Chapter 7
Study 1: ICT Use and Organizational Structure

The previous chapter discusses the design, selection of cases and analyses of data in Study 1. This chapter reports on the results of this study, which examines several assumptions. It was assumed that the introduction of ICT would give rise to new organizational forms characterized by:

- a flat structure, resulting from a decrease in vertical complexity and middle management;
- a lean and more integrated structure, resulting from a decrease in supporting and executing staff, as well as a decrease in horizontal complexity;
- a dynamic structure resulting from an increase in temporary teams and blurring organizational boundaries;
- geographical flexibility (employees working from physically dispersed locations, regardless time).

The following section begins by describing the organizational structure and use of ICT for each organization selected. This is followed by a look at shifts in organizational structure. The last section contains conclusions and a discussion.

7.1 Case descriptions: structure and ICT use

In the first round of interviews, general information was gathered about the organizational structure and the use of ICT. This section contains brief descriptions of all five cases, which are based on the initial interviews.

Organization A; ICT use: not very intensive-short period of time

Organization A is a trade organization founded over a century ago. The organization has some 68 establishments throughout the country, employing 14,000 people. This study includes the main office only, whose staff body numbers 650. The main office has a matrix structure. The matrix forms the core of the organization, surrounded by several supporting services.
The organization consists of about eight either hierarchical or functional layers. It is fairly centralized, but employees are gaining more responsibilities. However, the dominant principal in this old organization is: "everyone needs supervising." There are many cross connections within the matrix structure that have resulted in working in cross-sectional or departmental teams.

Each party within the organization must coordinate their activities with the activities of other parties. Cooperation between different parties is mainly coordinated in face-to-face contact (meetings).

When this study was conducted (2000), the organization had only recently (less than five years previously) started using ICT applications, such as datamining, supply chain management (SCP) and electronic data interchange (EDI). About a third of the employees had access to e-mail. Even fewer had access to the Internet. The organization had no intranet. A traditional mail system was still largely responsible for the exchange of messages and documents. Shortly before this study, the organization had undergone a standardization process. After an inventory of all applications, the number of applications used dropped from 150 to about 40. Most of these ICT applications had been introduced less than five years previously. Several of these applications were still in the experimental phase. The organization had a reactive policy with regard to ICT. In other words, it first made a thorough study of the added value of applications before making any investments.

**Organization B; ICT use: not very intensive – long period of time**

Organization B is an international organization founded in 1956. Its core focus is development aid. It works together with roughly 900 partner organizations in 45 different countries. In all, some 300 people work for this organization. The organizational structure is fairly flat, consisting of the board, a layer of middle management and the professionals, distributed throughout three departments. Every department can be regarded as a sub-organization with a decentralized supporting staff. Cross-departmental teams or projects are rare.

The organization had e-mail access and its own intranet. About two thirds of all employees also had access to the Internet. Some five years before this study, the organization began using a data warehouse. By and large, ICT use in this organization was not yet very intensive. However, many partner organizations did make intensive use of e-mail and the Internet, thereby stimulating the development of these tools this organization. Much effort has been invested in B’s intranet. The
implementation of an Enterprise Resource Planning System (ERP) was also underway. The board keeps a close eye on technical developments. As soon as an application has proven useful, the organization considers buying it.

Organization C; ICT use: very intensive – short period of time

Founded only a few years ago, organization C is a rather young organization in the service industry. It employs roughly 250 people and consists of three departments: Operations, Marketing & Development and Sales. Most employees work for either the Call Center (called “Operations”) or the Sales Department. Much like B, organization C is fairly flat, consisting of a board, a layer of middle management and an operational core. The different departments are interdependent and have to coordinate their activities. The organizational structure is fairly centralized, lean and integrated and tries to operate as flexibly as possible.

The organization intensively uses a wide range of ICT applications. The most important communication medium is e-mail, especially with regard to attuning activities. The Internet is frequently used to obtain information about the market. Moreover, documentary information systems, decision supporting systems and management information systems are used intensively. Standardization of these systems is high.

Organization D: ICT use: very intensive – long period of time

Organization D belongs to the financial service industry. The organization was founded in the late 19th century. It employs approximately 3,500 people, distributed in three different offices in the Netherlands. The organization is divided into five hierarchical layers. People do not work together in cross-sectional teams or projects. Activities are only attuned between different departments - if those activities are linked in some way. The departments (product groups) are not interdependent and can be regarded as separate sub-organizations.

In this organization, ICT applications had been used over a long period of time (longer than five years at the time of this study in 2000). Every employee had access to e-mail, which was used intensively. The number of Internet accounts was limited and related to the individual’s function. Intranet was available to everybody, and its use rapidly on the rise. Communication between different offices was supported by video conferencing. Documentary information systems, decision supporting systems, executive and management information systems and electronic data interchange
were also in use. A substantial part of these systems was standardized and controlled by a central department.

**Organization E; ICT use: very intensive - long period of time**

Organization E is a large governmental organization. It consists of five different divisions covering different fields of policy-making and a large supporting staff. For over 10 years, all divisions have been located in one large building (with the exception of several regional offices). The staff body numbers approximately 4,000. Five hierarchical layers can be distinguished. While the different departments work together, they are not interdependent. In some cases cross-divisional teams and projects are formed.

All employees had access to e-mail and several basic digital services, which can be regarded as forerunners to an intranet. Almost half of the employees had Internet access. In different places within the organization, small intranets had emerged. Applications, such as documentary information systems, decision supporting systems, video conferencing and ERP modules were used for different work processes. At present, the (public) service delivery process of this organization is being completely computerized. Although the organization is working hard to standardize its systems and applications, there are still some islands of automation. Part of the reason for this situation is the fact that each division establishes its own policies regarding ICT applications.

### 7.2 Shifts in organizational structure

The second round of interviews focused on (recent) structural changes within each organization and their possible relationship with the organizational use of ICT. Once again, the results of these interviews will be discussed per case (organization). Table 7.1 presents an overview of the results for each case.
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**Shifts in organizational structure**

**Flat structure**
- Decrease in vertical complexity: $+ \quad 0 \quad 0 \quad + \quad +$
- Decrease in middle management: $0 \quad - \quad + \quad 0 \quad -$

**Lean and Integrated structure**
- Decrease in supporting staff: $- \quad - \quad 0 \quad - \quad 0$
- Decrease in operational staff: $+ \quad 0 \quad 0 \quad + \quad +$
- Decrease in horizontal complexity: $- \quad - \quad + \quad + \quad +$

**Dynamic structure**
- Temporary teams: $0 \quad 0 \quad ++ \quad + \quad 0$
- Blurring of internal boundaries: $0 \quad 0 \quad ++ \quad + \quad +$
- Blurring of external boundaries: $+ \quad 0 \quad ++ \quad 0 \quad +$

**Geographical flexibility**
- Working time- and place-independent: $0 \quad + \quad ++ \quad ++ \quad +$

++ = Strong change in line with theoretical assumptions  
+ = Change in line with the theoretical assumptions  
0 = No change that can be related to ICT use as described in the theoretical assumptions  
- = Change in the opposite direction of the theoretical assumptions

The scores ++, +, 0, - are based on interpretation of the results (by three researchers).

**Table 7.1: Shifts in organizational structure**

Organization A shows only a little change in structure in the direction of the characteristics assumed of "the new organizational form." Several shifts that should lead to these characteristics were visible, but were not perceived by the consultant as related to ICT use. A decrease in hierarchical layers had resulted from a need for higher efficiency. The organization had learned by experience that ICT increased an individual manager's span of control. In light of that, it could be argued that ICT helped to bring about this preference for fewer hierarchical layers. However, the consultant did not want to draw this conclusion explicitly: "... hierarchical layers have decreased for efficiency reasons, not because of ICT use".

The employees worked in teams with several suppliers. As a result, external boundaries were crossed and were susceptible to some blurring. The number of functions, or
jobs, in the operational core was on the decline. And indeed, this was attributed to the process of computerizing simple routine tasks. Shifts towards a more integrated structure had not yet taken place. However, cooperation between the different departments had improved because of more accurate and rapidly available information. The organization had not yet explored options for working arrangements that break free from the traditional constraints of time and location.

In organization B, ICT use is related primarily to efficiency benefits. E-mail, for instance, is an important medium for contacts with partner organizations abroad. Since its introduction, information has been transmitted more rapidly, arriving at the right place at the right time. Moreover, the response rate (i.e. to questions asked) has increased. The relationships with partner organizations have not changed. No evidence was found of blurring in organizational boundaries (either internal or external). Internal use of e-mail and intranet serves primarily to exchange information and ask questions. The coordination of activities takes place mainly in weekly face-to-face meetings.

The in-house consultant did not consider the organization’s structural developments to be related to ICT use: “Organizational development is not related to ICT use; no important structural changes have taken place.” The middle management layer was seen as the backbone of the organization and ICT was not felt to be susceptible to change in the near future. Moreover, since the organization was still growing, it was more likely to witness an increase in its middle management, as well as in its supporting staff. “Middle management is the backbone of our organization. We are more likely to see new hierarchical layers form than to expect flattening”.

The implementation process of the ERP system did indeed lead to a discussion about the possible influence of that system on work processes, although fundamental changes were not expected.

Finally, because of the organization’s great interest in the well being of its employees, it devoted considerable attention to ICT’s potential to enable working arrangements that break free from traditional constraints of time and location. For instance, whenever employees wished to work at home, the options available were taken into consideration.

Organization C has only existed for a few years. Actual structural changes cannot be expected in such a short period of time. Therefore, in this case, our focus did not lie so much on structural changes as it did on current characteristics. The organization is structured to respond flexibly to its environment. It features no stable, or firmly standing structure. The organization strives to maintain an integrated, flexible structure with a minimum of firmly established departments. The board is small. Members of the board are aided by decision-supporting systems and management information systems, which makes them less dependent on the knowledge and expertise of employees.

The different organizational departments are strongly related to each other and their activities are continually coordinated. Internal boundaries are flexible. The same can be said
for the external boundaries. Within different projects, this organization works closely with other organizations. Full use is made of ICT’s potential for working arrangements independent of time and location. Employees, especially those in the sales department, work from different geographical locations and use ICT to maintain contact with the main office. The in-house consultant explained that the organization’s structure, as well as the design of its work processes, is based upon the options offered by ICT. Without these technologies, the organization could not function in this way. “ICT determines the effectiveness of our organization; all processes are supported by ICT. Without ICT, this organization could not exist”.

ICT also plays an important role in organization D. The consultant pointed out that several processes in this organization could not take place without ICT. “ICT definitely influences our effectiveness and increases our efficiency in performing activities. Without ICT, many of our current work processes could not take place.” Aside from efficiency and effectiveness, ICT also has led to shifts in organizational structure. The management continually checks the feasibility of merging different departments. Shortly before this study, several departments were merged to form a central call center, supporting several product groups. This happened as a result of the integration of information systems in these formerly separated departments. Organizational developments such as this cause internal boundaries to blur. This process is also stimulated by the use of temporary project teams. Blurring of external boundaries had not (yet) taken place.

From the bottom up, the organization was flattening. Increasingly, operational tasks, which take place in the lower layers of the hierarchy, were being computerized. Several functions in these layers had, therefore, disappeared. Finally, the organization made use of the possibilities ICT offers to work from different geographical locations. Satellite offices were, for instance, among the options under consideration.

Organization E had witnessed several reorganizations in recent years. These reorganizations had diminished hierarchical layers and were carried out mainly to improve efficiency and effectiveness. This flattening in the organization was supported by the use of ICT. The supporting staff had decreased due to the computerization of several tasks as well as the centralization of formerly decentralized tasks. Again, this centralization process was supported by ICT, since information systems were connected or integrated. We also found a visible decrease in the operational core. The process of computerization in a large operational department significantly reduced that department’s staff. However, the organization’s ICT application support staff rose dramatically.

The organization had set out to reduce its different departments with a view to increasing flexibility. Where it proved possible to merge departments, (e.g. because of strong coherence or overlapping tasks), it did. Although the organization did not directly relate this policy to ICT use, these organizational and technical developments appeared to show increasing coordination. Several experiments and pilots were conducted to support boundaries
crossing teams with ICT applications. The use of joint databases showed a rise in projects involving external parties (other organizations). Within these projects, the external boundaries appeared to blur.

This organization also explored options for working arrangements independent of time and location (e.g. tele-work, working at home). More and more employees were also tapping into the potential uses of ICT. One department consisted entirely of “tele-workers.” In all cases, the organization first made a thorough study of task characteristics and their suitability for work-at-home arrangements.

7.3 Conclusion and discussion

The shifts assumed in organizational structure (as a result of the interaction between ICT use and structural characteristics) fall in line with the empirical data. This proved especially true of the assumptions that structures become more dynamic and that options increase for work arrangements independent of time and location. The cases where we found intense, longer-term ICT use did, in fact, show shifts towards a more dynamic structure and an increase in work arrangements independent of time and location. These cases also showed a shift towards flatter, more integrated structures – albeit to a lesser extent. These structural characteristics were even more pronounced in the relatively new organization (organization C), which could not function as it currently does without ICT applications. Or as our informant put it: “Without ICT this organization could not exist”.

The assumed decrease in the supporting staff was not found in any of the cases. Organization E compensated the decrease in supporting staff (related to ICT use) by increasing its ICT support staff. Organization D even observed an increase in the supporting staff in general. These findings may be partially attributable to a growing complexity in work processes and to an increase in the rate of changes and new developments in organizations, which, in turn, are often related to new technologies. It may be worthwhile to explore this assumption regarding the supporting staff by means of quantitative research into more organizations. Earlier research (Crowstone & Malone, 1994) also observes a more central role of the supporting staff in modern network organizations.

In the organizations that do not use ICT intensively, the assumed shifts were hardly perceptible – if at all. In some cases, the opposite shift was actually observed. This can be explained by the fact that the assumed interaction between the use of ICT and organizational structure had not (yet) taken place. As argued in Chapter 4 (section 4.3), this interaction only takes place if the organizational structure and the technical structure match. In other words: if an organization wants to take optimal advantage of ICT’s potential, the processes for which ICT is used must by adapted to the possibilities. Organization B, for instance, uses an intranet for asking questions and exchanging information. Its task coordination process, by contrast, takes place in weekly meetings. However, an intranet could be used to support that coordination process. This could serve to replace weekly coordination with continual
coordination of activities. Cooperation between people or teams could improve as a result, and the role of the employee responsible for coordinating tasks could change. In this case, an adaptation would occur between the options ICT offers and the structure of processes.

To what extent an organization strives for and actually accomplishes a match between the options ICT offers and its design of processes, and thus to what extent the assumed structural shifts take place, do not depend solely on the intensity and duration of ICT use. Factors, such as size, organizational culture, the organizational branch and task characteristics, also wield substantial influence. However, this qualitative study supports the idea that organizations striving for optimal use of ICT's potential (to overcome problems of time and space, connect people and increase control) are shifting towards a flatter, more integrated and dynamic structure, and offer employees work arrangements independent of time and location.

The results of this explorative study cannot simply be generalized. Only a very limited number of organizations were studied. Even so, our results, together with those of other, earlier studies (discussed in Chapter 4), offer a sufficient basis for confidence in the reliability of the assumptions formulated in the first section.