IT-Innovation

A tool for organizational development in universities

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Abstract: This paper focuses on a critical constructive use of information and communication technology for strengthening and transforming university practices in order to accommodate postmodern social and technological conditions. The purpose is to use IT in order to build up new practices—to develop new pedagogical methods and to develop new kinds of collaboration in order to enhance mutual knowledge building and the democratizing of knowledge. The paper stresses an organizational IT strategy for a specific university—IT-Innovation at Aalborg University in Denmark (IT-I). After presenting IT-I, we will examine this strategy in terms of organizational learning theory.

1. INTRODUCTION

The structural premises for university practices will change dramatically in the next century. The anticipated changes will occur due to the integration of technological and social forces, the globalization of communication and the transgressing of time and space barriers, the disjunction of social relations, and the focus on knowledge production. On the one hand, these changes may lead to a disjunction of education and teaching, and increasing competition between institutions. In the worst case scenario, education becomes an abstraction on the Internet or just-in-time educational packages

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for self-instruction. Small, locally situated, physical institutions may disappear and be replaced by a few very big and prestigious world universities through online education.

On the other hand, technological changes also present possibilities. These changes introduce the possibility of building *really* distributed collaborative and co-operative research and learning communities, more or less independent of physical conditions. Groups of students, could never had the possibility of participate in or influence (Western) knowledge-building are now within reach due to a technology that offers the possibility of interaction, communication, and mutual collaboration. On a global level, students from so-called developing countries, who had no chance of attending physical learning centers before, can now, in principle, participate in virtual learning environments through technological means. On a national level, students and professionals from rural or remote areas can also participate in virtual learning university networks. In both cases, the virtual learning environment may be designed to stimulate these new groups of students to incorporate their experiences in mutual knowledge building. Some tendencies in this development are moving teaching and learning within the educational system towards more and more abstract and disjoint relations. At the same time, through the linking of locally grounded communities to the university, technology holds out possibilities for a more democratic access to knowledge construction and learning.

This paper takes a critical constructive approach to the use of information and communication technology in higher education. The goal of this paper is to discuss IT as a change agent for building up new practices within teaching, research, and administration in order to enhance mutual knowledge building and the democratizing of knowledge. The paper will focus specifically on an organizational IT-strategy for one specific university—IT-Innovation at Aalborg University in Denmark (IT-I). After presenting the strategy and the initiatives associated with IT-I, examine this strategy in terms of organizational learning theory.

2. IT-INNOVATION AT AALBORG UNIVERSITY

Aalborg University, founded in 1974 is a relatively young university. Today, it has more than 10,000 students at all academic levels from baccalaureate to Ph.D. Around 1987, Aalborg University began using computer conferencing systematically in open learning programs. At first, it was regarded as a peripheral activity. Today, there is an increasing understanding that the entire university needs to integrate information and communication technology systematically into all its activities. In the

summer of 1998, the University Board therefore designed and approved the IT-I (IT-Innovation) project at Aalborg University in order to stimulate and direct such an integration of IT. The project is to run for five years and has a minimum budget of two million dollars.

2.1 About the IT-Innovation project

The IT-Innovation projectⁱ aims to integrate information and communication technology into the existing university culture in a broad sense, thereby strengthening the university's quality.

The overall strategic goals of IT-I are:

- To ensure that the necessary preconditions—technical, pedagogical and communicative—are present for a qualitative application of information and communication technology to all the university's activity.
- To make use of information and communication technology in the overall activities of the university, wherever it can provide a *qualitative* improvement.
- To encourage, disseminate, and build up-to-date information and communication *competencies* at Aalborg University.
- To *open* the university, internally as well as externally, in order to stimulate interdisciplinary interaction and mutual collaboration.

Reach these strategic goals depends on five work areas:

- Basic infrastructure and qualifications
- The physical university & IT (ordinary programs)
- The virtual university (open learning programs)
- Opening the university through IT
- Research & IT.

The project concentrates on the following activities:

- *General institutional efforts*, which primarily focus on the infrastructure and qualification conditions.
- *Institutional projects (themes)* which focus on areas of general significance or strategic importance to Aalborg University.
- *Project catalogue*, i.e., projects which produce knowledge about and experience with more limited problems.

2.2 The first phase of IT-I, 1998-1999

During its first year, IT-I has focussed on the following five themes:

- The IT-window. Opening the university to the world.
- IT-supported co-operation and collaboration in education, research, and administration.
- IT-supported distance learning.
- The paperless semester.
- The virtual student-net.

The following activities are presently operating:

- Encouraging and supporting decentralized IT projects all over the university.
- Organizing seminars for the university's staff and partners.
- Organizing workshops in connection with the themes.
- Establishing electronic forums for the exchange of inspiration and experience.
- Establishing networks of IT-contact personnel (students and staff) in study committees, departments, and administrative units.
- Entering into agreements and co-operation with innovative educational institutions regionally, nationally, and internationally.
- Developing a strategic plan for competence development, and developing online and physical courses.
- Conducting research on central issues concerning the adaptation of IT.

We can illustrate the organization of IT-I by comparing it to a living tree. The *crown* of the tree consists of projects—the many, various IT initiatives scattered throughout the university. The *branches* are the experience-sharing groups that maintain connections between the projects and ensure that they operate in concert. The *trunk* consists of the project group—the secretariat, consultants, and researchers who observe and provide perspective to the effort of the enterprises, maintaining communication between the crown of the tree and its roots. The *roots* include the contact persons, on the staff-student study committees and in departments and administrative units, who maintain contact with the fertile soil of the university. This ecological metaphor is complete when we add that there is a *steering committee* and a *think tank*—irreplaceable for control, inspiration, and new thinking—which serve to pollinate the blossoming projects so that they bear fruit.

Figure 1. The IT-Innovation project

IT-Innovation is a networked organization. The role of this initiative is primarily to function as “a catalyst” to stimulate IT adaptation. Within specific areas, IT-I develops overall strategies, which are implemented in the university. The project aims to use or strengthen the existing organizational structures, sections and centers dealing with IT within the university. At present, approximately 60 projects are affiliated. Monthly workshops and seminars are arranged, and we have started activities regarding competence development.

3. A MODEL FOR TECHNOLOGICAL AND ORGANIZATIONAL CHANGE

In the IT-Innovation project, actors come together from different faculties and disciplines. Such collaboration is difficult because participants tend to have different worldviews and epistemological understandings, as well as different teaching and research cultures. The following presents a model that summarizes the organizational experience so far. We begin by presenting

some basic premises for organizational changes within the area of IT in a university context.

The point of departure is the university as a loosely coupled institution where decisions are made on all levels in the organization (in contrast to a bureaucratic organization). There is no single unifying goal for the university and when it comes to information and communication technology, the use of and, especially, our knowledge about future technological applications and possibilities are not at all comprehensive. Our thesis is, therefore, *that it is not possible or desirable to program organizational and technological change; rather, these changes must grow slowly and be an interactive process between initiators and users, based on experiment and dialogue.*

The problem of implementing IT in an organization is discussed more generally in the literature on organizational planning. In her article *Coping with Uncertainty in Planning*, Karen S. Christensen (1985) presents a very helpful matrix for preparing the premises for planning and organizational development, and for developing methods, that correspond to these premises.

		Agreement	Disagreement
Technology	Known	A) Programming - Predictability - Standardization	B) Bargaining - Uniting different preferences
	Unknown	C) Experimentation - Innovation	D) Chaos - Discovering and creating order

Figure 2. Prototype conditions and responses to planning problems (cf. Christensen, 1985)

This matrix is divided into two dimensions. The vertical dimension is *technology* and refers to know-how or means. The horizontal dimension refers to *purpose, goal, and desired result*. Each dimension is divided in relation to the phenomenon *security/insecurity*. A technology may thus be *known* or *unknown*; i.e., it has been tested or not, and the short-term or long-term effects and consequences of the technology are known or unknown.

With respect to the *goal*, again, there are two possibilities. There may be *agreement* or *disagreement* in terms of the goal. Is the goal decided by the top management, or is it to be negotiated within the organization, between the participants? Do the goals depend on the different worldviews in the professional area? Christensen makes the reservation that the real world is, of course, not as simplistic and dualistic as an analytic model. Often, the lines that separate the means from the goals are not clear and distinct. The goal is thus influenced by technology, just as the consequences of technology, similar to social systems, are rarely entirely known. Yet, despite these epistemological and practical preconditions, we find it useful to present a model that helps make conscious the planning condition with which we are dealing.

On the basis of this model, the following problem fields can be detected:

- Planning for known technology and agreement on goals,
- Planning for unknown technology and agreement on goals,
- Planning for known technology and disagreement on goals,
- Planning for unknown technology and disagreement on goals.

The next section, on the basis of figure 2, further discusses the individual areas according to the principles of IT-Innovation.

3.1 The model applied to planning conditions for IT-Innovation

IT-Innovation within the university is closely linked to pedagogical, organizational, and scholarly questions. With respect to *goal*, these areas are generally characterized by “*disagreement*” that is due not only to different interests, but also to epistemological differences stemming from different disciplines and different understandings of the problem area. With respect to *technology* within different educational areas, there is a very “*uncertain knowledge*” of information and communication technology, especially of the consequences and possibilities of future applications, as the technology is radically renewed every year. Many of the applications we are going to use are still merely experiments in research labs.

On the other hand, some groups within the university, which have been using technology for specific purposes, e.g., the distance learning group, have in fact relatively *certain knowledge* about pedagogical use, the consequences for pedagogical practice, and tips on good practice. Even within areas with relatively certain knowledge, however, the ongoing transition of the technology represents new possibilities and challenges to practice. Following figure 2 means that we are primarily in the two fields B and D, and in many cases actually in the D-field (*chaos*). However, in

relation to more specific problems (e.g. distance learning), we are placed in fields A and B. On this basis, the general conclusion based on Christensen's matrix is that we cannot *program* transition and development as our overall strategy. The overall conditions are that there is "*uncertain knowledge*" about the possibilities and limitations of the technology, and within certain areas there is "*disagreement on goals*" as well. As such, the overall methods have to take their point of departure in field B (experimentation) and D (chaos). However, in the case of a more specific task, there may be more certain knowledge and agreement about the goal. In these cases programming (A) may be the right tool. Finally, situations also exist where the technology is known but the pedagogical worldview is conflicts with it. Here (C) bargaining may be the right tool.

The conclusion we draw then, on the basis of Christensen's work is that the matrix can be used to clarify "where we are" and to choose the proper tools that correspond to this condition. As such, the model may be used as an organizational "tool for reflection". Moreover, the overall lesson to be learned from the model is that a more fundamental development and adaptation of IT to the university must deal with the fact that goals as well as knowledge about technology are uncertain. The overall methods to use are, therefore, "small experiments" to get order out of chaos (B and D).

4. ORGANIZATIONAL LEARNING AND IT-INNOVATION

In order to understand the conditions for an organization to deal with "small experiments" and "chaos", it may be relevant to expand Christensen's matrix on planning conditions with input from theories about organizational learning.

There are several theories about organizational learning. The following section draws on experiential learning, because this is in line with the ideas described in Christensen (ibid.). The experiential learning model was originally developed by Kolb (1985) in order to understand human learning on the micro-level. Nancy Dixon (1994) has later taken up this model as the basis for understanding organizational changeⁱⁱ.

The experiential learning model builds on the following four structural dimensions (Kolb, 1984):

- concrete experiences,
- reflective observation,
- conceptualization and integration,
- active experimentation.

This learning model is dynamic and circular: the four dimensions interact. The construction of meaning takes place dialectically between reflection and experimentation, apprehension and comprehension. It is important that the organization support all the dimensions in the learning cycle. If the organization only makes experiments but never comes to reflect and conceptualize knowledge, organizational development will be ad hoc and random. However, if development is based only on detached reflection, that development will not integrate the tacit experiences grounded in the organization.

The process of integrating the experiences into the formal organization is very challenging, and has to be stressed in an *organizational* learning model. It is important that all the actors or projects in an organization be learning. However, for the organization to develop, the key question is: How do we integrate learning experiences so that the organization does not simply repeat the same learning experiments again and again, but rather builds upon previous experiences.

4.1 The organizational learning model for IT-I

Learning Tools	Creation and exchange of experience	Generalization of experience / discovering and creating order	Materialization of experience	Consequences Actions
Projects	Experience creation	Conceptual models	Reports – newsletter – web-page	Implementing in the formal organization Study board, Dept., Service org., University board • Adjustment • Checklist • Development • Consultation • Policies • Courses
Seminars	Ad hoc/creative energy/exchange	Presentations/ lectures	Reports	
Visitation rounds	Amplifying experiences	Conceptual models	Manuals	
Prototyping	Experience concretization	Conceptual models	Prototype/ Demonstrator	
Policy making – Meetings	Expression of interests	Agreement	Action plans	

Figure 3. The organizational learning model for IT-I

The following presents the activities of the IT-Innovation project as an organizational model (figure 3), reflecting the experiential, organizational

learning circleⁱⁱⁱ. Furthermore, this model shows how we are dealing with the different planning conditions, namely, programming, experimentation, bargaining, and chaos. The model works with four parameters on the horizontal axis (following the experiential learning circle): Creation and exchange of experience, generalization of experience, materializing of experience, and actions to be taken in the organization. On the vertical axis, it deals with five parameters describing the more specific tools and methods to be used within each type of learning mode. The following section works through the different elements in the model (figure 3).

Figure 4. Relations between experiments and project-group

Figure 4 exhibits the relation between the experiments and the project group (steering committee/the implementation team). The figure illustrates the idea that the experiments develop knowledge and communicate the ideas and creative energies to each other and to the organization “through small steps”. The project group gives direction and “creates order” for the experiments and the goals. It also assists and interacts with the projects and works on the more general conceptualization, materialization, dissemination, and implementation of the gained knowledge into the organization.

4.2 Organizational learning experiences so far

The following discusses the organizational learning experiences from a point of departure in figures 3 and 4. Starting in the first column of figure 3 (creation and exchange of experience), the findings so far stress that there is a strong interest among the participating partners at the university to exchange knowledge and experience. It seems that very simple tools such as

projects, seminars, workshops and visitation rounds produce significant experience, which is shared and discussed; ideas are born, and new collaborations arise. From the experience gained so far, it is interesting to see how people from different disciplines and faculties enjoy meeting with and learning from each other. However, we have also found that it may be difficult to understand each other due to different worldviews, so in order to overcome this, an important tool throughout the process will be prototyping (or maybe, more precisely, the tailoring of modules and elements found on the WWW). Our experience is that prototyping gives the participating partners a sort of “shared language” across disciplines. Prototyping makes the problems to be dealt with more specific as well as it gives the participants a taste of what is technologically possible.

The ideal for the IT-Innovation project, in line with the experiential learning circle and Christensen’s matrix on planning conditions, is to establish a solid interactive platform between the projects and the project group (figure 4). The idea is to establish an organization where the projects are subjects of the transition process, and the project group assists this process by contributing accumulated knowledge. However, because of lack of resources to help each project, it is difficult to establish this interaction among all of them. In order to compensate, we have developed some online forums. However, the experience gained so far is that the activity here is low. So, taking Christensen’s advice on projects and experiments seriously, the lesson to be learned is that it takes considerable resources to assist the projects effectively.

Another essential aspect of organizational change is to be able to accumulate experience and conceptualize this experience in order to assist the projects and “create order out of chaos” (column 2). In order to do so, the IT-Innovation project has allocated significant financial resources to associate senior scientists and faculty members who have experience within the area regarding both implementation and research. This has been very important because it enables IT-I to function as a forum for conceptualization and accumulation of experience. Furthermore, it also gives the project the necessary political strength to integrate the findings into the formal part of the organization.

The third column concerns the materialization of experiences. There are several tools that enhance this process: reports, articles, notes, handbooks, prototypes, templates, policy papers, etc. One important tool, which we are currently exploring, is how to use the web as a shared organizational tool for materializing experience. In principle, the web can be accessed from everywhere in the world, just as information may be added from everywhere. It may indeed help a distributed organization (such as the university) to have easy access to the materialized experience. However, we have also realized

that in order for projects to learn from the experience of others, it is not enough to have access to shared information and prototypes. In the adaptation of the experience of other projects, it is very important to have human consultants who may help in the specific process of tailoring the experience.

The last column to deal with (column 4) is that of implementing experience into the formal organization. The IT-Initiative gains and accumulates much experience and knowledge regarding IT, administration, learning, and research. However, if this knowledge does not become integrated into the formal organization, the organizational learning circle will not succeed and many resources are, in fact, wasted. In order to deal with this problem area, IT-I works with different tools on developing checklists, strategies for building up competencies, and IT-ambassadors in the study board and the research board (department committees). It also brings together relevant key actors and boards in the organization.

5. SUMMING UP

In a loosely coupled organization such as the university, we cannot force or program IT organizational change. Knowledge in this area is too uncertain and dynamically changing, and goals are too richly faceted. If we program the development, we risk restricting the participants' creative energy and their teaching and research, and risk formulating limited short-term solutions. However, if IT is implemented anarchistically in the organization, much experience is lost and solutions are not grounded in the accumulated experiences of the organization. Therefore, in order for the organization to act effectively, we must formulate some shared policies and implementation strategies; however, these policies must be grounded in the experience and vision of all participants. In order to satisfy these contradictory demands, we can describe the IT organizational learning strategy as "a bottom-up model with top-down initiatives"^{iv}. The model takes as its point of departure the experience gained at a grass root level in the organization. However, to create order and to accumulate knowledge in the organization so that the organization avoids making the same mistakes again and again, activities must be coordinated and given direction in an interactive process among projects, the formal organization (study boards, departments, service organizations), and the project-group.

The IT-Innovation project has chosen a network-based organizational learning model. The project seeks to manage a series of paradoxes and contradictions: to gain a clear view and a sense of direction, but still be capable of opportunistic groping and experimentation; to have a core

ideology, but also to be open to vigorous change and movement. The IT-I network seeks to organize and to learn, to innovate and to develop the core values of the university, while still retaining efficiency and collaboration. The next couple of years will show whether the organizational learning model has been an adequate strategy.

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ⁱ This section draws on the following policy papers: Lorentsen, A: & Christensen, B: With Information- and Communications Technology on the Road to the University of the 21st Century. Proposal from the Virtual University Working Group to the Aalborg University Senate, February 1998, and Lorentsen, A: & Christensen, B: With Information- and Communications Technology on the Road to the University of the 21st Century. Status Report from the ICT Project Group to the Aalborg University Senate, June 1998. More information is available on IT-I's web page: <http://www.iti.auc.dk>.

ⁱⁱ The most prominent difference between human learning and organizational learning is the complexity. According to Nancy Dixon (1994), organizational learning principally contains similar elements in the learning process (cf. the learning model). However organizational learning is far more complex than personal learning. The organizational

learning process implies that the organization must reach a collective interpretation of the experiences and a reorganization of the cognitive and cultural framework of the organization to such an extent that common action is possible

ⁱⁱⁱ This model was originally developed within the VIRT-project (Dirckinck-Holmfeld, 1998), which was a cross-faculty and inter-disciplinary project based on the experiences of 11 partners working together with the shared objective of developing a conceptual model for virtual learning (<http://virt.auc.dk>).

^{iv} Ole Prehn, Dean of the Faculty of Humanities, Aalborg University introduced this label for IT-I in the opening ceremony of the center.