separate room (printing pool) and keep these noisy devices at these locations. This also prevents investing in a half dead equipment if a person does not require hardcopy too often. For the confidential data another pool may be created or time sharing may be utilized. For the bank office there are specially designed printers which are noise dampened. These printers are required for the bank tasks since they can print onto differing media (thick papers, bank account sheets etc.). But for more formal, correspondence type of papers, it is better to use should a more high–quality printer.

Printers' noise levels as Armbuster states are at a considerable level and he suggests some other precautions as well:

> Two important ergonomic factors of printers are noise and legibility of output. Daisy wheel printers have a noise level of 60 decibels (dB(A)), which is satisfactory but other low speed impact printers have noise levels of between 70 and 90dB(A), which are unsuitable for normal office environments unless noise-absorbing castings and/or foundations are used. Non-impact printers have much better noise level and some systems are virtually silent. Matrix printers, which create characters as groups of dots made by needles, can have reasonable noise levels but have high frequency acoustic

> emission which can be annoying or even detrimental to health (Armbuster, 1983; p.185).

Acoustical privacy, besides noise, is another issue to be met for a healthy office environment. The conversations among people create noise. When the level of this noise reaches to a certain level intelligibility of the speech degrades and speech volume increases, further increasing the noise level. Then people have to shout at each other to make themselves clear to each other. Galitz suggests that one may be aware of the conversations at adjacent workstations but the contents of these conversations should not be clearly understandable (Galitz, 1984). The acoustical privacy is measured by percent of words understood in normal conversation at the adjacent workstation. For confidential work it should be 5% whereas for normal privacy the value is at least 20% (Galitz, 1984).

An office design program should include sound and noise precautions within a range that is comfortable for performing office activities, should eliminate distractions, allow good hearing, and provide speech privacy. Galitz has the physical theory:

> In planning a noise control program, the primary consideration is the source of unwanted sound. Sound radiates in an expanding spherical wave. As waves hit various objects (ceilings, walls, furniture, people), they may be absorbed or reflected, depending on the kind of material they encounter. The objective of acoustical design should be to minimize sound–reflective surfaces so that sounds diminish quickly, according to the laws of physics (five to six decibels per doubling of distance).
>
> Some sounds, like the human voice, are directional in nature– when people speak , the sound waves travel mainly in front. A design objective should be to channel these sounds in directions that cause the least disturbance. (Galitz, 1984; p.88)

And for the solution again Galitz restates:

> An effective noise–control program focuses on three areas: the use of sound–absorbent materials, a sound–masking system, and office layout.

> Sound–absorbent materials: Such materials are used on walls and furniture, and it is critical that they be used on ceilings.
>
> Sound–masking systems: These eliminate the startling effects of sporadic noise. When a correctly adjusted sound–masking system is first installed, people are usually aware not of the new sound, but of a quieter workspace. Music or nature sounds combined with random–pattern noise, however, can exacerbate undesirable noise.
>
> Office layout: Barriers and desks should be located so that workers are not in the path of voice or machine sounds. People walking past workstations are major sources of disturbance (Galitz, 1984; p.89).

In the case of a bank since almost all of the office area will be open, noise cancelling can only be done in its source. Modular panel systems also help but this time it starts to divide the space. Choosing furniture, counters and floor coverings as to aid in absorbing sound is another solution. But for the case of noise it is a rule of thumb to cancel noise at its source.

5.4.9. Installation & Maintenance

For all the above technical problems proper installation and maintenance precautions should be considered. In case of any failure easy servicing is a time saving property.

With all of these electronic equipment office environment becomes more of a living organism with its blood-vessels of cables, lungs of air conditioners, other equipment be simulated to some other attributes as well. The electronic equipment like, living organisms can fail. And these failures, if not fixed at the shortest possible time may mean a dead office. Therefore the installations by no means should be static in their nature. Computer terminals should easily be removed and replaced by another, and the failed one should be taken for repair. Cable ducts should easily be reached for test and replacement thus, using raised floor systems with detachable units. If the cables are via the suspended

ceiling the ceiling should be composed of detachable units as well. Air conditioners' ducts should also be removable when there seems to be a fungi cultivation or dirt collection.

5.5. Psychosocial Requirements

Use of VDT's for long duration causes social disturbances. Some kind of relaxing place should be provided. Desk top should be designed so that the worker does not feel himself/herself immovable.

Today's computer operator, if observed during the day, is almost attached to the end of the keyboard as a peripheral of the machine in front of a dull wall, detached from all the external events, meditating. He/she has a fixed eye and arm position tapping on the keys all they long. There is no room for the operator to look at a distance to relax the eye muscles.

This detachment of the operator from the environment is not going to produce good worker relationships in the long run. Nobody will try to ask him/her anything since he/she is almost not there. Then the designer has to think of a place where these detached "meditators" should go to have a drink and talk with others and look at a distance to relax their eye muscles.

While designing, at least an allowance of 4.6m (Mahnke, 1987) should be provided in front of the worker so that worker's eye can accommodate to a distance in between momentary pauses.

5.6. Modularity

At any time in an office a change in workers position or an addition to the staff may occur. Hence, modular construction should be provided for further expansion.

As stated before while designing the office it is very important to consider fast and less costly changes in organizational structure. This requires a modular system rather than a fixed one. It is stated that 187x187 cm is enough for a desk, a chair, a module with drawers, computer, typewriter, telephone, a document closet, a bulletin board, desk lighting unit, book shelves, cloth hanger, flowers and even room for the person to circulate (Erentok, 1991) . These modules made of partitions may be designed in such a way that every module can be engaged with any different module in a logical order. This gives the office managers to rearrange modules in a very short time when necessity arises for a change.

> Furniture in today's fast–paced office environment must accommodate on–the–go work styles and changing work force. It must also meet the complex power–management demands of office and computer systems. One way that designers are meeting these needs is by incorporating furniture panel systems into their office layouts. These products are designed with the complex needs of today's office in mind (Cody, 1991).

The changing office in the bank sometimes requires moving the whole office to another location as well. In this case using movable modular systems which is integrated saves a lot of time and money while settling on the next location. The modular systems also let the designers to implement functions using functionally differentiated sub–units. A closet or a bookshelf can be installed to a partition whichever one is necessary (Figure 5.22).

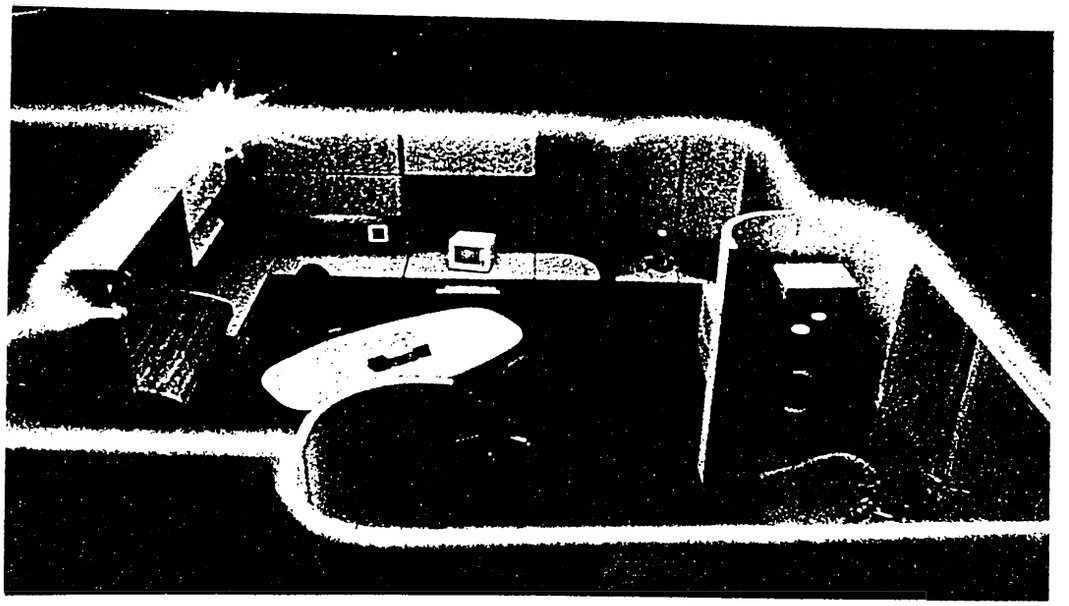


Figure 5.22. A modular system with different functions. Provides passage of utilitiy cables. (Harris, 1991)

6. CONCLUSION

Designing an automated office is not a simple task. Buying the equipment and sparing some place on the desk top for them should not be the way it would work. In search for efficiency, all the other things should not be sacrificed. People working in the offices are increasing in Turkey as the country develops. The stress that is introduced to the environment by a careless designer might produce unhappy people. Everyday one can see depressed people on the streets of cities. Carrying this depression, that took all their tall, to their home and family. People should feel that they are needed, they are intelligent; but should not have a feeling that they are in a position to fill the gap in a task that machines cannot do.

6.1. Designer's Role

Liberalism in the economy have made the bank offices of the years 70's and 80's a thing of the past. Stereotyped bank offices, are being replaced by designer made environments. These designs function as a showcase for the bank. There are now young, rich, old, warm, cold, high–tech atmospheres for the banks, each one trying to attract certain type of customer. This is a trend today which requires designer to shape the environment. The observations show that shaped environment is not a equally balanced one; but rather a surface treatment. While the bank has an inviting entrance and the ATM is installed with great precision in a post–modern environment and the waiting area does make one feel that he/she is important, at the back of the counters still the old song of disorder is being sung. Cables are floating all over the floor. A table, which does not have any identical resemblance to the furniture of the

entrance or that the front office, serving for a printer. Desks are staggered at illogical positions. Power is being drawn from a domestic wall supply. Electricity when cut is the pausing time for the bank.

Then, why do bank workers and the banks have to live with these ? This was a designed place and it should function properly ass well as be aesthetic. Finding a place for the printer should not be putting a casual coffee table under it. The problem can be traced down to designers' escape of the technical problems and not controlling nor having a chance to control the technical installations. Designer is a divergent person who should for different circumstances gather the knowledge required for the many situation to conduct the orchestra of different disciplines to raise the environment towards a perfect one.

As designers we are to design environments that should arose affection in people. We should also be erect not to cause any technical hindrance, especially when there is a risk of human life.

6.2. Conclusion

Today's bank evolved from a single office to today's offices living through all the phases of the office technology. Starting with conventional office banks today utilize open office plans with vast number of automation equipment. The most suitable office type for today's bank is the open office type. Which let's easy organizational change and team work.

The interior of an open plan can be easily prepared for the automation utilities and auxiliaries. The extra area which would otherwise be lost to the wall thickness can be utilized to serve for the extra services due to automation. There are extra precautions has to be taken for the case of automation like special lighting systems, heating, ventilation and air conditioning systems has

to be changed to answer extra load introduced by the use of computers and other equipment. Noise load of the environment also increases due to the above factors proper noise cancelling methods should be utilized. Certain types of color and texture are not applicable to the automated office environment due to visual problems that may arise with the use of computers.

6.3. Suggestions

The trade unions of bank workers, BASİSEN (Banka ve Sigorta İşçileri Sendikası, Bank and Insurance Company Workers' Union) in Turkey, has to put certain codes for designing the bank interiors. They should hav a trained team, consisting of the members of participating disciplines into the office design, to check the installations for suitableness, and the plans for new installations. Turkish Standards Institute (TSE) should, at least for installations which require networking, propose new standards for mains plugs to avoid reverse mains problems.

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APPENDIX

Design Checklist

Pulgram and Stonis (1984) have a well established guideline for the first steps of the design. The guidelines are included to help designer/planning team to draw a route before proceeding.

PREPROGRAMMING, Client Preparations (Pulgram and Stonis, 1982)

☐ Identify the project.
- •What is the scope?
- •Type of the bank?

☐ Gather existing information.
- •Organizational guidelines for space and furnishings
  - ••Floor plans of current and/or anticipated conditions
  - ••Floor plans of space to be used
  - ••If applicable > inventories of existing furniture and equipment
  - ••If applicable > telephone directory; previous staffing records
  - ••Current commitments to furnishings and equipment vendors
  - ••Current commitments to electronic equipment vendors

☐ Define project reporting structure.
- •Who is to be involved?
  - ••Who needs to be involved
  - ••Who should be involved
- •What degree of involvement will be required by participants?
- •Approval process: who will make which decisions?

☐ Get approval
- •Obtain senior management backing and commitment to participation. This is the key to ensuring maximum potential for success of the project. Once presented with data for first three items above, senior management can provide further definition and insight. The image of endorsement by senior management facilities not only the completion of these checklist items, but more importantly the entire project.

☐ Schedule key participants.
- •Define time availability of key personnel and establish a schedule of project input and review meetings.

☐ Establish communication channels.
- •Determine how information will flow between the design and client teams and the key people involved.

☐ Clear all channels to proceed.
- •To prevent premature work or false starts, ensure that all team members are fully aware of the project scope and schedule and that everyone is prepared to proceed.

☐ Fine tune projected budget.
- •Assuming that the budget has already been determined, identify any design priorities that may require special design attention.

☐ Identify Workspace.
- •It may be advantageous to provide workspace for consultants.

THE INITIAL WORK SESSION (Pulgram and Stonis, 1984)

1. Identify:

☐ Givens.
- •Are there corporate guidelines to be maintained?
- •Is there an existing facility or a newly constructed facility ?

☐ Constraints.
- •What is the time available?
- •Does the client have current lease agreements imposing constraints?
- •Is there an established budget for construction and interiors?
- •Does the owner intend to reuse any current furnishings and equipment?

☐ Precedents.
- •Are there any precedents-stated or unstated- of significance to this project?
- •Do they serve to authorize or justify the process or do they lead to prioritization?

☐ Preconceptions.
- •Has this task been attempted before?
- •Was it done successfully or unsuccessfully?

☐ Expectations.
- •How much has this project been discussed in the organization?
- •What level of expectation should be generated?

☐ Participants.
- •Who needs to participate?
- •Who should participate?

☐ Overview of Task Demands.
- •What is the general profile/ structure of organizational and group tasks? •What are the general individual profiles?
- •What groups and individual types are currently and projected to be most affected by technology?

☐ Trends.
- •Are general organizational directives evolving due to a change in operations?
- •Are there organizational / management inclinations that could affect the program?

☐ Available Resources.
- •Can the programmer draw on existing data banks for this project?
- •What resources–in-house knowledge, equipment, systems-can the owner make available for this project?

☐ Issues.
- •Define current or projected points of debate or controversy.
- •Define if and when they will be decided on.
- •Define if and when they will affect the process. (Issues will come up throughout the process. They should be recorded and resolutions should be documented.)

2. Establish:

☐ Goals and Objectives.
- •Establish an understanding of both client and programmer project goals and objectives.

☐ Priorities.
- •Prioritize goals, objectives, and issues.

☐ Direction.
- •Focus project to attain desired end result.
- •Ensure project success.

☐ Level of Expectation.
- •Are there levels of expectation that should be met (such as status indicators)?
- •Is there a level of expectation that should be generated?

In order to accomplish the above goals, objectives, priorities, direction, and levels of expectation, the following should be established

☐ Project Structure.
- •Who will be responsible for what?

List participants and their roles and responsibilities. This could include special task forces to focus and provide guidance on certain organizational requirements, like impact of technology.

☐ Project Procedures.

Set up systems for coordination of participants, review and approval by appropriate participants, and so forth.

☐ Decision-Making Procedures.
Special emphasis and clarification should be given this system. It is advisable to avoid decision by committee as it is an expensive and cumbersome process and increases compromised design.

☐ Budget.
Establish realistic preliminary cost estimate projections for construction and interiors.

☐ Dialogue.
Encourage communication to accomplish and expedite task.

3. Develop:

☐ Research Procedures.
•What data collection methods are required?
•Questionnaires, interviews, and so on?
•Are in-house or outside consultants necessary for programming special requirements?

☐ Questionnaires.
If applicable

☐ Reuse Inventory Procedures and Forms.
If necessary.

☐ Organizational Chart.
If required. Generally, most clients fail to keep their organization charts current and/or these charts do not adequately reflect organizational structure. In developing or modifying these charts, be sure to reflect the organizational structure, not the power structure.

☐ Schedule.
Set overall time available and develop "road map" of intermittent deadlines to attain goals.

☐ Content of Final Report.
•List and mock up the projected contents of the final report.
•Define the degree of finish
••Will it be used for presentation purposes?
••Will it be used as a selling tool to senior management?
Know your audience!

4. Document:
Record findings and ideas and send copies to appropriate participants. This is most important for clarification of groundwork.

DESIGN PREPARATIONS:

☐ Determine user requirements:
- •What the users are expected to do currently
- •Does user require a
  - ••Computer?
  - ••Terminal?
  - ••Typewriter?
- •Does user require a printer?
  - ••What type?
- •What type of keyboard?

☐ Determine space requirements:
- •Will the director/directrice have a private space?
- •How many front office clients?
- •How many rear office clients?
  - ••Are there any special services requiring rooms/divisions required?
- •Is the bank using tellers' kiosks?
  - ••How many?
- •Are the front office workers required to handle money?
- •Are ATM's to be utilized?
  - ••How many ?
  - ••ATM in the entrance hall
  - ••ATM on the façade
- •Storage area
  - ••How big?
  - ••Is safe required?
  - ••Is computer media stored
- •How close should the workers be for task efficiency?
- •How the groups should be arranged
- •Are there special service area requirements?

Like UPS's, Network Controllers, Telephone Multiplexer, etc.

☐ Determine equipment requirements:
- •Are there any equipment requiring special treatment?
  - ••Installatin air conditioned (requiring special environment)
  - ••Should be separated (Specialist is required for use)
  - ••Noisy, Heat emitting
  - ••Could extentions be added
  - ••Power (Telephone multiplexer requires a battery)

TECHNICAL PREPARATIONS

☐ Determine power requirements:
- •How much power is drawn by each equipment?
  - ••Are the lines adequate for the required power?
  - ••Is the mains power clean?
- •How the circuit breakers are arranged?
  - ••Is the current ratings of one circuit breaker to the next level differ by at least 30%?
  - ••Are there enough subsections so that a malfunction should not affect other parts of the sytem?
- •UPS properly installed?

☐ Determine cabling requirements:
- •Is there a second floor?
  - ••Poke–through distribution may be cost efficient
- •Is there going to be a suspended ceiling?
  - ••Use of Power–Poles may be efficient
- •Are there going to be a raised floor?
  - ••Does ceiling height introduce any problem?
  - ••Is HVAC going to pass through raised floor? Use a higher system
  - ••Think of the level differences
  - ••Prefer using a cellular system
  - ••Prefer using grid layout
- •Is building new and the building owner does not object changes?
  - ••Use underfloor duct system
  - ••Or use Access flooring
- •If none are applicable use Flat–Wiring system
  - ••Avoid cables under passages
- •Does the furniture have provision for screen wiring?
- •Are there separate shielded conduits for different signal levels?
- •Is there a proper grounding?
  - ••Is there possibility of voltage level difference between terminals?
  - ••Are terminals electrically isolated from each other?
  - ••Are you using optical data links?

☐ Data communication requirements
- •What type of network is decided?
  - ••If number of terminals will change too often use U–network
  - ••If speed is the main concern, and there is a single main computer and others are terminals, use Star–Network
  - ••When different requirements arise use a hybrid network
- •Are the cables suitable for the chosen network type?
- •Are there interferences between network cables?

☐ Communication requirements
- •If there is no constrain on choosing a particular telephone system use multiplexed microprocessor controlled telephone systems
- •Avoid using relayed systems if there isn't an installed one

☐ HVAC requirements
- •Are there extra heat generating sources? Like UPS, luminaries, human body?
- •Are there areas where exhaust air from equipment can be trapped?
- •Are terminals on the counters 'breathing' comfortably?
- •Avoid using plastic plants use real ones when necessary
- •Is moisture level too high or too low in the environment?

☐ Illumination requirements
- •Is the environment lit enough to impress customers?
- •Does contrast level let the users read VDT screens?
- •Task lighting employed?
- •Are there glare on VDT screens?
  - ••Are the luminaries recessed type?
  - ••Are you using wall wash /indirect illumination?

☐ Color and Texture requirements
- •What are the reflection values for
  - ••Curtains?
  - ••Ceiling?
  - ••Walls?
  - ••Floor?
  - ••Furniture?
- •What color are the walls facing computer users?
  - ••Is there a potential after image problem?

☐ Acoustic requirements
- •What are the expected noise levels?
- •Which equipment generate noise?
  - ••Is it possible to isolate the noisy equipment?
  - ••Is it possible to choose a less noisy one?
- •Is there a required acoustical privacy at a workstation?
  - ••Use modular panels or divide room towards sides
- •Use sound absorbent material
  - ••On the floor
  - ••At ceiling plenum or at suspended ceiling
  - ••On furniture upholstery

to reduce noise
- •Think static electricity properties of the upholstery and carpet

☐ Installation & Maintenance requirements
- •Are all equipment, cables easily accessible for maintenance?

☐ Psychosocial requirements
- •Is there a place so that users may go between each work sessions of 40-50 min?
- •Is there a clearance of 4.6 m. in front of the user?

☐ Modularity requirements
- •Are all components constituting the system compatible with each other?
- •Does the system let units be added to answer different functions?