

**STRUCTURING JOB RELATED INFORMATION ON  
THE INTRANET: AN EXPERIMENTAL COMPARISON  
OF TASK VS. AN ORGANIZATION-BASED APPROACH**

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**ABSTRACT**

In this article, we present a usability experiment in which participants were asked to make intensive use of information on an intranet in order to execute job-related tasks. Participants had to work with one of two versions of an intranet: one with an organization-based hyperlink structure, and one with a task-based hyperlink structure. Efficiency and effectiveness were measured in terms of execution time and task accuracy, respectively. After the task execution, participants were asked to evaluate the task as well as the intranet. The results show that participants perform more efficiently with the organization-based structure, which is probably due to their familiarity with this structure. A post hoc analysis revealed, however, a learning effect in the task condition, which suggests that once users are acquainted with it, a task structure is at least as efficient.

**INTRODUCTION**

Over the last decade many profit and non-profit organizations have started implementing intranet technology to disseminate internal communication: an internal Website containing news, instructions, communication facilities, and other organizational information for employees. Intranets are often intended to

replace paper piles of memos and to reduce costs on meetings and training personnel. Ward [1] gives an example of Xerox saving 10 million dollars by having 3800 (20%) of their technicians worldwide publish maintenance tips and best practices on an intranet.

Intranets have been widely used for the distribution of central organization information like phone books, agenda information, birthday calendars, board minutes and picture galleries. However important this information is, it is relatively peripheral with respect to the daily work of employees. Intranets can be exploited more effectively when they manage to become the coordinating and monitoring point for basic tasks to be performed daily by individuals and teams at all levels of the organization. In order to achieve this goal, intranets have to enable access to all declarative and procedural, explicit and implicit information employees may need to do their job: job instructions, regulations, policy documents, demos, customer files, etc.

Introducing the intranet as the center of information, communication and interaction faces organizations with many challenges. Intranets have to be technically robust, dynamic and really interactive, they have to be designed in a way that meets the needs of (cooperating) individuals and the organization as a whole. Employees have to learn to use new technology and get acquainted with new procedures and interfaces; they must be convinced that these additional efforts eventually lead to a more efficient and a more satisfactory task execution. Managers have to learn to organize projects and work flows taking into account the possibilities and restrictions of the intranet. In sum, setting up a successful and powerful intranet implies a joint effort coming from different experts, organization levels, and domains.

An important point in setting up a usable intranet is the global structure of the information. As with all other information products and especially digital information environments, intranets have to enable employees to easily find what they need. If not, they lose time, become frustrated, and in the end will turn to alternative ways of executing their tasks.

In this article, we present the set-up and the results of a usability experiment into the effect of two generic intranet structure models, a “semantic,” organization-based structure and a “pragmatic,” task-based structure. Participants were asked to perform job tasks, for which they had to make intensive use of intranet information organized in either an organization-based or a task-based structure. Efficiency, effectiveness and appreciation were measured. Before going into the details of the experiment, the next section explores the relevance of the two information structures for intranet users.

## **STRUCTURE IN JOB-RELATED INTRANET INFORMATION**

Intuitively, information structure in an intranet can be defined as the way in which different information nodes are grouped, labeled, and connected. An

important point here is the way in which hypertext structure is made visible by using structural navigation aids, such as navigation maps, navigation bars (bread crumbs), paging buttons, alphabetical content lists, history tools, (expandable) menus, back buttons, hyperlink previews, bookmark techniques, etc. Basically, they all refer to representations of the global or local structure of the information, or to clarifications of the position of the user within the information space.

Research into the effect of these tools is varied and the results are not always unequivocal [e.g., 2, 3]. However, unfortunate, this is quite understandable given the complexity and the variability of hypertext environments, with their differing sizes (large vs. small), navigation tools (e.g., static vs. interactive; global vs. local; etc.), purposes or tasks (e.g., open vs. closed; study/learn vs. search), and users (e.g., novices vs. experts). Consequently, conclusions about the effect of hypertext structures or navigation tools are only valid within the application range defined by the interaction of the variables as they are implemented in a particular (experimental) environment.

In this study, we discuss the usability of two competing ways of organizing and presenting hypertext information in the context of job tasks to be executed by expert employees in a marketing department of a local branch of a multinational.<sup>1</sup> As the organization was about to develop an intranet at the time of this study, the results could, as a side effect, serve the purpose of supplying useful information in the process of choosing the most adequate intranet structure. The intranet was to present information and procedures with respect to the marketing, the sales, and the final control of company products (brand management, communication management, account management, financial management, and research information).

### **Organizational and Task-based Information Structure**

Two generic structures were studied, a knowledge-based, or organizational, and a task-based structure, respectively. The organizational structure classified the intranet information on the basis of the major organization chart of the company: the divisions and the departments of the company, subdivided on the basis of its products. There were two large divisions (body and health care) each with a marketing, a sales, and a financial division, and each containing information about the different products (see Figure 1 for the organizational structure). The organizational structure is preferred by management teams who want an intranet partition for every department, or who are used to thinking in terms of communication within and between departments. A drawback may be that an organization-based intranet creates or perpetuates individual information compartments in different company divisions, which may require users to find appropriate information at different locations.

<sup>1</sup>Sara Lee Household and Body Care Holland, “daughter” of Douwe Egberts.

A major advantage is the familiarity of the organizational structure. As Horton [4] point out, organization chart diagrams are very familiar in corporate and institutional life, and as such are very suitable to structure large portions of information in memory. In addition, familiarity is known to be a crucial factor in the usability of navigation tools. In surveying the different studies on navigation maps, significant differences can be found in terms of the familiarity of information structures used, for example, between the fairly ad hoc concept map studied in McDonald and Stevenson [5] and the more familiar concept map used by Beasley and Waugh [6]. The familiarity of information structures can be achieved by eliciting expert domain knowledge, as is done by Patel, Drury and Shalin [7], or by using simple word knowledge schemata. A typical case is provided by Kim [8]. He shows the effectiveness of organizing cyber shopping mall information on the basis of the familiar spatial organization of the mall. Similar familiar structures have been used by Dieberger [9] and Dieberger and Frank [10]. The results show that task performance in a hypertext environment strongly improves if users can rely on familiar knowledge structures.

In sum, the organizational structure reflects familiar information, and employees may benefit from this existing knowledge in searching information associated with the task. Therefore, it was made sure in the present study that the users were very familiar with the organization chart of their company.

The task-based structure presented information in four task categories: how to market products, how to sell them, how to control finances, and how to control business. Each of these categories clustered a number of logical subtasks. For example, the marketing of products included tasks associated with the marketing of new and existing products, with developing a promotion plan, with consulting research results, and with making a budget. As opposed to organization-based structures, task-based structures generally are less familiar. However, as Schneider and Davis [11] pointed out, task-based structures nevertheless are a useful and logical choice. They argue that, in order to make the intranet more usable and applicable in everyday tasks, information should be clustered around real user tasks instead of around document types or tool categories. They provide the following example to illustrate the benefits of this approach. A user who needs to calculate a budget will look for a spreadsheet (a calculating tool) and the last year's budget (an internal document). In a document-oriented intranet, he will have to make choices from a menu with "calculation tools" and "internal documents." In a task-oriented intranet, he will find a menu option "calculating budgets" containing all the accompanying documents and tools. It is obvious in this example that the task-oriented intranet better suits the needs of the user. Of course, the task-oriented structure is not new. To date, it has been widely propagated, not only in handbooks and advisory literature [4] but also in many empirical studies. For instance, Odescalchi [12] compared the task performance of software manual users who either worked with a task-oriented manual or with a software feature oriented manual. She found that users working with the

task-oriented manual were more satisfied and more productive, and also made fewer errors. As far as task-orientation is concerned, intranet users are comparable with software manual users. They both look for relevant information, given a particular task.

In sum, the information structure in an intranet should enhance task performance by enabling users to locate relevant information quickly and efficiently. Such an environment will inevitably increase work satisfaction. This section provided arguments for organizational—as well as for task-based structures as the best choice for intranet applications in organizations: the organizational structure because of its familiarity, the task structure because of its suitability. In an experiment, we compared the two structure models and investigated which of the two factors, i.e., familiarity or task orientation, dominates the other in terms of task efficiency, effectiveness, and satisfaction.

## METHOD

### Materials

The materials used in the experiment were obtained from the company where the experiment was conducted (Sara Lee Household and Body Care Holland). The materials, which were derived from paper information at Sara Lee, were constructed as partial prototype intranets in two versions: a version with an organization-based structure and a version with a task-based structure. The hyperlinks used in the two versions reflected the differences between an organization- and a task-based approach. The organization-based hyperlinks had the form of noun phrases, the task-based hyperlinks verb phrases. The information, which was identical in both structures, was sufficient to support the experimental task and was hierarchically classified in four levels. Page design and navigation was intentionally kept functional and simple: white pages with black text and a structure frame on the left. That way, the risk of interference with other design variables was kept to a minimum. Example screens of the two structure versions (translated from Dutch) are given in Figure 1.

### Experimental Task

Company managers at Sara Lee pointed out that an important goal of the future intranet would be to directly support employees in their daily activities. One central task of the marketing department was to write packaging briefings: a 5-page proposal for the (external) supplier of product packaging materials. Participants were asked to compose a packaging briefing for an imaginary new body care product. In a packaging briefing, information is included about product and market characteristics of a brand, such as brand values, brand colors, competitors, buyer information, other products of the same brand, etc. With this

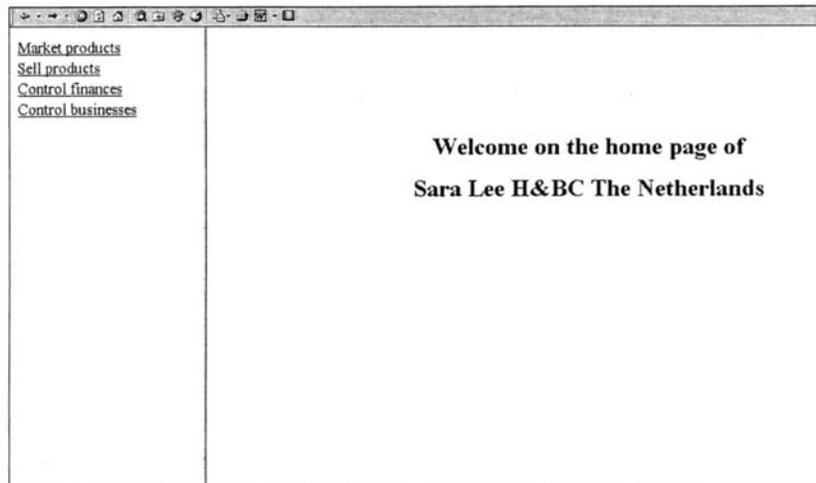
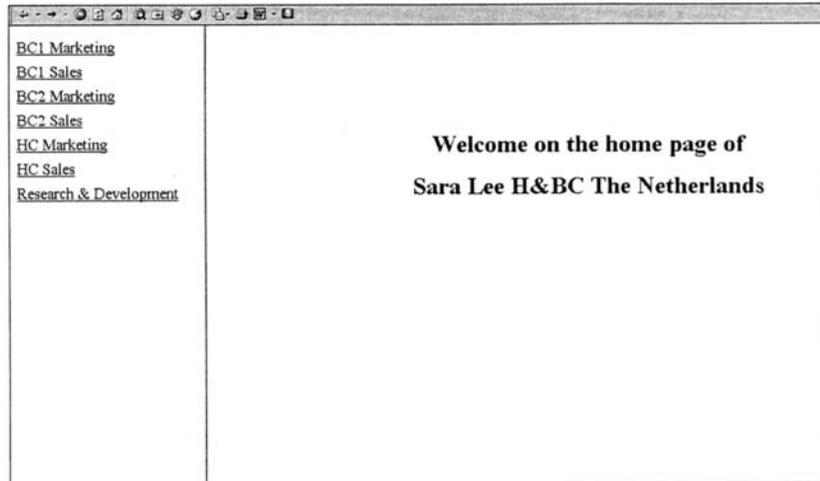


Figure 1. Example screens (home pages) of the organization-based (left) and the task-based (right) intranet prototypes (translated from Dutch).

*Competitor Analysis*

Name of the competitor:

Sales of the competitor in 1999:

Name of the competitor's leading brand in Men Care:

(Back to HOME)

Figure 2. Example of a subtask (competitor analysis) in the experiment with three fields to be filled out by the participants (translated from Dutch).

information, the packaging supplier is able to design an effective new product packaging. We did not choose an existing product because some of the participants would be too familiar with this product and therefore would have fewer information needs.

The task was decomposed into six different subtasks, each requiring the completion of two or three specific subject fields in the briefing. An example of a subtask is given in Figure 2. Altogether, 15 subject fields had to be filled in.

### **Participants**

Twenty employees of the Sara Lee Marketing department participated in this study: 13 women and 7 men. All participants had a degree in higher education and worked with computers for several hours a day. They were all experienced in producing packaging briefings behind a computer, a task they performed professionally on a regular basis, albeit for different products. Participants were assigned randomly to one of the experimental conditions.

### **Instrumentation and Dependent Variables**

*Task effectiveness* was measured by the number of correctly performed subtasks (minimum 0 and maximum 6). The correct outcome was defined in advance by the company's management criteria. Since the task consisted of finding facts and numbers, checking the responses was straightforward.

Furthermore, a number of online measures was used to register task efficiency. The clicks on hyperlinks as well as their timings were registered in log files (ProxyPlus software). From these log files, several measures could be calculated. *Exploration time* was defined as the time that expired between the start of the intranet search at the homepage and the first click on a hyperlink. We assumed participants used this time to explore the navigation frame on the homepage and a form a—preliminary—representation of the information structure in it. Information structure may affect the duration of this exploration process and thus may affect the overall task efficiency. *Search time* was the time a participant needed to locate the relevant information during the experimental assignment: the time that expired between the first and the last click in a subtask. *Task performance time* (both per subtask and for the complete task) was the total time participants spent exploring, searching, and actually carrying out the (sub)task.

Besides orientation time and search time, we also measured task efficiency in terms of the *number of nodes participants actually visited* to complete the (sub)task, both separately and in relation to the number of nodes that were minimally required to be able to complete the task. We adopted Smith's *measure for task efficiency* in Website searching [13]. She proposes a formula, presented below, on the basis of two efficiency indicators: the ratio of different nodes accessed and total node accessed, and the ratio of required and visited nodes. She and others used this formula to measure lostness in Websites [14].

$$E = \sqrt{((D/T - 1)^2 + (R/D - )^2)}$$

E = efficiency

D = number of different nodes accessed

T = total number of nodes accessed

R = number of nodes which must be visited to complete the task

The more efficient a participant works, the lower the value of E. When a task is performed with optimal efficiency,  $E = 0$ .

Finally, we measured user satisfaction: How satisfied were participants with the effectiveness, efficiency, and quality of their task performance. This was measured by an 18-item post-experimental questionnaire. The items were phrased alternately positively and negatively. Answers could be given on a 5-point Likert scale running from completely agree (1) to completely disagree (5).

### Procedure

We conducted the experiment at Sara Lee Household and Body Care Holland. The company did not have an intranet at the time we conducted this study, but was

making plans to develop one. The experiment took place on a normal working day during office hours in an office which was equipped like any other office in the organization. Participants executed the experiment individually. They were not aware of the goal of the experiment. Each participant took part in the experiment individually. The participant first received and read instructions on a sheet of paper and was allowed to ask questions about the procedure. They were explicitly told not to browse the intranet but to search decisively for the information required by the packaging briefings. When the participant fully understood the instructions for the experiment, he/she started carrying out the task on a lap top computer while the experimenter monitored the session. Participants were asked to complete one subtask at a time in the given order, and not to proceed to other subtasks before the subtask was finished. When the task was completed, the intranet was closed down and the participant completed the questionnaire. It took participants about 30 minutes to complete both the task and the questionnaire.

## RESULTS

Data were analyzed in an analysis of variance with information structure as between-subjects variable. The analyses were run over 19 participants and 5 subtasks. One participant was extremely slow in completing the tasks and had more than the average number of errors (9 out of 15 answers against an average of 1.97 errors for the other 19 participants). Also, subtask six was left out of the analysis because it appeared that the information labels misled the participants in the task-based condition to look for the information in the wrong place. This issue will be discussed later in the Conclusion section.

### Task Effectiveness

The mean number of errors per subtask (see Table 1) in the task-based intranet appeared to be somewhat higher than in the organization-based version, but this difference was not statistically significant  $F(1, 17) < 1$ .

### Task Efficiency

Table 1 also displays the results for the efficiency measures. Participants in the task-based condition needed significantly more *exploration time* than participants in the organization-based condition:  $F(1, 17) = 4.80$ ;  $MSE = 1.14$ ;  $p < 0.05$ . They also needed significantly more *search time* per subtask than the participants in the organization-based condition:  $F(1, 17) = 5.43$ ;  $MSE = 147.37$ ;  $p < 0.05$ ; more *task performance time* per subtask:  $F(1, 17) = 5.09$ ;  $MSE = 718.72$ ;  $p < 0.05$ ; and more *task performance time* overall:  $F(1, 17) = 89.19$ ;  $MSE = 7702.41$ ;  $p < 0.05$ .

The average number of nodes visited to complete a subtask did not differ significantly ( $F(1, 17) < 1$ ). The two conditions did not differ either on Smith's efficiency measure, although the results showed a trend, indicating that the

Table 1. Task effectiveness: mean number of errors, and task efficiency: mean exploration time, mean search time, mean task performance time (seconds), mean number of steps, and Smith's efficiency measure (0 = efficient; 1 = inefficient) as a function of intranet version (organization-based versus task-based)

	Organization-based	Task-based
Mean number of errors - per subtask	1.60	2.33
Exploration time - per subtask	1.06	2.13
Search time - per subtask	11.04	24.04
Total time - per subtask	104.67	132.45
Total time - complete task	636.70	752.11
Number of steps - per subtask	5.34	5.76
E (Smith's efficiency) measure - complete task	0.84	0.86

Table 2. Participant satisfaction about efficiency and quality of task performance as a function of intranet version (organization-based versus task-based): mean scores on a five-point Likert scale (min. = 1, max. = 5).

	Task-based	Organization-based
Satisfaction	3.99	4.04
Efficiency	4.02	4.04
Quality	3.97	4.04

task-based intranet may be somewhat less efficient than the organization-based version:  $F(1, 17) = 3.89$ ;  $MSE = 7.74$ ;  $p = 0.07$ .

### Satisfaction

The questionnaire was divided into three parts: the participant's opinion about efficiency; effectiveness; and quality of the task performance. The reliability of the effectiveness subscale appeared to be insufficient (Cronbach's  $\alpha = 0.50$ ) and the scale was therefore left out of the analysis. The reliability of the other scales was satisfactory (Efficiency:  $\alpha = .70$ ; Quality:  $\alpha = .66$ ). Table 2 shows the mean scores. Participants in the two conditions did not judge differently about the efficiency or quality of their task performance ( $F(1, 18) < 1$ ).

## CONCLUSIONS AND DISCUSSION

### Task Efficiency

The results showed that participants worked more efficiency with the organization-based intranet. Working with the organization-based intranet took less time: less time overall; less time to complete subtasks; and less time to start searching. Apparently, as employees of the company, they benefitted from their knowledge of the organizational chart on which the information structure was based.

Participants in the task-based condition had to search information in a structure which was unfamiliar to them. The participants had extensive task experience, but the task structure was less explicitly accessible as an organizing principle. Apparently, the task structure was unexpected to the participants and did not work as efficiently as the organization model.

If unfamiliarity or inexperience rather than the ineffectiveness caused task-based structures to be less efficient, one may expect a learning effect of the task-based structure over the five subtasks. Participants may gradually learn to use the task-based structure as they become more acquainted with it, whereas such a learning effect would not be expected in the organization condition. In a post hoc

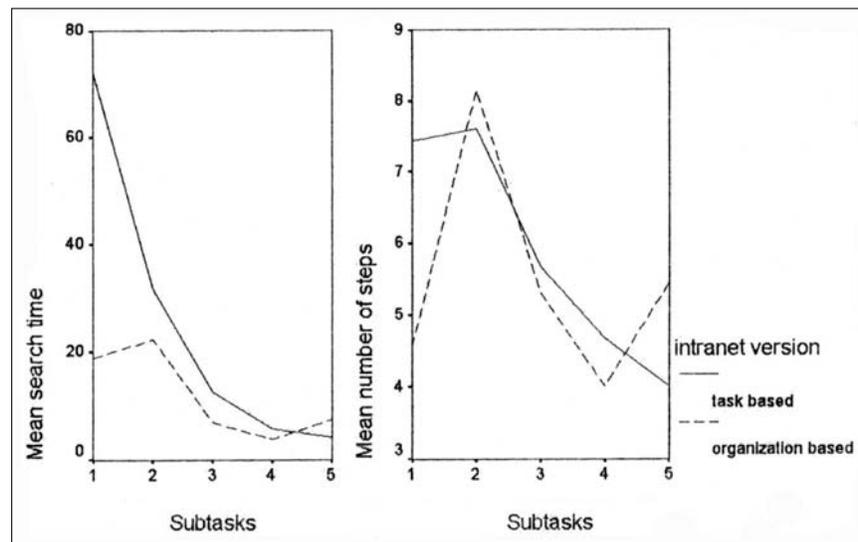


Figure 3. Mean search time (left) (in seconds) and mean number of steps (right) on the five subtasks as a function of intranet version (task-based versus organization-based).

analysis of linear trends we analyzed this possible learning effect. The results did not show a significant linear trend for the orientation time for subtasks in the task condition (task:  $F(1, 3) = 3.89$ ;  $p = 0.14$ ; organization:  $F(1, 3) = 4.80$ ;  $p = 0.11$ ), but there was a significant linear trend for mean search time in the task condition, as is seen in Figure 3 (left). As participants in the task-based condition performed more tasks, search time was shorter ( $F(1, 3) = 12.96$ ;  $p < 0.05$ ), a trend that was not found in the organization condition ( $F(1, 3) < 1$ ).

Likewise, there was a linear trend in the task condition in the number of steps that were taken during task execution. Figure 3 (right) shows that, in the task-based condition, the number of search steps decreased linearly as the participants performed more tasks ( $F(1, 3) = 34.94$ ;  $p < 0.01$ ). Again, this trend was absent in the organization-based condition ( $F(1, 3) < 1$ ).

In sum, there was a clear learning effect in the task condition, which indicated the soundness of the task-based structure once participants get acquainted with it.

### Task Effectiveness

Task effectiveness did not differ in the two experimental conditions. Apparently, the difference in familiarity did not influence the eventual results of the searching process.

### Satisfaction

Satisfaction did not differ in the two experimental conditions either. Apparently, efficiency differences did not influence the satisfaction of participants. This may be due to the learning effect: participants may gradually have had a more satisfied feeling about working with the task structure.

### In Sum

In terms of organizational practice, the results of the experiment seem to favor an organization-based structure. The familiarity with the organization-based structure clearly dominated this experiment resulting in a more efficient task performance. However, task model users appeared to catch up quickly. Besides, they executed their tasks equally correct and were equally satisfied. The suggestion is that once users are acquainted with a task structure, it is at least as efficient as an organizational structure.

Organizations that opt for task-based information structures have to take into account extra time and energy during the learning phase. Furthermore, whereas the labeling of hyperlinks in an organization-based structure seems straightforward, the labeling in a task-based structure seems to require special attention. As became apparent in the present study, participants in the task-based condition erroneously chose the link *Control finances* in order to look for budgetary product information (subtask 6). However, this information was to be found under the link *Market*

*products*. Participants in the organization-based condition, on the other hand, were not misled by the labeling of the links. Their problem was to find the correct *Marketing department* where the information was stored.

Once a task-oriented intranet has been set up, it may be as efficient as an organization-oriented intranet. However, it is unclear from our experiment whether this investment pays off. Of course, in daily intranet practice other factors come into play, which may equally well argue in favor of task orientation as a structuring principle. For example, intranets contain much more information than our experimental environment. Task orientation may well be able to structure large portions of information meaningfully. Likewise, task orientation seems to be better suited than an organizational orientation to support collaborative task execution, especially collaboration between colleagues in different divisions. At least enough reasons not to close the discussion on task-based structures.

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