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LINKING DESIGN TO BUSINESS STRATEGY THROUGH FUNCTIONAL ANALYSIS

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ABSTRACT

The paper discusses how designers, conducting design projects in specific organization's, can assure that the design of IT is appropriately linked to the organizations overall business strategy. A case study is presented in the form of a design project in a small public organization. Functional analysis was used as a means to clarify how a specific needed information system could support the organization's new business strategy. Using functional analysis in the design project had a powerful effect: it seriously challenged the organization's business strategy and revealed that the system the organization believed it needed was irrelevant, while it needed other systems nobody had thought of beforehand. Functional analysis is outlined, the results from using this analysis are described, and lessons to be learned are discussed. The paper concludes by pointing out the need for explicit attention to the relation between an organization's IT-projects and its business strategy and by suggesting that it is the responsibility of the designers, conducting design projects, to assure that this task is taken proper care of. Practical guidelines for this purpose are given.

1. INTRODUCTION

This paper presents a case study from a larger research program, the purpose of which is to develop *theories of and approaches to* early systems design in an organizational context (Kensing, et al. 1994).

We use the term 'design' in the same way as architects do - focusing on the analysis of needs and the preliminary design of functionality and form. This is in contrast to what is commonly known within computer science, where the term 'design' is borrowed from engineering - focusing on construction and implementation.

Contextual design focuses on the application area: complex administrative, managerial, and professional work within a specific organization, and the process of designing relevant computer support for this work. This is in contrast to the designing of generic systems (Bansler & Havn 1994) aimed for a (larger) market.

By a design project, we refer to the early processes of systems development, where a vision of a future computer-based system is developed and outlined. The result of a design project includes representations of visions of computer support, which thus form a basis for the organization to decide on and, subsequently, purchase, develop, and implement computer-based systems. Based upon a design proposal, it should be possible for the organization to decide upon the suggested computer-based systems and related organizational changes. Eventually the project may proceed to purchasing generic systems and/or developing and implementing organization specific systems.

It has, for many years, been accepted that contextual systems design must be considered closely related to organizational issues (Simon 1973), and that organizational analysis is (or should be) part of the design practice (Andersen, et al. 1990, Cash, et al. 1992, Keen 1991, Kling 1993, Lanzara & Mathiassen 1984, Scott Morton 1992). An overall business strategy should form the context within which systems design is considered (Henderson & Venkatraman 1992, Kovacevic & Majluf 1993, Parker, et al. 1989).

Linking - or aligning - business strategy to IT is addressed by IS-literature, especially within the field of strategic information systems planning (SISP). Lederer and Sethi (1991) define SISP as "the process of identifying a portfolio of computer-based applications to assist an organization in executing its business plans and realizing its business goals" (p. 105), "whereby an organization establishes a long-range plan of computer-based applications" (p. 104). Lederer and Sethi (ibid) identify five critical factors (organization, implementation, database, hardware, and cost) leading to problems in the SISP-process. The most significant factors comprise 'organization' (including failure to take into account organizational goals and strategies) and 'implementation' (including that identified IT design projects require substantial further analysis). The authors recommend that future research should "attempt to better understand the circumstances under which specific factors are more perplexing and arduous" and "attempt to discover the actions which information systems planners can take to reduce the severity of the factors" (Lederer & Sethi 1991). This paper could be seen as a contribution to this request.

Linking business strategy to IT is generally viewed as a (top) management issue (Cash, McFarlan & McKenney 1992, Keen 1991, Lederer & Sethi 1991). Yetton et al. (1995) claim that IS-literature is dominated by a rational top-down view where "strategy drives structure which in turn determines technology and management processes, as well as individual skills and roles". An approach to SISP might thus begin by clarifying business strategy and end by defining appropriate design projects, as e.g. in the 'six stages' methodology presented by Kovacevic and Majluf (1993). In contrast to a top-down management perspective, this paper focuses on the perspective of the designer being in charge of a specific IT design project, which might have been recommended as a result of a preceding SISP-process.

We argue that the relation between design projects and an organization's business strategy is not only a management related issue and that it should not only be viewed as a top-down process. It should also be considered as a part of the specific design project. This approach corresponds with what Henderson and Venkatraman (1992) refer to as 'double-loop transformation process within strategic alignment' and it corresponds with the approach to SISP which Earl (Earl 1993) terms 'organizational'.

We have experienced that when a specific design project is initiated, the relation between this project and the business strategy might not be clear by the involved parts. During the project, contradictions, disagreements, or lack of policies concerning the need for IT support and the strategic business level might arise.

In this paper we suggest that it is the responsibility of the designer, conducting a design project in an organizational context, to examine the overall rationale of the project by clarifying how the organization's business strategy is related to, and should be supported by, the needed IT. Hence, from the perspective of the designers, they face challenges to:

- Analyse the organization in question clarifying the organization's business strategy.
- Clarify the degree to which the involved parts of the organization see the relation between the business strategy and the current project.
- Assure that the design project supports the organization's business strategy, and if not, question the design project or the business strategy.

A recent and progressive method for participatory design, The MUST-Method, suggests the use of a sociological founded functional analysis in dealing with this issue (Kensing, et al. 1996). The focus in functional analysis is on the functional requirements of the environment upon the organizational units in question (Schmidt 1988, Simonsen 1994). Functional analysis offers a conceptual framework and methodological guidelines for this task of clarifying the link between an organization's overall business strategy and the organization's more specific needs for IT-support.

This paper presents a case study in the form of a contextual design project in a small public organization known as the Film Board. A thorough description of the case is given by Simonsen (1994). The starting point in the case was a recent change in the organization's overall business strategy, which led to a need for a specific system. The case involved functional analysis in order to clarify how the new business strategy appropriately could be supported by IT. Using functional analysis in the design project had a powerful effect: it seriously challenged the organization's new business strategy, claiming it was in contradiction to other environmental requirements. This led to the conclusion that the system the organization believed it needed was irrelevant, while it needed other systems nobody had thought of beforehand.

The paper presents the case by describing the setting and starting point of the design project, outlines functional analysis and how this analysis was used in the project, and which results it ended up with. This is followed by a discussion of the effects of, and lessons and practical guidelines learned by, using functional analysis in contextual design.

2. THE SETTING

The Film Board is a public organization in Denmark under The Ministry of Cultural Affairs. The Film Board has 50 employees and a budget of approximately US\$7.5 million a year.

The Film Board's main function, as specified by law, is to promote information, education, and artistic and cultural activities by *producing* and buying films and videos along with *distributing* such films and videos to their customers: educational institutions, associations, and individuals. They produce about 100 new films and videos per year and distribute about 300.000 copies to customers per year.

The film-categories of the Film Board are mainly short films comprising:

- Cultural and social conditions, such as documentaries, portraits, and debate films.
- Education.
- Art, e.g. experimental video art.

The production of films and videos involves funding and supporting directors and producers, and to some extent managing the production. This is conducted by an Editorial Board, which receives applications for productions of films and videos, decides which of these to support, negotiates contracts, and supports and manages the succeeding production. Applications are received from producers and directors from the film milieu in Denmark.

When a film or video has been produced, the Film Board has the right of making and distributing copies from their internal stock. The distribution is handled by a department for order receiving and marketing. The department receives orders from the customers requesting copies of films and videos. The customers are public and private institutions (typically schools and libraries) and private individuals. Films and videos are booked by the customers for a specific period of time, e.g. a certain date or week. The main way of ordering films and videos is by phone, though customers also may order by mailing in written forms. Often, when customers called to make an order, they did not know exactly which film or video they wanted. The Film Board would thus, during the phone conversation, consult the customer regarding which films and videos the Film Board could offer to serve the customer's specific need. All orders were entered into a central booking-system.

The marketing function of the department comprised organizing premieres of new films and videos, informing customers of new productions, and producing and marketing a yearly catalogue of available films and videos. This included regular visits to their main customers by what the department referred to as "fieldwork": taking care of existing customers, and cultivating new markets for their films and videos.

Due to its relatively small size, the Film Board had no internal IT-department, though some of the employees were trained to take care of routine maintenance of their systems. Design and development of systems were outsourced to external consultants and vendors.

3. STARTING POINT

A few years before the project, the former president had retired, and a new one was employed for the purpose of organizational and managerial restructuring and modernisation of the entire organization. The Film Board had thus recently conducted a major organizational restructuring and had decided to achieve a change in its image:

- From "the old dusty house with films for schools," or "a public library for films and videos," which was the way they believed most of their customers conceived them,
- To "the house for film and video art" i.e. an organization viewed by their customers, and by the film producing milieu, as a dynamic and cultural center for film and video art.

The Film Board's main purpose should be to "ensure that short films and documentaries remain as an art form, where original, experimental, and individually unique artists could have free reign with their creativity".

Two years before, the Danish government had decided that a number of public organizations (including the Film Board) should increase their income besides receiving governmental funding. The purpose of this demand was to force the Film Board to initiate a change from a non-commercial public organization to a more business-oriented organization, having greater attention towards its earnings, expenditures, and productivity.

Changing their profile and image became an important part of the Film Board's business strategy: the department for order receiving and marketing were to increase their efforts in their fieldwork and launch the new image. Increasing their fieldwork would support the marketing function in general resulting in distributing more films and thus increasing their income (customers pay a fee for each film or video they borrow). The department thus needed to release resources from current work to support their fieldwork. In order to release resources, the organization had decided to invest in new IT-support in the department:

- The booking-system in the department was rather old, and in the near future it would have to be replaced with a new system.
- The libraries had, during the last few years, become one of their largest customers. Their orders (along with most orders from the second largest customer, the educational sector) were very straightforward, and they experienced that about 50% of all orders by phone was now a kind of "automatic" order, where the customer knew exactly what film or video he/she wanted and, hence, did not need any consulting. If the department invested in a new booking system, which could provide their customers with the ability to order their films and videos on-line, the management in the Film Board would expect a significant drop in the booking-task. This could release the needed resources for the fieldwork.

The situation described above was hence the general starting point for the design project. The specific starting point was the department for order receiving and marketing and its need for an on-line service to their customers. The designer in charge of the design project argued that the design project should include a functional analysis. This analysis would include the environment of the department and e.g. include interviews with other departments and

some of their main customers. There were two reasons for using functional analysis. First, the need for the on-line service was clearly related to the new business strategy and to some extent the demand for income. Hence it was relevant to clarify how the system could support this appropriately. Second, the design project was part of an (action) research project where we wanted to experiment with functional analysis as a means to develop such kind of clarification.

4. CONDUCTING THE DESIGN PROJECT

The design project was conducted by one designer, working 260 hours within a period of three months. For a thorough description of how the project was conducted see Simonsen (1994). The design process was organized with regular meetings with a working group, with managers and employees from the department for order receiving and marketing, and a steering committee, with the president and representatives from other departments in the Film Board.

The main data gathering method used was unstructured interviews. All sixteen employees in the department for order receiving and marketing were interviewed as well as the president and managers from other departments. Each interview was performed "in situ", and lasted for about 1/2-2 hours, and most of them were audio-recorded. In addition to the interviews, bookings by phone and some meetings in the department were observed. A thorough document analysis was performed, as the department produced a lot of written material (catalogue, status-reports from efforts doing fieldwork, statistics, booklets, leaflets, etc.). These activities, characterizing a participatory and also an ethnographically inspired approach, are not in focus in this paper, but are reported on elsewhere (Simonsen 1994, Simonsen & Kensing 1994; 1997). Also, five main customers representing the libraries and the educational sector were selected and interviewed. The involvement of customer relations in the design project is only briefly touched upon in this paper but is reported on in detail in (Simonsen 1996).

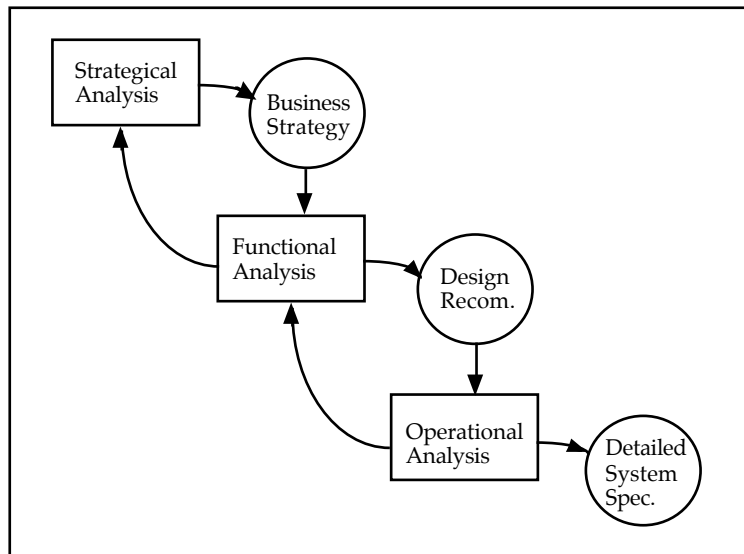


Figure 1. Functional analysis is one level of the analyses within Work Analysis (Schmidt & Carstensen 1990). Functional analysis has a starting point in the organization's business strategy and aims at pointing out *where*, i.e. within which work domains, IT-support should be applied. The succeeding operational analysis (e.g. OOA & D) aims at *how* the recommended IT-support should be designed.

5. FUNCTIONAL ANALYSIS

The overall approach to the design project was functional analysis, which is one level of the analyses in an approach known as Work Analysis (Schmidt & Carstensen 1990, Simonsen 1994), see figure 1.

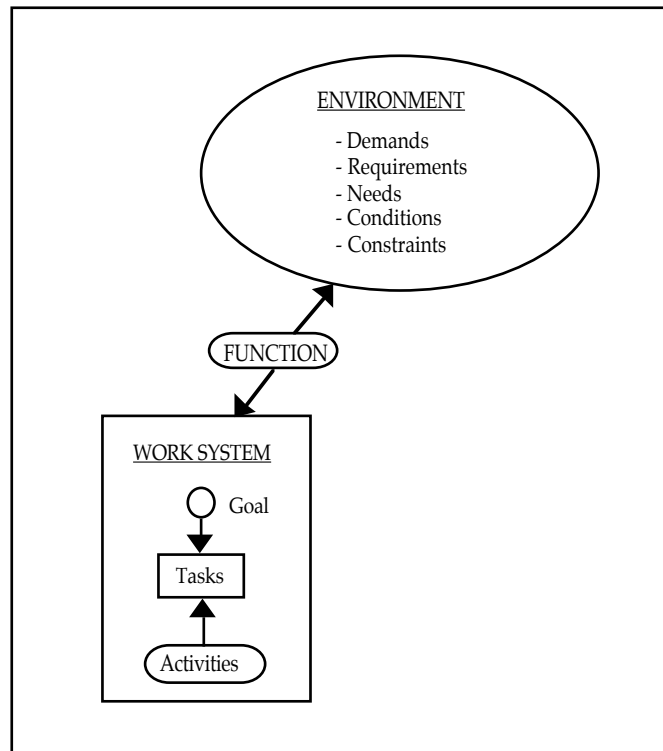


Figure 2. Basic conceptual framework of functional analysis (Simonsen 1994). The work system is perceived as a social or sociotechnical system. The environment is that part of the world which imposes requirements and demands on the work system, and which imposes conditions and constraints on the work system concerning its effort to meet the requirements. The function is the means-end relationship between the work system and its environment and expresses the purposiveness of processes in the work system, disregarding the actual implementation of these processes.

Functional analysis is an approach rooted in the FAOR-project (Schmidt 1986; 1988), and it has later been further evaluated, developed, and described in Schmidt and Carstensen (1990), Simonsen (1994), and Carstensen (1996). Functional analysis aims at establishing a link between business strategy and the detailed design of IT-support, i.e. to clarify and delimit which work domains should be in focus in the design project. Functional analysis provides a conceptual framework and guidelines for modelling the work system in question and its function towards its environment. The focus is on the functional requirements of the environment, or "outer world" (Simon 1969), of the work system in question, in order to clarify how the function of the work system corresponds to the equivalent requirements, needs, conditions, constraints, and demands from the environment (see figure 2). The analysis thus clarifies the potentials for investments in IT-support and it investigates organizational, economical, and technical limitations. It involves development of an under-

standing of the organization's situation on a competitive market, which parts of the organization need to be strengthened and how this relates to the current design project, identification and analysis of customers and suppliers (internal and/or external), and which products and services the organization should provide. For a thorough description of functional analysis see Simonsen (1994).

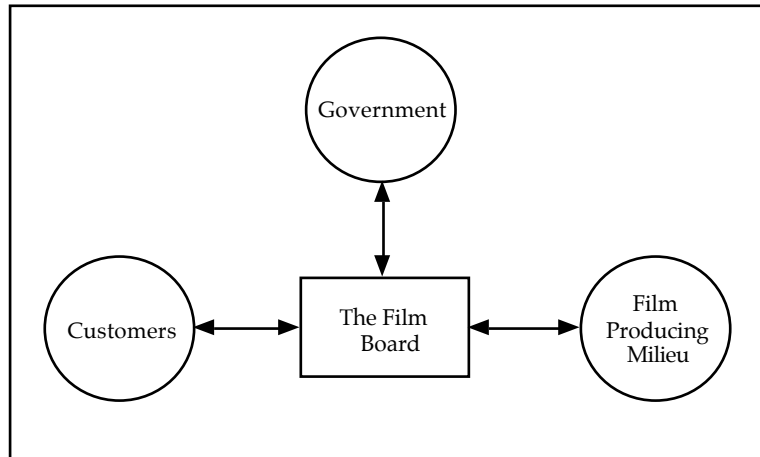


Figure 3. The Film Board's three main functions.

Using functional analysis in the design project in the Film Board clarified the functions towards the customers and the film producing milieu (as stated by law) and also the functions towards the government and the Ministry of Cultural Affairs, under which the Film Board, a public organization, is a subordinate (see figure 3). The results seriously challenged the organization's new business strategy, and developed new ideas for systems support not yet considered.

6. RESULT

Referring to figure 3, the following environmental issues and corresponding functions were clarified:

- *Not meeting the demands for earnings.* The recent demand for income from the government meant that the Film Board should earn about one fifth of its overall budget (about US\$1.5 million out of US\$7.5 million). This demand for income was automatically raised by US\$30,000 every year. The Film Board did not succeed in earning the demanded sum and had to cover the remaining amount from its operating budget. The only source of income was from the distribution of films and videos.
- *Larger decrease in earnings foreseeable.* In the past two years, the Film Board had slowly experienced an overall decrease in the number of films and videos distributed. During this period a large number of libraries had become new customers so that nearly all libraries in Denmark were customers of the Film Board. Each new individual library's number of borrowed films and videos stabilized rapidly. Since there soon were no libraries left to add as new customers, the Film Board could foresee an even larger decrease in the total number of distributed films and videos in the future.

- *Lack of management information.* The Film Board's work practice and mentality were not geared to manage their expenditure compared to their income: no one knew if a specific way of distributing films and videos was profitable. Management had no information about the income made by the department for order receiving and marketing - and no one was considering to change this situation.
- *No focus on customer's needs.* Their efforts in the fieldwork were concentrated on launching the Film Board's new profile and image. No systematic work was done in monitoring and analysing the different customers' needs for films and videos, even though the department for order receiving and marketing knew, from its many visits to customers, that e.g. schools and libraries were not in particular interested in highly cultural and artistic film and video productions. On the contrary, they requested titles within education, films for children, and entertainment. Also, the Editorial Board was not informed systematically about customers' needs. And customers' needs were to some extent even neglected, partly due to the new profile and image, which supported the function towards the film producing milieu and disregarded the function towards the customers.
- *Business strategy primarily supports the film producing milieu.* The film producing milieu acknowledged the new profile and image. This gave the producers better possibilities for producing cultural and artistic films (funded by the Film Board). These productions were considered more prestigious and challenging than their commercial productions, e.g. production of advertisements for private companies.
- *Customers do not need an on-line booking service.* Even though the Film Board needed its customers to use on-line booking, their customers did not have an equivalent need. The Film Board's rationale for the on-line booking system was to automate a time consuming process. The proposed solution however, required that (major) customers should invest in an on-line connection to the Film Board. All the Film Boards' routine booking requests (estimated to be 50% of all calls) came from a corresponding high number of different customers. One library visited was one of their largest single customers. They had only 1 or 2 booking requests per day. In this situation, they viewed the telephone as the relevant technology for ordering films and videos. They would resist paying for equipment for an on-line connection and for the training of their staff to use the booking system that the Film Board had in mind (Simonsen 1996).

Using functional analysis caused the project to focus on new (or neglected) functions at the organizational and management-related level, which again, on a technological level, pointed to new areas for systems support, not considered before the design project.

At the organizational and management-related level, the design project concluded that the new strategic image ("the house for film and video art") and the demand for income contradicted each other. The business strategy of changing to a new image, decided by the organization itself, of course had great attention. This business strategy, focusing on a production of artistic films and videos, tended to neglect the needs and requirements from the customers and hence, on the source of income. The demand for income was forced on the organization from "outside". Its purpose was to force quite radical changes onto

public organizations, having no tradition of balancing earnings with expenditures. This environmental requirement was unaccustomed and hence, complicated to handle, and the organization was reluctant in paying serious attention to it. The overall organization, management, and current work practices were not geared to an awareness about "where do we spend our resources and where do we earn them" as the demand for income entailed.

Neither the governing body, the president, nor the management group had beforehand realized the contradiction as to the overall economic situation in trying to follow the policy: "a house for film and video art" instead of the former policy: "a public library for films and videos."

This result of the design project challenged the Film Board's current business strategy and the Film Board was faced with a serious choice: It could neglect the contradiction, insist on the current business strategy, and hope for changes in the overall policy from the government. Or it could try to fulfill the demand for income (which would impose a change in its business strategy). These two possibilities opened a discussion reflecting two camps in the organization: One camp, taking care of the function towards the film producing milieu, was insisting on the current business strategy. Another camp, taking care of the function towards customers, was in favor of the former policy, arguing for a stronger focus on customers needs.

The functional analysis clarified, on a technological level, new needs for IT-support. The Film Board's customers did not have a need for an on-line booking service to the Film Board. The planned new booking system would thus not provide for the expected effect (reducing resources doing the booking task), and the design project consequently recommended that the Film Board should reject the plans for this system (Simonsen 1996). The design project concluded that the Film Board needed another kind of IT-support for the function towards the customers, which could provide management with information in order to monitor income, spending, consumer market, etc.:

- How much money have we currently earned? And how far is our income from a goal of 20% of the overall budget?
- From where do we get our income? Which kinds of films and videos? Which way of distributing? From which kind of customers?
- Where do we lose shares of market? Where do we win shares of market? Where should we make a specific market campaign? What was the result of our market campaign?

If the design project had not included an analysis clarifying the relation between the organization's business strategy and needed IT-support, it could have resulted in a design-solution recommending an investment in an irrelevant system. The involvement of environmental issues moved the perspective from design of a specific system (on-line booking service) into an analysis at the organizational and management-related level, which finally challenged the organization's overall business strategy.

7. DISCUSSION

The immediate effect of using functional analysis in the design project was to reject the proposed on-line system, since the service this system would provide did not correspond to an equivalent need from the customers side.

The overall effect, though, of clarifying the relation between the initial ideas for IT-support and the new business strategy - and of applying functional analysis for this purpose - was a shift in focus: From a need for a specific system, to the functions this system should support. This shift in focus resulted in clarifying a contradiction in the overall business strategy, when the demand for income was taken into account. Furthermore, in order to support the demand for income the analysis pointed to new needs for systems specified at monitoring the market of customers and the Film Board's related income and spending. In this respect the design project provides an exemplary case study on the relevance and need for clarifying the link between needs for specific IT-support and business strategy.

In general the following lesson to be learned is suggested (Simonsen 1994):

In conducting a design project, you might realize contradictions, or a lack of policies, regarding the link between the needs for IT support and a strategic business level. Clarification of this relation might be crucial for ensuring that the design of systems appropriately supports the organization.

This lesson points out that a part of a specific design project should be to give explicit attention to the relation to the organization's business strategy. We have experienced that this is often a neglected task, even in cases where an organization has a business strategy and a related IT strategy. We suggest that it is the responsibility of the designers, conducting a design project, to assure that this task is properly taken care of.

In larger organizations this task may be interposed between different organizational units or projects. It is not always possible to include such a clarification in a design project's aim and mandate if the responsibility for this e.g. is delegated to another organizational unit (Kensing, et al. 1997). In this case, the designers should take precautions to establish the necessary cooperation and coordination with this unit. Who has the final responsibility and how a possible coordination is managed should be clarified during project establishment and clearly stated in the project charter or elsewhere.

In smaller organizations, like the Film Board, the starting point for a design project may often be that the responsibility for this task is not delegated to any specific person or organizational unit (Simonsen 1994). In such cases the designers should take the responsibility of defining this task as part of the design project.

The relevance of the task is dependent on how clear the organizations business strategy is presented, how clear the initial goal of the design project can be defined, and how clear the involved parts see the relation between the business strategy and the design project.

Given that clarifying the link between specific IT-support and business strategy is a task to be conducted as part of the design project, it might be approached with different levels of ambitions, according to the uncertainties given in the specific situation. In some cases this task may be solved during e.g. a few meetings as part of project establishment. In other cases (like the case presented in this paper) it might develop into a primary project activity. In the latter situation functional analysis has proven to be useful and efficient.

Whether other approaches than functional analysis might have been equally efficient, leading to similar results in cases like the one presented, is not a question that this study can affirm, but we do not assert functional analysis as

the right approach: Alternative approaches are (of course) possible (Yetton, Craig & Johnston 1995). In suggesting alternative approaches, one should have in mind that IT designers might not be experienced managers within strategic information systems planning, and they may thus find a rather simple "tool" appropriate in conducting this task. Functional analysis provides a relatively simple yet effective tool for such an analysis mainly due to its conceptual framework. Developing a model of the organization in question, in terms of overall functions and environment, provides an appropriate description for initiating discussions at a management related level. This experience is similar to the comparison between the conceptual model and the problematic "real life" situation known from Soft Systems Methodology (Checkland 1981; 1984, Checkland & Scholes 1990).

A more complex problem for designers using functional analysis (or other similar approaches) might be that the analysis explicitly shifts the focus from *how* to design IT to *where* it is relevant to apply IT. This involves a shift from a technical oriented domain to an organizational oriented domain, which might entail political discussions characterised by power, norms, and traditions within the organization. Conflicts and power struggles may become manifest, regarding which business strategies to follow, how to do it, and consequently, which functions need to be strengthened by IT-support.

The case study gives an example in this respect: Defining and deciding the new image of the Film Board was a result of a recent power struggle. The new image clearly supported one camp in the organization, serving the function towards the film producing milieu, on the expense of the other camp, defending the former image and serving the function towards the customers. Using functional analysis clarified, and brought into focus, the new demand for income. This demand not only made manifest the power struggle again by challenging the new image, but it also led the functional analysis to the recommendation of new systems. These systems, when implemented, might work as a tool that support the camp serving the functions towards the customers and, hence also their position against the camp serving the function towards the film producing milieu.

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