THE STRATEGIC ROLE OF AN ORGANIZATION IN DEVELOPING A MODERN INFORMATION SYSTEM

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Abstract

The large bureaucratic organizations were developed and used before the significant growth of information and related technologies. These bureaucratic organizations were and are still hierarchical, and centralized, so they are inefficient, and uncompetitive. Today's modern and effective Information Systems (ISs) require flattened organizations which have fewer levels of management, with lower level employees being given greater decision making authority and responsibility in order to make more accurate decisions, and contribute decision making process that previously was made only by upper managers.

In this study, the role of an organization and its structure in developing a modern IS was investigated. When a new Information System (IS) is constructed, the organization has to be redesigned and reengineered. Since an Information System is a socio-technical entity, it requires arrangements of both technical and social elements of the organization. The principles of re-engineering were used to eliminate delays in management decisions, and backlogs in paper forms, so as to control information flow and develop a flattened organization.

MODERN BİR BİLGİ SİSTEMİNİN GELİŞTİRİLMESİNDE KURUMLARIN STRATEJİK ROLÜ

Özetçe

Büyük bürokratik kurulumlar, bilgi ve bilgi teknolojilerinde gerçekleştirilen kapsamlı gelişmelerden çok daha önce oluşturulmuş ve kullanılmışlardır. Bu bürokratik organizasyonlar ilk kuruluş dönemlerinde olduğu gibi, günümüzde de hiyerarşik ve merkeziyetçi bir yapıya sahip olduklarından kaynaklarını etkin olarak kullanamamaktadırlar ve dolayısıyla rekabetçi değildirler. Bugünün modern bilgi sistemleri, daha doğru ve etkin kararlar verebildiği düşünülen merkeziyetçi üst yönetimler yerine, sayıca daha az fakat daha geniş karar verme yetki ve sorumluluğa sahip personele ve hiyerarşik olmayan girişimlere ihtiyaç duymaktadırlar. Bu çalışmada, modern bir bilgi sistemi oluşturulurken kuruluşların rolü incelenmiştir. Bir bilgi sistemi, kurumların yapısal olarak yeniden dizaynı esas alınarak, gerçekleştirilir. Çünkü, bilgi sistemi sosyo-teknik bir entitedir, kuruluşun hem teknik ve hemde sosyal unsurlarının yeniden dizaynını gerektirir. Bu nedenle, değişim mühendisliği yaklaşımı kapsamında bir sistem analizi çalışması yapılmış, bu felsefenin prensipleri kullanılarak, karar süreçlerindeki gecikmeler, evrak akışındaki yığılmalar ve yanlışlıklar giderilmiş, bilgi akış kontrolü yeniden sağlanmış ve hiyerarşik olmayan bir yönetim yapısı oluşturulmuştur.

Keywords: Information system dizayn, Flattened organizations, Reengineering.
Anahtar Sözcükler: Bilgi sistemi dizaynı, Yassı organizasyonlar, Değişim mühendisliği.

1. INTRODUCTION

An enterprise has been defined as a dynamic set of interacting elements, including technical processes, organizational processes, technical functions, departments, business centers, and subsystems such as finance, production, marketing, and management. An element of an enterprise serves multiple roles, and interacts with other elements and with the environment. Elements of an enterprise include men, machines, buildings, inflow of materials and orders, outflow of goods and services, monetary values, human relations, and management. Enterprises experienced significant technological and managerial changes over the last decades. Changes have been forced by various events: global competition, workforce changes, new technology, and continuously changing customers' preferences. Organizations must harmonize its structure and deal with competition in an increasingly complex and vaguely understood business environment. The business organization or enterprise is viewed as a socio-cultural system. Managers and leaders should view organizations as flexible work groups with information flow across the business functions, instead of vertically arranged discrete functions with well-defined boundaries [1].

As it is well known, the traditional business organizations were and are still hierarchical, centralized, and have structured arrangement of specialists that relies on a fixed set of standard operating procedures to deliver the service. The employees working in these traditional business environment rely on formal plans, and rules and appeals to loyalty. These organizations have rigid division of labor ensuring proper operations in the organizations. Structure of these organizations, their work flow, work procedure, and policies have a profound impact on organizational efficiency, effectiveness, and on the structure of a new IS which is rooted as an outcome of organization structure, culture, politics, work flows, and standard operating procedures [2]. If an IS is developed based on a hierarchical traditional organization, it may transfer all the structural and managerial problems to the internal structure of IS as well. The system analysis is a road map containing a statement of corporate goals and specifies how IS will support the organizational goals. An important part of

this strategy is to move from the current organization to achieve a flattened one. This generally indicates the decisions made by the managers concerning hardware acquisition, telecommunications, centralization or decentralization of authority, and hardware and software fitness required for organizational change. Therefore, IS development plans are business re-engineering plans which are powerful tools for organizational change enabling organizations to redesign their structure, scope, relationships, politics, work procedures and requires reorganizations of workflows, combining steps to cut waste and eliminating repetitive paper intensive tasks.

Organizations that choose to incur higher IT expenses presumably expect compensating benefits, such as the ability to respond the customer's needs more quickly and accurately to change in their environment or to use less of other resources. The only way to bring about a successful change in an enterprise is to change the technology, tasks, structure, and people simultaneously. Some states that it needs to unfreeze the organization before introducing an innovation and quickly implementing the changes, re-freezing or institutionalizing the changes to reduce the resistance [2]. Otherwise, all endeavors might fail and do not add value to the enterprise. The problems causing IS failure falls into four categories. These are design, data, cost, and operations related problems. These sources of failure can be attributed not only because of technical features of ISs but also nontechnical sources as well. An IS fails if its design is not compatible with the components such as structure, culture, people, tasks and goals of the organization as a whole. All these components are interdependent a change in one will affect all the others. Hence, designing an information system is redesigning the organization as a whole. Similarly, data in an IS may have a high level of inaccuracy or inconsistency [3], if a system does not operate well, information will not be provided in a timely and efficient manner. The computer operations that handle information processing will fail, and jobs that abort too often will lead to excessive reruns and will delay or miss schedules for delivery of information on time.

This paper is organized in four sections. The study is introduced in section 1, section 2 describes the literature review. Section 3 starts with road map design of a contemporary IS for an organization and continues with ISs design and development details. Section 4 presents the results and comments. The paper ends with the list of references.

2. LITERATURE REVIEW

There is a significant body of literature that examines the Information Technologies (IT) and Information systems (IS) adoption and implementation from various perspectives [4]. Most of these studies have focused on issues related to adoption, development and implementation of such technologies referring either to IT for implementation of cutting-edge information and communications technology, or IS to denote a combination of hardware, software, and networking systems [5].

Grover et al., [6] states that it is widely believed that the adoption process of IT influences successful use of information systems. Many researchers have investigated the factors influencing the extension of IS applications in the organizations [7]. Others have proposed behavioral and psychological models for explaining and predicting users' behavior toward IS adoption at individual level [8]. These two streams of research suggest that the determinants and mechanisms for an IS decision adoption may vary from stage to stage during its lifecycle. Davis et al., [9] studied the IT acceptance model and has encouraged IS "use" research to led to much exploration and widespread discussion over its application and extensions at the organizational level [10]. Bhattacherjee, [11] proposed the expectation confirmation model to describe user's behavior in "continue to use" an information system. Cheng and Liu [12] designed an empirical study to explore and investigate the sophisticated relationships between organizational culture and the adoption of ITs. Carty and Walsh [13] examined the causes of knowledge loss in a company undergoing a process of radical change.

Kant and Singh [14] studied the knowledge management implementations by understanding the dynamics among various knowledge management barriers that hinder the implementation of knowledge management in organizations. Jantunen and Laukkanen [15] investigated the intensity and directions of knowledge flows between different actors and found out that the knowledge acquisition is needed to find the relevant signals from markets, and knowledge sharing could facilitate benefits from network externalities and collaboration.

Roses et al., [16] evaluated the perception gaps of service quality between information technology (IT) and its clients. They state that quality of information systems must take into account both a technical dimension related to results, and a functional dimension related to processes. In the IT context, the outcomes of IT products are provided by suppliers according to specifications given by the client (users). When the supplier does not meet this technical dimension, the client develops an objective perception based on tangible characteristics. However, the functional dimension concerns the process of client–supplier relationships related to the product, which involves intangible variables such as trust, commitment, cooperation, responsiveness, and empathy, and many others. These characteristics provide a challenge to establishing quality assessment models for IT services that provide subsidies to IT governance. Many theoretical models were described and studied by practitioners.

3. DESIGNING A CONTEMPORARAY INFORMATION SYSTEM FOR AN ORGANIZATION

Redesigning an organization means much more than installing a new machine in the organization. It requires redesigning the organization as a whole and developing a new information architecture. Figure 1. illustrates the information architecture of an organization which is a particular form from which the Information Technology (IT) is affected. It includes the extent to which the data and processing power are centralized, but the responsibilities of professionals and achievement of data is distributed and simplified.
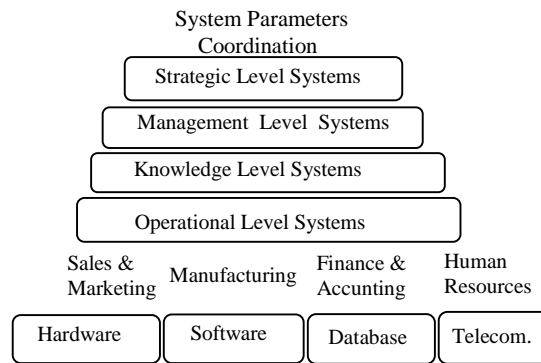
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System Parameters
Coordination

| Strategic Level Systems |
| Management Level Systems |
| Knowledge Level Systems |
| Operational Level Systems |

| Sales & Marketing | Manufacturing | Finance & Accunting | Human Resources |

| Hardware | Software | Database | Telecom. |

Figure1. Information architecture of an organization

Because, as the IS is centralized, the effectiveness of the system is increased, communication and coordination power of the system parameters is increased. Therefore, an enterprise should rethink and redesign, the way it works, produces, delivers, serves and maintains goods and services, designs and develops special hardware, software, and communication standards to create a cross-cultural accounting and reporting system [17]. The information architecture of an organization requires coordination between the various computer and business system applications to meet the information needs of each level as well as the needs of the organization as a whole. All major types of ISs facilitate the flow of information and have organizational knowledge embedded in them.

3.1   An Information System Design & Development Plan

Information System design and development is a structured kind of plan to solve problems with distinct activities. Actually, it is a renewation problem. As it is depicted in figure 2, these activities consist of establishing strategic business plan, the existig Information technology application in organization, new IT development, management strategy, implementation plan and budget requirements. Business strategic plan includes system analysis, system design, programming, testing, conversion, and maintenance [2]. System design has three objectives and shows how the

system will fulfill the information requirements. Firstly, the system designer is responsible for discovering alternative technology configurations for realizing and developing the system. Second, He/She is responsible for the management and control of the technical realization of systems. Third, He/She details the system specifications that will deliver the functions identified during the system analysis. The specifications should address all the managerial, organizational, and technological components of the system solution [18].

System analysis is the analysis of the problems that the organization has to solve. It consists of defining the problem, identifying its causes, specifying the solution, and identifying the information requirements. The key to building any large IS is a thorough understanding of the existing organization and its working system. Therefore, the system analyst has to investigate the problems of existing organization in detail by examining documents, paper works and procedures, policies and interviewing key users of the systems [2].
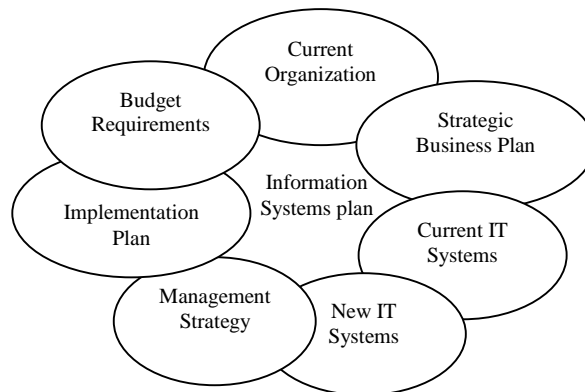

Figure 2. Information system design and development road map

The possible solution of a structural kind problem in an organization is elimination of all unnecessary works, combining the repetative operations and elements, changing the sequence of operations and simplifying the

necessary operations. Re-engineering is a good solution to the structural problem of an organization. Hence, we performed a series of interviews with the autorised staff to determine the existing administrative system. Besides these interviews, we observed the jobs related activities and determined paper forms which were incoming, outcoming and outgoing, flowing from one department to another on the daily and monthly basis. The process charts are the devices for recording an organization in a compact manner, as the means of better understanding and improving it. These charts represents graphically the separate steps or events that occur during administrative actions. The process charts for every steps through the factory are analysed and certain suggestion was made for improvements in order to find better routes between operations that can be eliminated. When these forms were examined through operation analysis methods, we found out that there was unnecessary repetition in the preparation of paper forms. In this step, the radical changes are proposed for all the administrative system. The target is the re-engineering of the organization and establishing job oriented group technology cells for simplifying the complexity of paper work and re-route within and among the departments. This requires revising the structure of the organization and obtaining a flattened one. Figure 3 depicts a flattened organization with little bureaucracy.
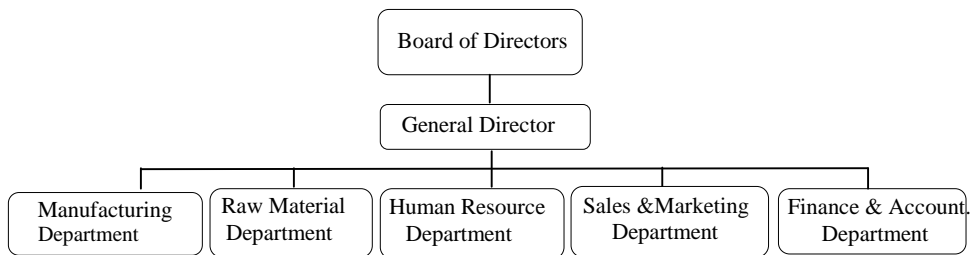

Figure 3. Structurally flattened organization

As it is seen from Table 1, almost a complete elimination and simplification was done in the paper flow in the organization. To achieve this purpose, we have to convert whole the papers into electronic forms and

set network connection between departments and establish a central processing unit. This will eliminate all unnecessary backlogs, transportation of paper forms, storage, and reduce transaction time on the paper forms.

ISs require flattened, flexible, decentralized organizations. They require that the organization will recognize the strategic role of information and begin to manage and plan for information as a corporate resource. This requires the development of a data administration with a power to define information requirements for the entire company and direct access to the senior management. The fundamental principle of data administration is that all data are the property of the organization as a whole. Data can not belong exclusively to any one organizational unit. All data are to be made available to any group that requires them to fulfill its mission. But, the organization needs to formulate an information policy that specifies its rules for sharing, disseminating, acquiring, standardizing, classifying and inventorying it throughout the organization. The information sharing policy is to determining which organizational units will share information, where information can be distributed, and who has responsibility for updating and maintaining the information.

Table 1. Simplification of Paper Forms

Paper Form	Activities	First-step	Second-step	Third-step
SOF		725 mins.	0	0
		400,70 mins.	400,70 mins	350,45 mins
		3360mins	2400 mins.	1920 mins.
Throughput time		4555 mins.	2870 mins.	2315 mins.
% Reductions in Throug. time			37%	49%
DAF		60 mins.	0	0
		150,15 mins.	150,15 mins.	150,15 mins.
		60 mins.	60 mins.	60 mins.
Throughput time		285 mins.	225 mins.	225 mins.
% Reductions in Throug. time			21%	21%
POF		90 mins	0	0
		215,85 mins	165,85 mins	120,40 mins.
		10800 mins.	7200 mins.	7200 mins.
Throughput time		13735 mins.	7450 mins.	7360 mins.
% Reductions in Throug. time			45%	46%
MRF		90 mins.	0	0
		30,20 mins.	30,20 mins.	20,20 mins.
		0	0	0
Throughput time		140 mins	50 mins.	40 mins.
% Reductions in Throug. Time			64%	71%

Application of IT intends to increase productivity of employee in the offices. Today professional knowledge and information work remains highly document centered. Digital processing systems are the core of today's Information system, and they provide high speed digital communication and data transmission. The office automation system which is used at the operational level, is to provide the efficient employee with increased productivity and creative work by using office equipment for

routine works and is to accelerate the evaluation and decision making in
the level of middle management and to increase the speed of data
processing [18]. It is clear that information technology can cut through
many of the problems created by traditional file organization, if the files are
arranged properly. The systems may be organized to serve many
applications effectively by centralizing the data and minimizing redundant
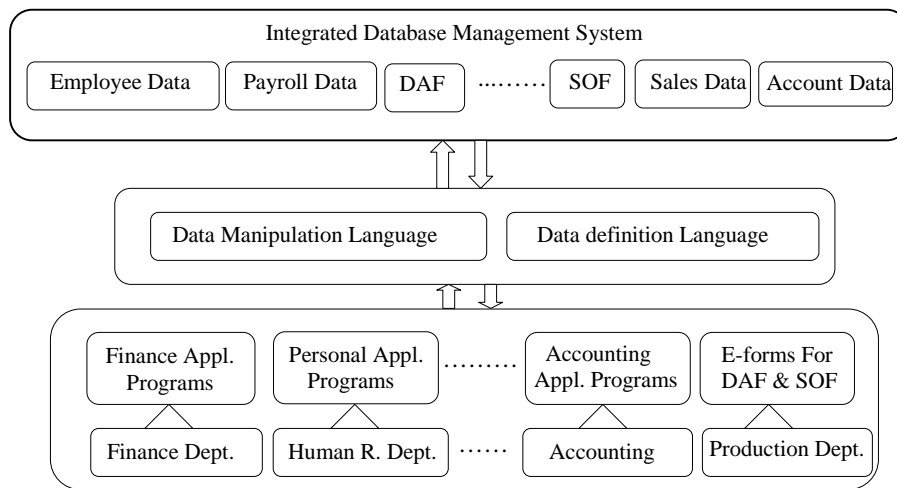data rather than storing them in separate files for each application.

Figure 4. Recommended database management system

As it is seen in Figure 4, data and information is physically seems to
be appeared to users as being stored in only one location. That is a single
database service, but provides multiple applications. For example, instead of
a storing employee data in separate information systems and separate files
for personnel, payroll, and benefits, it is better to keep them in a central
processing unit and providing accessibility of all users. The accessibility of
data is possible by applications programs which can call for a data item such
as gross pay, basic salary etc., the system finds this item in the database and
presents it to the users.

5.   RESULTS AND COMMENTS

A new IS involves more than fitting a new hardware and software in an organization. It includes changes and redesign the jobs, improve of skills, and changes in the way of management and organization. One important thing in building a new IS is that, a new system means new ways of doing business and new ways of working together. That is, an IS may be differentiated by functional specialty, such as sales and marketing, manufacturing, finance, accounting, and human resources, each of these can be served by their own IS. In large organizations, sub-functions of each of these major functions might have systems for inventory management, process control, plant maintenance, computer aided engineering. Moreover, different organizations may have different IS for the same functional areas, because no two organizations have exactly the same objectives, structures or interests. Therefore, ISs must be custom made to fit the unique characteristics of each organization. There is no such a universal IS that can fit all organizations. Every organization does the job somewhat differently. Every organization should weigh its needs for integrating systems against difficulties of mounting a large scale system. There is no one right level of integration or centralization and decentralization for an IS. Information processing becomes more distributed with the growth of powerful telecommunications networks and declines in computer hardware costs. The network of the organization consists of a central host computer connected to a number of smaller computers or terminals and used primarily in mainframe systems. An IS can technically succeed but organizationally may fail because of a failure in the social and political process of building the system or vice versa. Therefore, IS builders must carefully orchestrate the activities. In case that this implementation encompasses the paper forms, the gains from time and efforts will be more dramatic.

In our study, a great number of employees were reduced dramatically after work descriptions were done. A study was conducted to make it possible to work with smaller number of employees and to find multi functional, cross trained optimal number of employees in each department. As it can be seen from Table 1, The standardization of work

procedures   provide reduction of processing times, standardization of processes and paper forms and leads to complete the works with less time and fewer backlogs. Re-engineering was carried out, and the main body of organization was totally re-engineered which helped us to simplify the paper flow, constitute a new flattened system.

As a result, organizations and ISs are mutually exclusive entities. An organization is affected from a new information system and an information system is also affected from the structure of an organization. The transactional system, multi functional employees, standardization in work procedures and adoption of computerized decision support systems will reduce the requirements for expertise. This will refute the approach introduced by Adam Smith that the division of labor into the smaller elements and assigning them to experts will increase productivity.

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