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# On-Line learning and Traditional Organizations

Høgskolen i Hedmark
Rapport nr. 22 – 2003

Online-versjon

Utgivelsessted: Elverum



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(http://www.hihm.no/)

Rapport nr. 22 - 2003

ISBN: 82-7671-341-6
ISSN: 1501-8563

# Hedmark University College

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| **Title:** On-Line learning and Traditional Organizations | | | |
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| **Number:** 22 | **Year:** 2003 | **Pages:** 30 | **ISBN:** 82-7671-341-6<br>**ISSN:** 1501-8563 |
| **Financed by:** Hedmark University College | | | |
| **Keywords:** On line learning, traditional organizations | | | |


**Summary:**
This paper proposes that a shift of focus is required when traditional educational institutions are embarking on the task of implementing on-line learning programs. Traditional organizations of higher educational institutions are bureaucracies, structured to serve and support educational programs with lecture-based learning processes. The allocation of resources is closely related to the traditional tasks of planning and preparing the use of lecture theatres, arranging exams in traditional settings and providing the students, technical support staff, libraries and teachers with required information.

With the introduction of on-line learning programs, applying new technology and alternative pedagogy, the structure of traditional organizations is challenged. The new learning programs requires more flexible, matrix-based organizations, able to efficiently adapt to new requirements and changing external conditions. The prevailing focus, when introducing on-line learning programs, is on issues related to the combination of pedagogy and technology. Focus on these issues are important but not sufficient. Only half of the job is completed if organizational issues are not addressed. The task of implementing and delivering on-line learning programs should be considered as «permanent» twin-level systems development projects, concerned with both pedagogy and technology and organizational changes.

# Høgskolen i Hedmark

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| **Tittel:** Nett basert læring og tradisjonelle organisasjoner | | | |
| **Forfattere:** Bjørn Faugli | | | |
| **Nummer:** 22 | **Utgivelsesår:** 2003 | **Sider:** 30 | **ISBN:** 82-7671-341-6<br>**ISSN:** 1501-8563 |
| **Oppdragsgiver:** Høgskolen i Hedmark | | | |
| **Emneord:** Nett basert læring, tradisjonelle organisasjoner | | | |


**Sammendrag**:
Denne artikkelen peker på at en endring av fokus er nødvendig når tradisjonelle organisasjoner skal ta i bruk nett baserte lærings program. Tradisjonelle organisasjoner innen høyere utdanning er byråkratier strukturert for å betjene og støtte tradisjonell utdanning i form av forelesningsbasert læring. Allokering av ressurser er nært knyttet til oppgaver som planlegging bruk av forelesningsrom, arrangering av eksamener på tradisjonell måte og å forsyne studenter, IT tjeneste, bibliotek og forelesere med nødvendig informasjon.

Med innføringen av nett basert lærings program og anvendelse av moderne teknologi og alternativ pedagogikk blir strukturen til tradisjonelle organisasjoner utfordret. Ny lærings program krever mer fleksible, matrise baserte organisasjoner som er i stand til å effektivt tilpasse seg nye krav og endrede eksterne forhold. Ved introduksjon av nett baserte læring er det vanligvis satt fokus på temaer som omhandler kombinasjonen av pedagogikk og teknologi og dette er nødvendig, men ikke tilstrekkelig. Bare halve jobben er gjort hvis ikke også organisasjonsmessige forhold blir vurdert.
Implementering og levering av nett baserte læringsprogram bør betraktes som et permanent systemutviklings prosjekt på to nivåer som fokuserer på både teknologiske, pedagogiske og organisatoriske temaer.

# Introduction

Information and Communication Technology (ICT) will play an increasingly important role, as a supporting component in educational systems in the years ahead. IC technology has a considerable potential for enhancing the quality and efficiency of learning-processes and making educational programs accessible for larger proportions of the population. Since the start of organized learning in societies, with the establishing of schools and universities as formal educational institutions, it has been required that learners and teachers meet face to face in classrooms or lecture theaters. With a few exceptions, this has been the only practical way of organizing effective communication and interaction between learner and teacher and efficiency considerations have further reinforced this organizational solution. Cost efficiency considerations favor the gathering of large number of learners within hearing distance of the teacher. These considerations and requirements represent frameworks, imposing considerably limitations on the freedom to choose alternative ways of organizing education and restrict the options of applying suitable and efficient pedagogy for conducting learning processes. Formal learning processes have traditionally been based on transfer of knowledge directly from the teacher to the students, applying a pedagogy, which can be characterized by a knowledge PUSH approach, where the learners are passive receivers of knowledge.

> «The teacher lectures and the student listen. Children assume the role of passive, rather than active participants. It is as if the knowledge the teacher has can be transmitted directly to the students; the metaphor is that of pouring information

> from one container (the teachers head) to another (the students head).» (Brown, Campione 1990)

Traditional organizations of higher educational institutions are bureaucracies, structured to serve and support educational programs with lecture-based learning processes. Generally, organizations are formed to serve more or less predictable functions and deviation from the predictable will often cause problems. *«Organizations are great resisters of change»* (Hall R. H. 1974). The allocation of resources in these organizations is closely related to the traditional tasks of planning and preparing the use of lecture theatres, arrangements of exams in traditional settings and providing the students, technical support staff, libraries and teachers with required information. Even if the traditional lecture based learning processes, to an increasingly degree, are relying on technological solutions for presentations in lecture theatres and learning material on the web, these learning processes are not particularly vulnerable to the efficiency and availability of the supporting technology. When applying Problem Based Learning (PBL) and Collaborative Learning (CL) based learning processes, most of the traditional planning procedures and functions become less useful. If a video projector for a power point presentation is failing during a traditional lecture, it can almost always be substituted by plastic foils on an overhead machine or even by the old fashion whiteboard or blackboard. And if the web server is down, or the course material is not available for shorter period of time, it has rarely catastrophic consequences for single lectures. With Net-Based Learning Environments (NBLE), applying PBL and CL, the situation is different and a much higher degree of attention is required by the technical help desk. Experience from six years of experimenting with on-line learning at Hedmark University College indicates that focuses on technical and pedagogical issues are important but not sufficient for successful delivering of on-line learning programs. Only half of the job is completed if organizational issues are not addressed, comparable with the classical misjudgments done by inventors, believing that a product is commercially available when the prototype

is functioning. During the experimental development the new and untraditional learning processes, frequently challenged the organization at HUC, causing frustration for both the developers and the administrative staff.

# ICT scaffolded, On-line learning processes

Computers have been applied in education since the early 1960ties, but until recently, computer applications have been limited to peripheral and supplementary support functions for traditional learning processes. Computers have rarely been included as a major component in educational systems. The development of powerful computers, high capacity data communication, advanced software and in particular availability of the Internet, during the last decade, have created new, favorable conditions for constructing efficient flexible learning systems. It allows realization of flexible learning processes where learners can choose the time and place to study and the teachers are freer to apply appropriate pedagogy. For the past half a century, flexible learning has been successfully available through traditional distance education programs organized as correspondence courses. However, with modern ICT, the conditions for delivering distance education programs, are dramatically changed. With lifelong learning on the agenda, worldwide, efficient and flexible educational programs of high quality are expected to be increasingly in demand. A growing proportion of the population needs continuously refill of knowledge or a more comprehensive reeducation to comply with the rapidly changing working life conditions. Many of these learners are fully or part time occupied in jobs, have family obligations, reduced mobility due to handicaps or are for various other reasons unable to spend long periods of time with physically presence on campus. Off-campus students represent a new category of learners requiring flexible learning conditions and constitute a new an important part of the student market. Providing efficient and high quality educational

programs for this new category of students is a major challenge for most educational institutions.

Numerous educational institutions are promoting net-based educational programs for off-campus students as a better alternative to traditional on-campus programs. E-learning has become a fast growing and prosperous business. Most Net Based Learning Environments are implemented as high-tech solutions for off-campus students using powerful computers and the Internet without achieving more than could be done by using old-fashion books, chalk and blackboard and sometimes not even that. The IC technology is superimposed on traditional lecture-based learning processes. A prevailing attitude among many ICT specialists and educators seems to be that with access to the Internet it is trivial to organize and deliver off-campus education programs. This attitude is reflecting an insufficient understanding of the complexity of developing and implementing systems involving people, technology and organizational issues.

> «When educational IT is examined there is often little evidence of it being grounded in any learning theory.» (Jones A. 1996)

And when a connection to learning theory is apparent it is frequently related very traditional pedagogy.

> «Instructional theories, though, which have been influential in American educational software design, have in the main drawn on behaviorist ideas.» (Jones A. 1996)

Successful utilization of the potential of modern ICT requires that issues related to pedagogy, learning theory, design of supporting technology and the organization are addressed.

# Research approach

The research findings presented in this paper are mainly based on analysis and interpretation of empirical data, collected during the experiments conducted in the PedTek (Pedagogy and Technology) project. PedTek was initiated in 1997 and the Norwegian Ministry of Education and Research granted 1 million Norwegian Kroner (approximately USD 140 000) in economical support. The overall goal of the PedTek project was to design educational solutions for physically handicapped and other students unable to comply with the requirements of ordinarily on-campus teaching. The experimentation process of PedTek was terminated in 2002. Throughout a period of six years, experiments were conducted based on principles from experimental systems development. More precisely the development objective was to:
*«Design an efficient and flexible Net Based Learning Environment (NBLE) for off-campus students, applying pedagogical principles based on Collaborative Learning (CL) in combination with Problem Based Learning (PBL).»*
And the objective of the research activity was to:
*«continuously acquire knowledge as feedback in support of the development process and to gain general knowledge in the field of NBLE.»*

A four-component Net Based Learning Environment (NBLE) prototype was tested and continually redesigned during the experimentation. Based on constructivist learning theory and in particular the work of Piaget and Vygotsky, operational NBLE prototypes were designed in accordance with guidelines from CL

(Collaborative Learning) and PBL (Problem Based Learning). The NBLE prototype consisted of the following four-components:

1. Pre-produced learning material (books, articles, video/film).
2. Learning Management System (LMS).
3. Supervision and exercises.
4. Face to face meetings and workshops.

This represented a learning environment, very different from the traditional knowledge-PUSH-based way of organizing learning processes. The objective was to provide the students with favorable conditions for «pulling» required information from a surrounding support system and, based on this, allowing the construction of new knowledge.

During the project period, six prototype versions of a Net Based Learning Environment (NBLE) for an undergraduate course in Project Management was designed, tested, evaluated and redesigned. Approximately 650 undergraduate Computer Science students have attended the experimental courses during the project period. Evaluation of the prototypes performance was conducted by collecting empirical data using questionnaires, interviews and participant observation. Prior to the PedTek project a similar curriculum was used for several years in a traditional, lecture-based course in Project Management, attended by the same category of undergraduate students, who were exposed to the prototypes during the PedTek experimentation. Experience from the traditionally organized course allowed for a valuable comparison of the traditional and the new learning environments. With the PedTek objective of realizing a high quality NBLE for off-campus students, the prototype performance was evaluated with main focus on the following four criteria of success: Learning Outcome, Degree of Flexibility of the learning processes, Resource Requirements and Learners Satisfaction.

## «Permanent» projects

The term «permanent» projects can be considered a contradiction, since a project is defined as one-time phenomena. However, the term is applied in order to emphasize that for a long time ahead, educational institutions will probably maintain a traditional, bureaucratic structure, and must hence consider implementation of on-line learning programs, as an exception from the ordinary situations. The PedTek experience indicates clearly that the implementation of net based learning environments in organizations not can be considered a trivial task. The questionnaire surveys conducted among the undergraduate students indicates that about 30% of the students are dissatisfied with way HUC have been administrating the courses and only 16% are satisfied or partly satisfied. The implementation process should be defined as a proper systems development project and a continuous exercise as long as the organization is involved with delivering flexible net based learning solutions. In the future, we may be in a situation with sufficient experience, enabling us to handle this as standard organizational activity. But until then developing and implementing on-line learning programs should be defined as an exceptional situation. This requires either a flexible matrix-based organization or the activity should be considered as a «permanent» systems development project providing organizational learning.

# Organizational learning

Organizational learning, in this context, represents a considerably challenge. It is suggested that organizational learning, as a part of the systems development, should be explicitly related to pedagogical principles.

> «To reach a higher logical level in the cognitive process, conditions for reflections must be provided. Time for individual reflections can be provided by for example, writing or programming,) and for collectively, multiperspective reflections through discussions and confrontation of opinions ref. Naur (85. The process from the general to the specific can be supported by enquraging the project participants to apply experience from other disciplines (such as management, organizations, official regulations) to understand the specific situation in systems development.» (Øgrim L. 1993)

For most systems development perspectives and guidelines, user participation and organizational learning is considered a prerequisite for successful results. It is however, rarely suggested approaches to organizational learning based explicitly on pedagogical principles. In most cases it is assumed that user participation and organizational learning «in some way» automatically takes place through user involvement in the process and to some degree this is true. But with the nature of the systems development process in question, it is suggested that learning should be organized systematically and based principles from PBL and CL. Analysis, to provide user requirement specifications and a proper understanding of the systems environment, as part of the systems development, may benefit from applying an a modified Activity theory approach. In Fjuk and Smørdal (1997) it is concluded that:

> «The interrelation between individual and collective oriented action is important when it comes to understand and analyze the complexity of (collaboratively based) work. With basis in Engestrøm (1987) model of collective activity, we enrich the concept of collective action with Strauss' (1993) theory on action and interaction.»

In organizing development projects, being an integrated part of a larger organization, a key success factor is involvement of the management. The management must have an «ownership relation» to the project and thus ensuring that all parts of the organization are involved and allowed to allocate time and resources for engagement in the project. For educational organizations, not very experienced with organizing and delivering net-based educational programs, involving untraditional pedagogy, the development activity should be defined as Systems Development and not considered a trivial expansion of traditional learning processes. By conducting the introduction of new educational programs as proper systems development projects, it is ensured that user participation in both planning, analyzing the user requirements and implementation has an increased possibility of being successful.

## Twin level systems development

Having terminated the major part of the first level of systems development, a reasonably stable Net Based Learning Environment, successfully combining pedagogy and technology can be introduced as the technological element, at the second level of the information system. At this level, the users, represented by the faculty, administrative staff, library staff and the technical support staff, should be involved in the development project and organized in groups faced with tasks and real exercises, allowing collaborative learning processes to take place. A development process of this nature is not terminated, even though, the formal project is concluded and closed.

> «It understands systems development as a process that does not stop when a development project stops. It comprises development and use.» (Kautz. K. 1993)

Experience gained from the field of systems development during the last decades, indicates clearly that emphasis must be on both technical, individual and organizational issues.

> «A common misinterpretation among educators who are not familiar with a systems approach is that it is possible to benefit from introducing technology into education without doing anything to change the other ways in which education is currently organized. They think that by moving cameras, computers and microphones into the classroom, schools, universities, and training departments, they can increase enrollments, provide new curricula, and save money without doing anything else. According to this view, once the technology is in place, there is little else to be done except to let teachers get on practicing their craft as they have always done.» (Moore and Kearsley, 1996. From Fjuk, Annita 1998)

Developing NBLE solutions, represents a type of systems development with the goal of implementing what a little imprecisely can be defined as a «pedagogical computer based information system». The experience gained throughout the experimental process in PedTek, indicated however, that focusing on the NBLE as a computer based information system represents a too narrow perspective on systems development in this context.

> «Cole and Engestrøm discuss whether technology can be a catalyst for educational change. Concerned with this, they suggest that it is not enough to consider individual instruments. Rather, any analysis must consider the whole complex of educational activity.» (Fjuk A. 1998)

Larger part of the educational institution must be included in the development process and based on this, it is suggested that systems development, involving NBLE in an educational institution, should be conducted at two levels. The first level includes the NBLE and it's

immediate surroundings and the second level includes the first level, implemented in an expanded organizational environment. Sound principles of systems development emphasizes that development must involve the technical system, the organization and the individual users as equally important elements. Based on this perspective, a twin-level systems development approach requires that particular attention is paid to which part of the total system should be involved in the development at each level.

At the first level, systems development can be conducted relatively isolated from the organization of the educational institution. The particular challenges involved in the integration of the NBLE in an organization can be preliminary handled by the developers as part of the development work. At this level, the Learning management System (LMS), as part of the NBLE is considered the technical element of the information system, the organizational element will be the learning process and the users are the students and the supervisors. The main development objective of the first-level-process is to produce a solution with optimal balance of pedagogical and technological factors. When a satisfactorily degree of stability is reached for the first-level-solution, the second level of systems development can be approached. At the second level, the solution, resulting from the first level development, is considered as the technical element of the total system. The organizational element, at this level will be the organization of the educational institution and the users will be the administrative and technical support staff at the institution. A graphical presentation of this twin-level systems development is shown in the fig below.

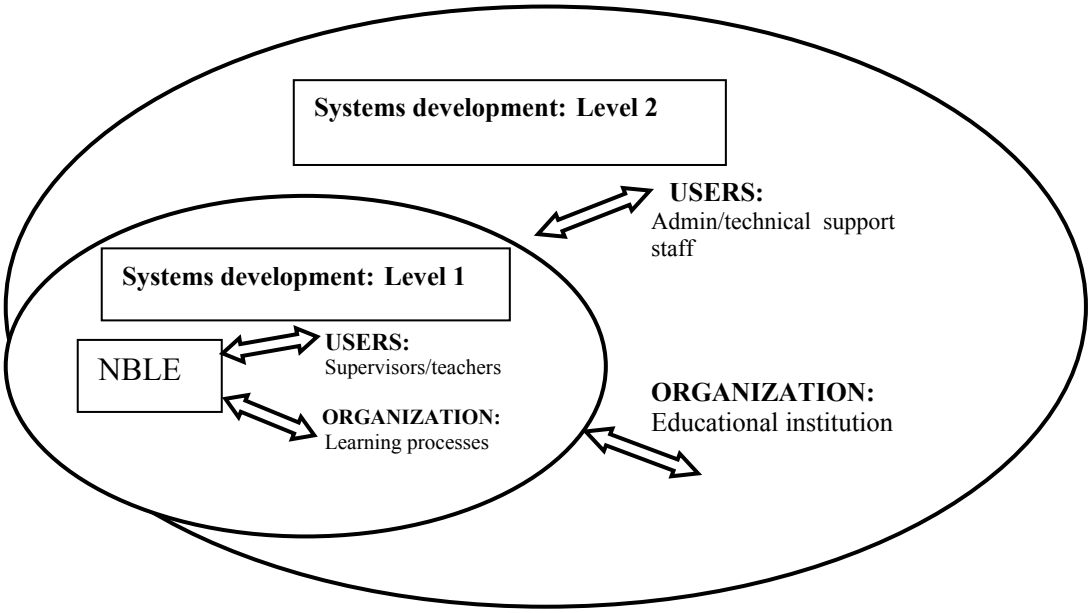


***Fig. 1***
***Twin level systems development***

Approaching the process of developing computer based information systems with successful results can advantageously be based on dialectical principles.

> «Dialectic theory has a strong position within the Scandinavian critical tradition in academic systems development (Mathiassen, 1981; Ehn, 1988; Stage, 1989; Bjerknes, 1989; Øgrim, 1993), since dialectics can support both multi perspective thinking and the understanding of change. The belief of this tradition is, that systems development is an uncertain and complex process, a process that can only be partly granulated and planned in detail.» (Fjuk, 1998)

Introducing a computer based information system, with considerable implications for the host organization, requires careful planning and the involvement of the users in the process is important in several respects. Firstly, the users should be involved for democratic reasons.

Introducing or changing computer-based systems may have considerable effects on the members of the organization and these should thus be involved in the process. In Scandinavia, user participation is required by law. Secondly, the users should be involved because successful systems cannot be developed and implemented without active participation and contribution from the potential users. In this context it is important to clarify what is meant by successful systems. As opposed to a common conception of the term successful, it represents a characteristic, which cannot be objectively and absolutely defined. The definition is to a large extend dependent on the background and perspective of the observer. This has considerable implications for the introduction of computer based information systems in organizations. The following «formula», illustrates this in a simplified way. *Success=ƒ (Quality, acceptance)* (Methlie 1990). Verbally this can be expressed as: Success of something is a function of or depends on both the quality of the product and how it is accepted by the users. Expanding on this, it means that the success of introducing a computer based information system depends on both the quality of the system and how the system is accepted by the users. The most important aspect of this «formula» is that it indicates that a system can be successful even if the quality is not the best as long as the users, for whatever reasons, accept the solutions. And the key to acceptance is conducting development processes with real and comprehensive user participation.

# Conclusions

Development processes of computer supported learning systems are never terminated, even though, the formal project is concluded and closed. A large part, possibly the major part of the experience and knowledge gained by conducting the development process in PedTek was not visible in the sense that it could easily be articulated in writing and presented in reports. The experiences, knowledge and skills are embedded in the organization, represented by an enhanced conscious relationship to the problems and challenges involved in delivering flexible net based learning systems. It is suggested that the implementation of net based learning environments in organizations should be defined as a twin-level systems development project. The first level should isolated deal with the combination of pedagogy and technology and the organizing of learning process with the students as users of the system. The second level should deal with the NBLE in relation to the administrative and technical support part of the organization, involving administrative and technical staff as users. Recommendations related to the use of the results in practical situations is that the implementation of net based learning environments in organizations not can be considered a trivial task. The systems development project should be considered a continuous exercise as long as the organization is involved with delivering flexible net based learning environments. In the future, however, we may be in a situation with sufficient knowledge and skills to enable us to handle this as standard organizational activity, but until then it must be considered as a project.

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