A FRAMEWORK FOR OFFICE AUTOMATION EDUCATION

by

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ABSTRACT

An educational framework for Office Automation (OA) education is presented. It is based on the analysis of educational content as a function of enabling factors, architecture, and range of integration of OA. These factors are embedded into an educational framework that relates the level of user involvement with the modes of interface with office systems. Educational goals for each user (involvement) level are specified. A sample course outline for educating MIS knowledge workers in OA is presented to illustrate the applicability of the framework.

1. INTRODUCTION

Office Information Systems (OIS) or Office Automation (OA) have been the subject of many studies in recent years. Those studies generally take one of two approaches to the area: a system analytic approach or a behavioral one. The system analytic approach treats the system as it would any other introduction of new technology into the organization. The topics of discussion here, then, are needs analysis; cost-benefit analysis, and methodologies for design and implementation of OIS. Examples of such studies are found in Hammer (1982), Sirbu et. al., (1982), Abraham (1982), Garon (1982) and others. Here the treatment of OA is similar to the way EDP was treated in its initial stages of development.

The second approach to the study of OA focuses on the people of the office-a behavioral approach. The underlying premise of this approach is that traditional data processing and office automation are conceptually different from one another. As Hammer (1982) points out "Office systems are not intended for use by computer professionals ... they are used by ordinary office workers in the daily course of doing their jobs. As such, these systems must accomodate themselves to the characteristics and working styles of their users, not the other way around." The behavioral approach, therefore, focuses on the individual, his or her work station, comfort, job satisfaction, and the like. Studies in this area were conducted by Bair (1982) and Driscoll (1982).

Our framework for OA education derives from the behavioral perspective on OA. Our point of departure is the people associated with the office system rather than the selection and implementation of an OA system in an organization. We hold that trained and well educated people at all levels of the office are a key factor to the success of OA in becoming part of the overall information handling of a firm.

There is an increasing need for educating people about office automation at colleges and universities. The curricula for such courses is based on the growing presence of office systems at work, school and home. We argue that since the configuration of OA is a function of people, these courses must combine the technical aspects of OA with an educational approach that is people-based. In the educational framework for office .automation we identify the interface between the various types of people and the office systems and relate them to different levels of involvement that characterize such systems.

Our starting point is that OIS is fundamentally different from EDP. In addition to the different people involved several other differences exist. Electronic data processing is usually centralized whereas office automation is autonomous and covers sometimes many independent tasks. The work pattern of EDP is relatively fixed following data entry, processing, and reporting in given predetermined periods. This is scarcely the case with OA where the pattern of work varies considerably. Finally, while in EDP the machine is central to the performance of the task with little or no human intervention, in the office the advanced technology is second to the human with continuous intervention. These aspects seem to justify an approach for educating OA people that is different from the one taken to train EDP personnel.

2. OFFICE AUTOMATION: CURRICULUM CONTENT

The educational approach has the objective of students (users) understanding both the context of office automation and the relevant content. For this

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reason there are three major themes to be covered. The first answers the question of why office automation is here and is used. The second explains just what office information systems are. The final topic considers how office automation is introduced and used in an organization.

2.1 ENABLING FACTORS

While the need for office automation may have been a growing recognition, it seems as though there are certain thresholds that have only recently been reached. One such factor is productivity.

Productivity has long been a goal of efficiency-minded management. At present, however, management appears to be almost in a frenzy to improve the productivity of white collar workers. This attention reflects the changes that have been taking place in the makeup of the American workforce. The vast majority is no longer engaged in agriculture or industrial-age production but In the service sector, of which office workers are a significant part. Despite this fact, the technological support available for office workers is quite disproportionate in comparison with other types of workers. For example, $35,000 is an average capital Investment per agricultural worker. Industrial workers have an .average of $25,000 worth of technology to support their efforts. Office workers are lagging far behind with an average of only $2,000-$3,500 per person (Chorafas, 1982).

Reco.gnition that the level of technological support for office workers IS Inappropriate, however, is not a sufficient basis for widescale implementation of office automation systems. What is also required is a sufficient understanding of the tasks engaged in by office workers, the ways in which they spend their time, and the kinds of technological support that would have the greatest impact on productivity. Such data, then, enables the matching of systems to the various types of office workers. Such data is now becoming available (Poppel, 1982, for example) and is being used in the design of office systems.

In addition to a sufficient level of motivation there also needs to be an appropriate set of technological components which will enable development of configurations of office systems. They generally fall into three categories: processing, storage and retrieval, and communication technologies. Microcomputers provide processing capability that is inexpensive, easily done, and autonomous. Distributed processing enhances the ability of stand alone systems by adding the benefits of centralized processing without losing the advantages that a decentralized work station offers. Database capability available for all levels of systems has allowed for document storage and retrieval which is a crucial component of office systems. Analysis and planning activities are also enhanced by the ability to have access to the corporate data base and to perform "what if" queries on it. The problems associated with physical distance, timing and speed of distribution are addressed by the range of new communication technologies.

2.2 ARCHITECTURE

We can see, then, that office automation is a tool whose time has come. There appears to be both sufficient motivation and sufficient technological support to enable wide scaleuse of such systems. The kinds of services provided correspond closely to the types of technology required to support office automation developments. They can be organized into the following categories: text processing, communication and personal processing. An understanding of office automation, then, must also include an overview of what types of services are available.

Office information systems that fall into the category of text processing involve technology to support the function of text entry, processing, storage and retrieval. Word processing software and stand alone systems support document preparation, entry and report generation. Centralized databases facilitate shared, real-time access to timely information and support archival and reference purposes. Document display and delivery is available in a variety of forms, including numeric, text, graphic and audio.

Communication needs are satisfied by way of conferencing and electronic messaging systems. The former provides for synchronous communication requirements and is available through computer-, video-, or voice-conferencing facilities. Electronic messaging systems provide the capability for asynchronous yet timely communication. Documents and messages can be created and sorted for internal and external distribution. Recipients can be classified into a single or few {"narrowcasting"} or many C'broadcasting").

Overcoming difficulties associated with people who are frequently out of their offices is assisted by store and forward communication systems. These range in SOph.Istlcatlon from the simple voice message recording systems to those that will forward a call to a person who is away from the office. When if is not necessary to communicate with someone in real time, electronic mail systems can be utilized. Both messages and documents for review can be sent to a person, providing the timeliness of face-to-face or telephone communication. The advantage is that while being timely it is not synchronous. The message can be sent at the sender's convenience and read at the convenience of the receiver.

The third major category of office information systems consists of those that provide for personal pro-

cessing needs. These, in a sense, are parts of the "electronic desk." In addition to standard word processing tools, computer-assisted writing is possible through editing and spelling/correction software. Spreadsheet software combined with the capability for graphic output services the calculating needs of an office worker.

2.3 RANGE OF INTEGRATION

The previous discussion of office automation products was based upon their associations with existing manual methods (e.g., electronic filing cabinet, electronic mail, electronic desk). Another way to view office information systems is from the point of view of integration and, hence, sophistication of the information product. This point of view, in contrast with the increased processing efficiency, deals with greater effectiveness of the output.

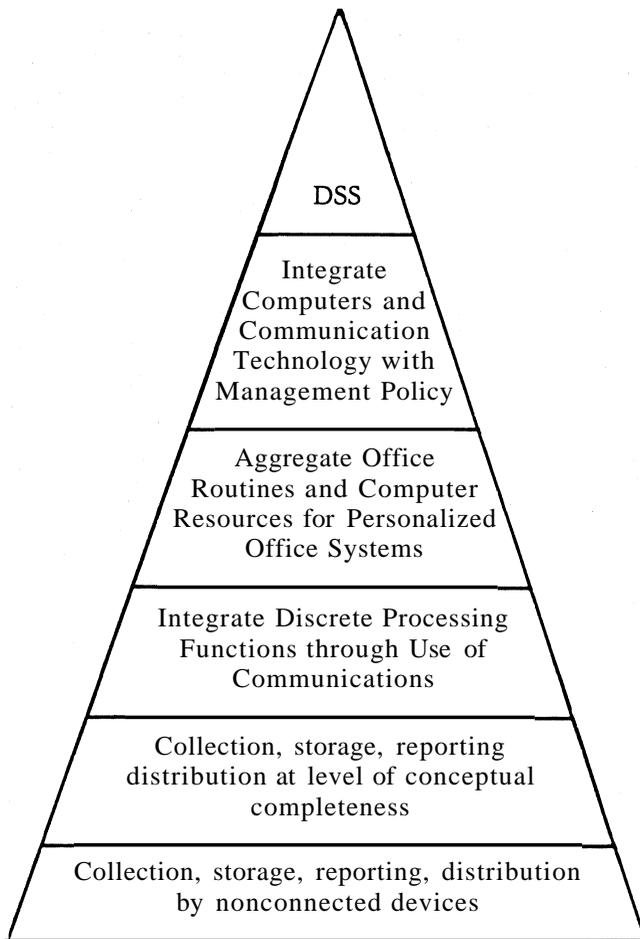Chorafas (1982, p. 19) considers office systems in

FIGURE 1
Hierarchy of Office Information Systems

terms of a six-step hierarchy. As noted in Figure 1, the more integrated the information, the higher its position on the hierarchy. An example of a Step I system would be a stand-alone, dedicated word processor for use by clerical workers. A Step II system might include all the processing associated with a single individual. At this stage, the office information system supports, primarily, the clerical workers and only indirectly the managerial and professional staff. In Step III where cross functional communication is introduced and in Step IV, where traditional computing resources merge with manual office routines, the functional needs of middle managers and professionals can be served. Step V offers office information system support to senior management and when all the relevant information is integrated, a decision support system exists (Step VI). It is interesting to note that a DSS would probably be considered at the pinnacle of a traditional data processing or MIS configuration as well. At this level, distinctions between the office or the computer center as locations of information processing are no longer relevant. It can be observed then, that the progression of support provided by office information systems is consistent with that of traditional MIS's (Spiegler, 1983).

3. A PEOPLE BASED EDUCATIONAL APPROACH

Our educational approach to OA is defined over two dimensions: levels of involvement and modes of interface with office systems. The first dimension classifies the usage found in the office environment. The second dimension specifies the various interfaces with automation independent of any particular user. Each of these dimensions is explained in further detail below.

3.1 LEVELS OF INVOLVEMENT

Office systems are approached by three different levels of users: the clerical, knowledge worker, and executive levels. These levels point out the wide range and diversity of office automation. The involvement at each of the levels may consist of the following:

Clerical. Clerical workers are associated with the day-to-day operations of the office. The people employed at this level are non-technical and are trained mainly in the handling of equipment and processing of documents. They can be subdivided into transaction processing - various data entry and routine, repetitious work, and productivity enhancing -secretarial functions that are to aid knowledge workers in performing their jobs.

Knowledge Workers. This category covers a wide range of .professional and managerial activities found in any organization. These tasks are generally non-procedural, non-repetitive and require creative

and analytical skills. Knowledge workers can also be subdivided into two groups: non-managerial professionals such as planners, engineers, analysts, designers, scientists, editors, and programmers; and managers such as supervisors, administrators, or project leaders.

Executives. Executives or senior managers are also associated with the office system. While obtaining clerical services from other employees and technical support from knowledge workers. executives are responsible for setting the goals, allocating budgets, and defining policies with regard to office automa- *tion.*

3.2 MODES OF INTERFACE

Three modes define the interaction with an office system - design, use, and management. Viewed chronologically, design takes place prior to the introduction of technology at the user site; with implementation the system is used by various employees during day-to-day operations; and following, or in conjunction with use the new technology and associated techniques are managed. The factors to consider in each of these modes are:

Design. In the design of any system, and in particular an OA system, there are considerations of physical and human engineering, hardware, software, graphics, ease-of-operations, and many others. Human engineering design is not confined to hardware only. Software should also be "human-engineered." Simple error messages, easy-to-use languages, and documentation are all part of the design mode of office systems.

Use. Office systems are used to automate the information handling functions of the business that are usually carried out in the office. These functions are: text creation and editing, forms creation, verification, filing, copying, simple calculation, update and retrieval of documents, and transmission. Automating each of these functions independently is not the target of OA as is often the case with data processing technologies. Rather, the aim of OA is to integrate all these functions so the office and other workers of a firm can handle information both efficiently and effectively.

Management. An office system, like any other system, must be managed for efficiency and control. Factors of OA management include the management of equipment, personnel, procedures and time.

3.3 EDUCATIONAL FRAMEWORK

In order to gain a clear perspective on the range and variety of office information systems, we combine the two dimensions of OA defined earlier. The results is a two-dimensional space which defines the modes of interface along the vertical axis and levels of involvement on the horizontal one. The intersection points of the table define the correspondence between the modes of interface and the level of involvement with OA. Entries in the table are possible activities and operations that require attention in educating people about office automation. The table showing this framework is depicted in Figure 2.

As seen in the figure, the clerical level includes activities related to each mode of interface design, use, and management. For example, human engineering or work station comfort are aspects relating to the design mode. The main use of OA at the clerical level is form creation, editing, and work processing. The clerical worker, as an autonomous unit of the office, must manage his or her time appropriately and allocate time for each task.

The activities of the knowledge worker can also be described in terms of the modes of OA interface. The design of OA systems for knowledge workers must have human factors and engineering considerations embedded. Here, flexible and friendly software, and simple languages and commands should be available. The primary use of OA by knowledge workers is in text creation and editing, and the analysis of data. Knowledge workers come from the middle management level of the organization. As such their managerial responsibilities are associated with efficiency of tasks performed. They are concerned with budgets, schedules, and reliability.

Executive's involvement with OA is also related to the modes of interface. With respect to design, they may be associated with the selection of new technology, defining procedures, or redesigning job descriptions within the office. Their main use of OA may be electronic mail (receiving and transmitting messages), analysis of information, and graphical displays. The management dimension of executive involvement concerns the effectiveness of the work. Effectiveness is different from efficiency in that it measures how well one selects among alternatives while efficiency measures how well as particular alternative is performed via the output to input ratio.

4. AN OFFICE AUTOMATION CURRICULUM

As developed earlier, the premise underlying this curriculum is the observation that office automation is significantly different from conventional electronic information processing methods. As such, the educational approach must also diverge from conventional educational approaches in this area. The primary divergence is the attention given to users of the

Levels of Involvement

Modes of Interface	Clerical	Knowledge Worker	Executive

Design	Human Engineering
	    Equipment
	    Work Station
	    Training
	Comfort
	Ease of Operation
		Human Factors
		    Software
		    Language
		    Friendliness
		Procedures Design
			System Selection
			Office Design
			Job Redesign

Use	Form Creation Editing Word Processing	Text Editing Computation Transformation Filing	Receive & Transmit Information Retrieval Analysis Graphic Display
Management	Time Management Schedule Equipment	Budgets Employee Schedule Efficiency	MIS Integration DSS Policy Effectiveness

FIGURE 2
Levels of Involvement

systems. Unlike MIS and EDP where a significant portion of the system/user interface is enacted by people familiar with information processing technology, the users of OA tend to be technological neophytes. In addition, the degree and type of OA use will be largely a function of the level of the user: clerical, knowledge worker, or executive. Finally, the type of information (less structured, less formal) and the setting within which it is processed (decentralized or distributed) are different from conventional EDP and MIS Information processing. Because a new (and varied) type of individual will be processing a new type of information in a new way, we agree that an office automation curriculum cannot be unidimensional. Rather, it should be intimately linked to the characteristics of intended use and the type of student being educated. In the following section, we overview the types of OA courses that could be developed and focus in detail on one: an office automation course for MIS professionals.

4.1 EDUCATIONAL GOALS FOR USER LEVELS

Clerical

It is important for a number of reasons to have clerical workers involved in the design of office automation systems. It is generally acknowledged that the greater the involvement of personnel in the planning and enactment of change, the lower will be the level of resistance to it. In addition, it makes good design sense to have the user input. In order, therefore, for clerical workers to be in a position to contribute to the OA design process, their education should include a consideration of the design process, what the components of good design are, and how they can participate in this activity.

Clerical workers should also receive hands-on training in the use of various types of equipment. They should have varied experiences where at all possible. This is so that they won't be "locked-in" to knowing

how to use a single system only, but will have been able to generalize their knowledge.

The management dimension of OA for clerical workers has two sides to it: how they should manage and how they will or might be managed. Their education should therefore include issues associated with time management, scheduling of equipment, and task changes due to the introduction of OA. Another educational objective should be consideration of the impact that OA might have on the way they will be managed. Greater centralization of workers, formal output measurement, and a flexible temporal and locational work environment may all result from office autornation. The education of clerical workers should include consideration of these possible changes in management style so that they will be better prepared to cope with them.

Knowledge Workers

When considering educational goals associated with this category, it is important to distinguish MIS personnel from the rest of the knowledge workers. This is because the former plays a different role - they will be designing and implementing the systems.

Like clerical workers, knowledge workers should learn how to participate in the design process, especially because they may have to make selection and implementation decisions. This means, primarily, that they must learn how to express their needs and have some understanding of the offerings available. MIS professionals, obviously, need to learn how to design OA configurations.

Regarding use, knowledge workers should receive training in the kinds of systems that they would directly use (primarily personal processing and communication) and should be acquainted with the capabilities of the systems which those under their supervision will be using (text processing).

Knowledge workers must learn how to manage both their own use of OA and that of those under their supervision. Depending upon the type of work engaged in by this knowledge worker, the management aspect could become a large component of their OA education. MIS professionals need to study implementation issues and the relationship of OA to both MIS Policy and overall corporate policy.

EXECUTIVES

Senior managers may be heavily involved in the system selection process and the redesign of jobs as a consequence. They should, therefore, learn about the relationship between system selection, office design and job redesign.

Executives would probably directly use OA systems the least of the three levels. However the more

sophisticated and integrated the OIS, the more likely it is that they would use it. Advanced communication offerings such as video conferencing and electronic messaging might prove desirable in their conduct of daily affairs. Certain of the personal processing systems might also be directly used by them. At any rate, in the education of senior managers, hands-on exposure to the range of offerings gives them the opportunity to successfully use them some time in the future, should they choose to do so.

Probably the area of greatest involvement by executives is in the management of OIS. Depending upon its sophistication, an OIS has the potential to radically alter the configuration of office functions. If not introduced and managed properly, resistance and other negative consequences can result. Unlike more conventional areas of information processing, information processing in the office cannot be managed by the EDP personnel; it must be managed by those responsible for the area in question. Thus, executives must be educated in the ways of managing the change that results from the introduction of OA. They must also learn how to participate in the integration of OA policy with MIS Policy and the firm's overall strategic plans. One area worthy of special note relates to changes in work due to *GA*. If displacement, deskilling or radical altering of jobs is to occur, long range planning should be employed. Knowledge of such circumstances and the range of possible management responses is, then, necessary.

4.2 COURSE OUTLINE:
Office Automation for MIS Professionals

As indicated earlier, MIS professionals are a special category of knowledge workers. Not only must they learn about the ways in which they will use OIS, but they must learn how to design, develop, implement and manage such systems. The following is an outline for an office automation course directed at their educational level. Such a course could be offered as part of an undergraduate MIS concentration, an MBA elective, or as a component of the emerging M5-MIS degree.

WEEK	TOPIC
1.	Rationale for Office Automation: Productivity
2.	Overview of Office Technology
3.	Design: Requirements Analysis
4.	Design: Analysis by User Level
5.	Design: System Selection Process
6.	Use: Text Processing
7.	Use: Communication
8.	Use: Personal Processing

9. Management: Technical Issues during Implementation
10. Management: Behavioral Issues during Implementation
11. Management: Integrating Office Automation with MIS
12. Training by User Levels
13. Management: Linking OA Policy with MIS and Corporate Policy

5. CONCLUSION

The introduction of office automation into an organization represents an entry into an area of information processing that is significantly different from existing ones. Both the type of information and the personnel involved are ·different from those associated with EDP and MIS. Because of this fact, a different approach to OIS development and implementation is called for. This approach is a behavioral rather than a system analytic one.

In keeping with the recognized differences in this area of information processing, we have argued for an educational approach that is tied directly to the kinds of users and their type of involvement with office automation. As an example of the way this framework can be applied in curriculum design we have presented a sample course outline for an office automation course for one type of user involvement with office systems: that of the MIS professional.

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