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Published in:
European Conference on Information Systems (ECIS)

Publication date:
2008

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):
Ørngreen, R., Nielsen, J., & Levinsen, K. (2008). Designing e-learning solutions with a client centred approach. In W. Golden, T. Acton, K. Conboy, H. van der Heijden, & V. K. Tuunainen (Eds.), European Conference on Information Systems (ECIS) (pp. 742-753). The Association for Information Systems (AIS).

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DESIGNING E-LEARNING SOLUTIONS WITH A CLIENT CENTRED APPROACH

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Abstract

This paper claims that the strategies applied in designing e-learning solutions tend to focus on how to proceed after the precondition, e.g., learners requirements, pedagogical choice, etc., have been decided upon. Investigating the HCI research field, we find that the methodological approaches focus on end-users and primarily address the phases succeeding the initial pre-analysis. The HCI approach lacks pre-analyses, including focusing on the client as a user of the product. With the point of departure in our study a private educational organisation within healthcare, we understand the client as the organisation that has initiated the e-learning project and needs to manage the e-learning system after its development. Through the Client Centred Design and in close collaboration with the client, three strategic issues are uncovered and strategic models are presented for each. These models are complementary perspectives in a Client Centred framework that is useable as the starting point for others in developing large scale e-learning projects.

Keywords: e-learning, client centred design, human computer interaction, strategies,

1. Introduction

Human Computer Interaction (HCI) is an interdisciplinary field. With the aim of investigating strategies applied in the early phases of designing e-learning solutions, it becomes particularly relevant to look at the interplay of the following fields.

1.1 A Software Development and Engineering Approach

When developing software solutions for both smaller and larger organizations, the most common approach is to take clients' vision of the final product as the starting point. This approach Cato has called the "creation trap" where clients too early in the process claim that: 'We know what we want; 'Don't waste any more time exploring and understanding. Just get on and create it'' (Cato 2001, p. 20). Whether it is research on project management of information systems, or multimedia- and web projects, there is a focus on collaboration with clients early in the process and on clients' needs and contexts. The methods applied deal with the design and management of processes from the initial idea of a project to the final delivery, e.g., the Holistic Approach (Christensen & Harder Fischer 2004) and Managing Multimedia and Web Design (England & Finney 2002). However, the processes seem to be based primarily in systems thinking with an engineering or an economical rationale, and the focus on the technical system (see also Boehm 1988, Goma 1997 and Gordon & Bieman 1995). Methods concentrating on preparation phases of IT development, e.g., the MUST-method (Bødker et al. 2000) include clients, but primarily from the perspective of working with employees from the client organisation that are end-users of the envisioned work system, not as clients that have to develop and manage the system.

1.2 An E-learning Development Approach

The same may be said for many e-learning projects. Grützner et al. 2004 focus on e-learning production and address collaborative methods including, client and user analysis. However, due to the technical and economical focus, clients' current competencies and how these relates to future possibilities are absent, and users are reduced to target groups rather than people engaged in learning through interacting with computers. Engelbrecht 2003, however, takes a broader perspective and looks at the use of strategic planning of e-learning at universities. She points to the importance of pre-analysis, such as SWAT-analysis, etc., prior to implementation in order to identify important conditions within the client institutions. However, she does not see the client as a collaborating partner and tends to pursue e-learning for the cost-efficiency approach.

The most common strategy when exploring possibilities for developing large scale e-learning projects is to take the point of departure as the end-users: the learners, teachers and educational planners. Salmon 2002 focuses on the education of teachers to become online teachers. Laurillard 2002 focuses on how teachers can support their students' learning process by establishing a conversational framework. Sorensen & Tackle 2002 have shown how to motivate learning and shared knowledge construction through dialogue, and Fjuk 1998 points out the interrelation between technical, pedagogical and organisational conditions. These strategies for constructing e-learning solutions focus on how to proceed after the preconditions, e.g., learner requirements, pedagogical choice, etc., when the requirements for the project have been decided upon. However, studies involving a large number of companies have documented that even though e-learning applications were implemented in organisations, they were often not adopted (Elkjær 2002).

1.3 An HCI Approach

The HCI field provide a methodological approach, which focuses on the user, most strongly expressed within the school of User Centred Design (e.g. Beyer & Holzblatt 1998, McCracken & Wolfe 2004, Preece et al. 2002, Dix et al. 2004). HCI has developed a vast number of methods to investigate and to inform design teams about users and their needs: ethnographic field studies, persona, scenario, cultural probes, etc., (Blomberg, et al 1993, Nielsen 2005, Orngreen 2003, Gaver, Dunne & Pacenti 1999). However, the most widely used methods and tools in HCI practice are simple prototyping, heuristic evaluation and usability testing, e.g., Think Aloud (Nielsen, Clemmensen & Yssing 2002), which are

methods that are used in the phases succeeding the initial pre-analysis and requirement analysis (Mao et al. 2001).

Although end-users are of unquestionable importance when exploring possibilities for developing large scale e-learning in complex contexts, a fundamental insight into the client is equally essential. Clients are understood as the organisation that has initiated the e-learning project and needs to manage the e-learning system after its development. However, because focus in the literature is on the end-user, the client is not included – not as customer, nor as co-producer. That is, the client is never thought of as a user of the product, as the one having to administrate the learning environment and facilitate the actual learning. Hence, not only the end-users of the envisioned system need to be understood, but also the clients' current competencies, resources and future possibilities to ensure a better grounding of design solutions and enhanced adoption of the systems.

1.4 A Client Centred Approach

In this paper we argue for Client Centred Design, characterised by an explorative approach and a foundation in mutual learning processes. The paper is organized as follows: After this introduction, we describe in section 2 the Lundbeck Institute and its existing educational course activities and relations to its participants. We introduce the project on which we collaborated with the objective of an initial exploration of the problem spaces and possibilities for an e-learning based Continued Medical Education at the Lundbeck Institute. In section 3 we reflect critically upon a number of methodological approaches. We acknowledge the Scandinavian System Development tradition, but approached from an HCI perspective, we introduce the Dialogue Design approach. Dialogue Design is used in collaborative projects with knowledge workers, and builds on the principles of open dialogue and mutual learning. In our project the user is not the client; however, we frame our project within the methodological understanding of Dialogue Design, and use dialogue and mutual learning as guiding principles for the cooperation with the Lundbeck Institute. In section 4 we introduce our empirical findings and describe three strategic issues identified, and then develop a strategic model for each of them. These models are complementary perspectives in a Client Centred framework. In the final section, section 5, we sum up the characteristics of Client Centred Design and conclude with a brief reflection on the process in the project.

2. THE CLIENT AND THE TASK

The Lundbeck Institute (founded in 1997) is an independent educational subsidiary company of the Danish medical company, H. Lundbeck A/S, one of the world's leading manufacturers of pharmaceuticals for neurological diseases, especially for treatment of depression. Although product independence is stressed heavily, the Lundbeck Institute is a non-product related initiative of H. Lundbeck A/S that plays a significant role with respect to the Institute's financial situation and also to the general identity of the Institute. The vision for the Lundbeck Institute is "*...through educational activities to contribute to improve quality of life for patients suffering from psychiatric and neurological diseases*" (Lundbeck Institute 2003, p.3). The goals are to reach consensus within diagnosis and treatment, to educate and establish networks between the target groups (general practitioners and Specialists), and the target groups and the Institute (Lundbeck Institute 2003).

The Lundbeck Institute makes extensive use of its own global network and faculty, but also draws on H. Lundbeck's local knowledge and network in other countries. The main educational activities are *Seminars* of a week's duration held in Denmark. These seminars are quality assured by the Faculty, a group of highly reputed external professors and specialists, who also often give lectures at or produce material for the seminars. Approximately 25 'top seeded' specialists from all over the world participate in each seminar. The seminars use a relatively dialog orientated pedagogy where the participants share knowledge and invited experts present new results from the field. At the time of our study, more than 1,500 specialists from all over the world had participated. Previous seminar participants were invited to *network meetings* at conferences, they had received *newsletters*, and had been encouraged to organise *local workshops* in their own region.

In recent years the Institute has initiated a series of *online activities*. *DepNet* is an online forum targeting patients, their family and friends, as well as individuals, who know or think they may suffer from depression. *cnsforum* presents news and knowledge of evidence-based medicine in psychiatry and neurology, and in addition to the traditional content, the Institute's homepage links to a drug database and contains educational tools for brain functions and disorders.

Prior to the pre-phase project, the Institute had investigated possibilities for Continued Medical Education (CME) in an e-learning environment. The investigations consisted of several target group surveys as well as discussions with the faculty network. One survey named "*Unmet needs in the treatment of depression*" documented that general practitioners in Europe felt unsure about some aspects of treatment and diagnosis, indicating the need for further education, for which a CME e-learning environment might be a viable solution. At the same time, governmental regulations throughout the world require general practitioners to take a certain number of accredited courses annually in order to keep their license. With this insight, the Institute explicitly broadened their activities to include general practitioners along with the specialists, and explored the possibilities for offering accredited online courses within their field.

It was on this basis that the Lundbeck Institute contacted the HCI research group at Copenhagen Business School. The Institute funded a preparation phase, a sort of feasibility study, which ran four months. KA-CHE was the abbreviation chosen as project name and the project was defined as a mutual Knowledge Acquisition process that focused on Continuing Healthcare Education in Computer-Human Environments.

The objective of the pre-project was: an initial exploration of the problem spaces and possibilities for a Continued Medical Education at the Lundbeck Institute. The e-learning situation under investigation was aimed at learners from all over the world, primarily general practitioners, but also specialists (psychiatrists and psychologists) within the field of neurological diseases.

3 THE METHODOLOGY

Methodological approaches in HCI to e-learning projects most often lack pre-analysis, and it is not clear how the choice among various methods and techniques for dealing with a development project is grounded (e.g., Mikkonen et al. 2002, Granollers et al. 2002). Bødker & Sejer Iversen (2002) point out that methods are often taken "off the shelves" rather than chosen on the basis of pre-analysis and grounded decisions. The tendency is to jump directly from an identified problem to working on solutions. Little is said about investigating the client's situation and context for adoption of a system (e.g. Vass et al. 2002, Urnes et al. 2002, Iacucci & Kuutti 2002). This may be due to the common misconception that HCI is only concerned with testing and evaluation of user interfaces. As a consequence, involvement of HCI-experts takes place after the preconditions and requirements of an interactive system have been established (McCracken & Wolfe 2004 and Metzker & Reiterer 2002).

Close co-operation with clients' employees throughout the development of an e-learning environment has been documented, e.g., Hewlett-Packard Virtual University (Svarre Nielsen 2002), the Danske Bank (Kypreos 2003), Danish Rail and the Danish Army Officers School (Hansen & Borup 2001). The focus of these e-learning projects was in-service training and competence development of staff. They addressed end-users' needs and context, but their focus and product ensured that clients' needs and context were addressed as well. In the analysis of our case, we drew on the tradition of Scandinavian System Development, but approached it from an HCI perspective. The Dialogue Design method (Nielsen Dirckinck-Holmfeld & Danielsen 2003) and the MUST method (Bødker et al. 2000) seemed promising. Both methodologies have their focus on end-users who are also clients. MUST introduces tools for pre-analysis of possible design spaces in collaborative formats. However, the method has a system thinking perspective, and the need for mutual learning between the partners is not considered. Dialogue Design builds on the principles of open dialogue and mutual learning, and is a methodology which has grown out of collaborative projects with knowledge workers. The educational work of the Lundbeck Institute, its history and the need for an initial explorative study made Dialogue Design an obvious choice, and thus mutual learning became a guiding principle for the cooperation.

In the pre-phase a project group with three members from the HCI-group and two members from the Lundbeck Institute was established, and the collaborative work started to unfold through iterative steps. In a traditional approach to pre-phases, the major part of the resources are used to develop an understanding of new e-learning theories and systems on existing learning activities and strategies, answering questions such as: Which learning models are used? What do participants learn? What are the subject areas? In KA-CHE the initial question was: What is known? Through this question, existing competencies and pre-requisites within the Institute were uncovered and subsequently analysed. This, in turn, led to the identification of the unknown and to new questions. Through the iterative collaboration with co-participants from Lundbeck Institute, new issues evolved allowing concurrent qualification of the discovered knowledge and the Institute's vision.

Several techniques were applied: Mind Mapping to uncover the problem spaces, document analysis, interviews with key personnel in the Institute, analysis of the Institutes' work processes and context, analysis of existing educational practice, mapping of the way the Lundbeck Institute had organized and divided the areas of activities, observation, etc. At the core of all these activities were the explorative collaborative sessions with our co-participants. It was within this space that the dialogue unfolded, the findings were contemplated, ideas were generated, and possibilities were explored.

4 EMPIRICAL ANALYSIS

The analysis of the empirical data has a strategic focus in relation to the development process and possible solution, rather than the actual production of a concrete solution. The analysis led to a strategic framework that is directly tailored to the clients' organisational needs and resources. This specific framework consists of a variety of e-learning, dissemination and implementation strategies, which have general value for e-learning development processes in complex contexts. Due to this approach with focus on the clients early in the process and the creation of a basis for e-learning design decisions, we refer to the approach as Client Centred Design.

The analysis identified a number of issues central to the Lundbeck Institute. In the following we introduce three of these issues and develop a strategic model for each of them. The analysis shows that Lundbeck Institute:

- defined its learning objective as change of attitude and behaviour in relation to diagnosis and treatment,
- operated with several target groups diverging according to professional level, geography, culture, technical skills and access to the Internet, and
- established long term relations with participants from the e-learning programmes.

4.1 Learning Objectives and a model of e-learning strategies

Apart from the seminars, the Lundbeck Institute already had a number of online activities and e-learning tools. Originally, these were not intended as integrated elements in specific e-learning courses; however, with the aim of building on the clients' resources and competencies, these activities came into play. Also, our interviews uncovered that additional educational activities were already under development at some departments, one such activity was the development of digital patient cases. Cases that show the "fictional but real" stories of patients that included: background information, activities from everyday life, the process of diagnosis and treatments involving dialogues with doctors, etc. With the e-learning objective to change attitudes and behaviours in Specialists and GPs (in their diagnosis and treatment), such a case-based teaching can be expanded into experience-based and knowledge sharing e-learning activities. For example, if a patient case is seen by all participants prior to an online dialog session, it may serve as a rich foundation for discussions, on how to apply new theories or treatment for patients in the case story, and to reflect upon their personal practice. However, if users have to see/watch and reflect upon the case on their own, it takes much effort just to reach a minimal level of identification and learning. Further, to reach the learning objective of a change of attitude and behaviours, stand-alone cases must include rich descriptions, media and interaction. This requires significant resources in terms of pedagogical design and

programming. Thus, stand-alone cases are expensive, in consideration of how relatively small and inexpensive the cases may be when used in a collaborative manner that nourishes interaction, dialogue and experience sharing among users, rather than interaction between a user and a learning program (Orngreen 2002).

This example illustrates that it is possible to have an e-learning counterpart to the existing traditional seminars. The need for accreditation of courses (as mentioned earlier) meant that content material and activities of sharing experiences had to be “split up” so that accreditation committees could easily identify content for accreditation. The content part, as e.g. inclusion of digital patient cases as well as new fact-based knowledge from journal papers, was called *E-courses and E-seminars*, whereas possibilities for dialog oriented online environments was named *Communities of Practice*. This is based on Wenger’s term Communities of Practice (Wenger 2003), and the idea is to support long-term relations and knowledge sharing where the users can exchange information, opinions and experiences. This dialog-oriented environment may be supported through moderated discussions based on the E-courses and E-seminars, but also based on the participants’ own experiences. Also, *expert panels* with discussions activated through Faculty experts’ input were contemplated. For example, an expert may initiate a discussion by writing an input to a topic of current interest, and users may ask questions of the expert. *Local Initiatives* may also be facilitated online with video conferencing, enabling expert participation or sharing of experiences of different local events. At the time of the study, the Lundbeck Institute encouraged former participants in seminars to conduct workshops based on presentation of powerpoint slides sent out by the Institute. Many had done so, which to us showed a genuine interest in disseminating results within this area. As it can be difficult to initiate or keep the momentum of online discussions, the idea arose to support online activities with a broader spectrum (than “just” presenting slides) of face-2-face *Local workshops* moderated by former participants and dedicated trainers. This, in turn, meant a need for ongoing facilitation and supervision of these participants, and agents in the form of *Coaching* in a virtual environment could be an adequate way of providing Local Trainers with support.

The table below is a strategic model for independent and interdependent logical building bricks for stepwise implementation. It shows the different activities identified which fit the client’s competencies and resources. Some activities require more resources than others (e.g., personnel for running the activities with appropriate pedagogical as well as medical qualifications, personnel for the technical administration and technological investments). The suggested activities (Table 1) range from E-courses and E-seminars with controlled identifiable content that can be accredited to Communities of Practice based on sharing experiences and knowledge.

E-learning activities	Users	Specific competencies needed	Ex. of learning models/pedagogical tools
E-courses	General practitioners	Content and user management Administration of accreditation certificates Technical assistance	Presentation of information Case-based teaching / learning Problem based pedagogy
E-seminars	Specialists	As above, although if a dialog-based concept is chosen as in existing seminars, discussion moderators are also necessary.	As in E-courses plus: Dialogs between participants and the moderator
Communities of Practice	General practitioners, Specialists, Network specialists	Administration of access rights, privacy issues Editor – incl. filtering and (n)etiquette Moderators Invited experts Technical assistance	Knowledge sharing and management Case based learning Experience & dialog based learning
Coaching	Local	Coaches – should be experienced in	As in Communities of Practice

	workshop organisers & Trainers	learning and pedagogy online and within the subject area.	plus: focusing on learning by individual coaching and communities sharing experiences within the practice of teaching/moderating dialogs.
Local Initiatives	General practitioners, Specialists	Administration and planning of event Moderators Technician - online issues & video conferencing Invited experts (also possible per distance)	Dialog based learning Presentation of information Case based learning and experience based learning
Other e-applications	General practitioners, Specialists	Content providers Pedagogical Designers Administration	Primarily presentation of information – probably in an interactive environment.

Table 1. E-learning Strategies

4.2 Expansion of Target Groups and a user segmented strategy

A second strategic issue identifies the Lundbeck Institutes interaction with several divergent target groups, with respect to: professional level, geography, culture, technical skills and access to the Internet. The adequate mix of online and traditional pedagogical tools depends on the user group and the learning objectives; hence, the content and form differ, depending first on whether the user is a general practitioner or a specialist, and also on whether the user is situated in the city or in a rural area. The geographical context (e.g., Western Europe, The Middle East, Africa and East Asia) implies differences according to culture, language and learning traditions, which strongly point to the need for local support and local differentiation. Decisions about the way the interaction with the user takes place influence not only the activity, but also the many nationalities' views on clients in general. This therefore calls for support (and control?) from the institute over the local initiatives.

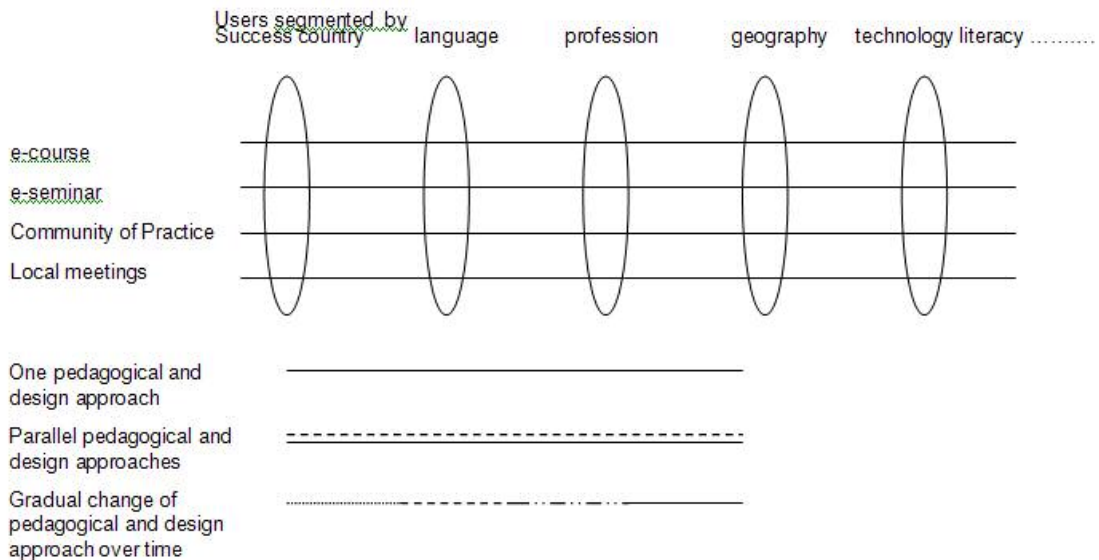


Figure 1. Model for user segmented strategy for implementation of e-learning building bricks

These considerations also include discussion and reflection on whether one or more countries are usable as a “first rollout” country, or if specific user groups would be more appropriate as “trial

groups” (in comparison to the term “early adopters” by Rogers 1995). We must emphasise that the criteria for segmentation is to be reliant on real knowledge of users, not only on target group information. We make a distinction between knowing who has a need for accreditation courses and knowing what it takes to get this exact group of users to log-in and use the e-learning program. Also, different segmentations have various consequences for the pedagogy, choice of e-learning platform and design. For example, the Institute needs to know if all English speaking learners have enough in common culturally, that is, in their professional conception of mood disorders, their personal learning style, access to the internet, etc. In other words is it reasonable to expect that all can benefit from the same educational solution? This led to other strategic considerations: The choice of one or several solutions of the same e-learning activity, or what is known as decisions regarding internationalisation or localisation strategies (Siegel and Dray 2005); as well as considerations that regard decisions on the choice of singular or parallel development and dissemination processes, and finally contemplation of the need for dynamic and gradual changes to content and process over time (see figure 1)

4.3 Long Term Relationship and a flexible and large scale strategic framework

Experience shows that users of e-learning applications do not automatically appear, as any online activity needs exposure. Taking advantage of the already existing network of former participants, contact persons at special interest societies, the Faculty and local agents, as well as creating new contacts in, for example, universities, is therefore seen as a viable way of moving forward with the overall e-learning strategy.

It is evident that networking already plays a huge role in the Institute’s current activities, with respect to recruiting seminar participants, as well as establishing contact with well reputed experts in the field. The perspective is that people who have contact with the Institute are viewed not only as brief contacts. It is important to the Institute to establish long term relations in order to ensure that knowledge about treatment and diagnosis is updated. Of particular interest is the network, the Faculty, already built by the Lundbeck Institute and the seminar selection method. Here, participants are chosen among prominent international specialists by use of local agents around the world from the H. Lundbeck Medical company. This gives cause for reflection concerning the boundary between the Institute and H. Lundbeck, the medical company. It is not as high a brick wall as it is generally perceived to be. Keeping in mind the ethical and public concerns, which have to be taken very seriously, H. Lundbeck, the medical company does represent a vital network, having local agents that know the GPs and their needs not only for information about products, but also for learning about proper diagnosis and treatment of the mental disorders.

Face-to-face communication and other non-digital initiatives (folders, etc.) are vital tools to expose and create awareness about the e-learning features available. They are even more important when wanting to establish and maintain a long-term loyal relationship with users. The users need to know the “face” of the Institute, and face-to-face meetings are the best way to show such a “face.” Contemplating the Lundbeck Institute’s and Lundbeck H.’s network at local geographic positions, it seems possible to utilise *local representatives* as a way of providing such a “face.” Having social activities, such as short evenings of *Local Introduction Meetings*, is another supplementary way to provide presentations, hands-on introduction to the platform, and inspire people to “sign-up” for e-course and e-seminar modules.

With the objective of getting good ambassadors who can disseminate the word-of-mouth recommendations through success stories, we see *Local Initiatives* as a sound way to create long-lasting relationships. In comparison, an E-course or E-seminar is seen as a relative short-term entity, where the relationship ends with the achievement of accreditation points. Even if users continue to take other E-courses or E-seminars, the relationship has an impersonal and disjointed character.

However, since the whole set-up is new and no prior users exist, other measures are also foreseen as being needed at the beginning of the dissemination process. For example, the use of and approval from *national organisations* will appeal to many users. Likewise, approval from *international*

organisations, even collaboration with *university partners*, will most probably be seen as a sign of a blue ribbon CME-initiative. (See figure 2.)

The model (figure 2) holds an element of continuity, which is important. Large-scale e-learning projects with a time frame running over several years cannot be perceived as final products. They must be considered as ongoing processes that have to adapt to changing conditions in the world as well as in the local contexts. Also, the Lundbeck Institute could opt for a stepwise implementation strategy, as described in the previous section.

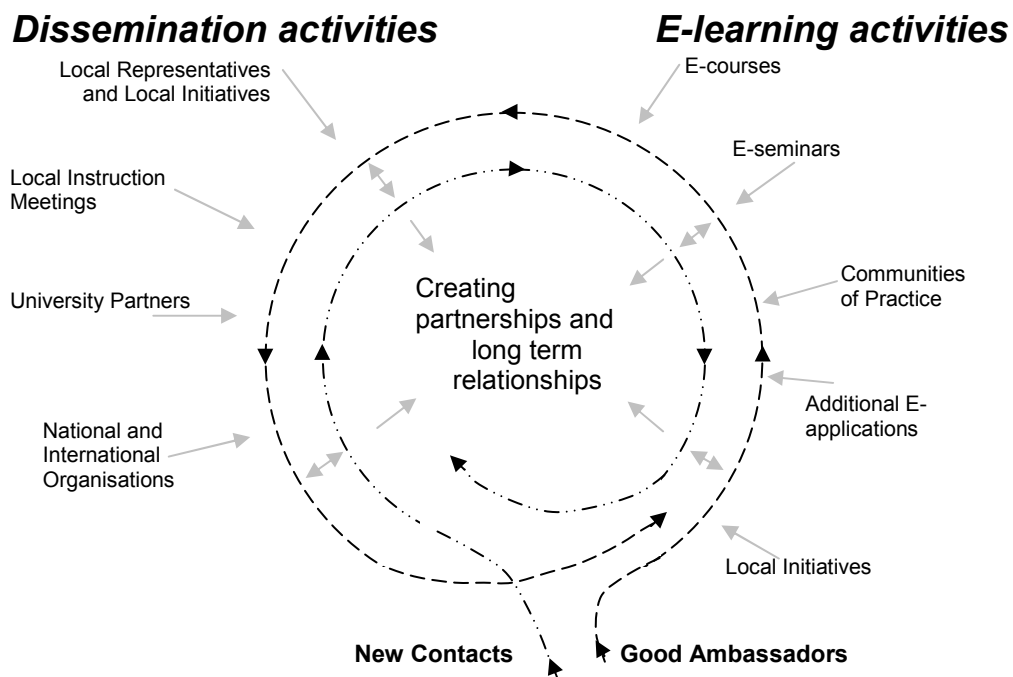


Figure 2. A strategic model for e-learning projects and long term relationships

5 A CLIENT CENTRED STRATEGIC FRAMWORK

The objective of the presented pre-project was: an initial exploration of the problem spaces and possibilities of an e-learning based Continued Medical Education at the Lundbeck Institute. The investigation resulted in a strategic framework for Client Centred Design. The learning strategy with interdependent building bricks and the strategic model for expansion of the target group form complementary perspectives which support the establishment and maintenance of a Client Centred Strategic framework.

- A Client Centred Design method is based on dialogue between the Client and the HCI team.
- A Client Centred work process is explorative, giving space for recognising that: 1) there may already be ways of working in the organisation which contains inherent possibilities, and 2) validated knowledge may, when viewed from another perspective, give reasons for concern.
- A Client Centred Design approach does not result in specific design solutions.
- A Client Centred Design approach focuses on current and future critical questions to ask, further steps to explore and opportunities to investigate within a particular project.

In some ways, Client Centred Design bears similarities to the well documented approach within the field of business economics known as feasibility study. But Client Centred Design differs from

traditional feasibility studies in two ways. First, feasibility studies are focused primarily on analysis, where the Client Centred approach draws on Dialogue Design and is oriented towards collaboration, dialogue and mutual learning. Both approaches focus on learning about the clients' current activities, resources and competencies, but the second difference is that traditional feasibility studies aim at recommendations of best solutions, whereas the Client Centred Design aims at raising questions about what the client needs to consider when contemplating a large complex project.

That is, decisions about forthcoming strategies must reflect and build on – but not be limited to – the clients' competencies and resources, and reflections on the clients' ability to provide for a set of possible solutions. Focus on the users, their culture, language, their technological skills, their work, etc., and a focus on use are equally important. The user and use approach constitute the complementary perspective in the design of e-learning systems. This complementarity is not easily bridged – however, this is the focus for future investigation.

5.1 Reflection on the process

KA-CHE was a typical project where the actual project is preceded by a process of clarification and negotiation of meaning. In this process, the client's contextual knowledge, needs and visions meet with the researchers' competencies, scientific interests and experiences. But KA-CHE was special in that the Lundbeck Institute not only allowed for using a considerable amount of resources on a pre-study, but also that the contact persons within the organisation succeeded in working in this very explorative manner to become collaborative partners. At times, it was very frustrating for the participants from the Institute, because neither they, nor we, were able to see where we were heading, but also because they were not used to working under such floating and drifting conditions, where nothing tangible was produced.

At the end of the KA-CHE pre-phase, it became clear that we had worked through a number of themes in an iterative manner. Those themes, it turned out, vitally influenced our design considerations, and evolved as a consequence of constantly questioning the knowledge that we gained during the process. This allowed new themes to emerge and influenced our perspective and changed our view on the initial theme. These interrelations could not be identified beforehand, but unfolded gradually.

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