

Heterogeneity and situatedness – challenges for work-integrated e-learning

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Abstract This paper reports from a large-scale e-learning initiative where a nation wide project was launched to address the challenges raised by geographical information systems to the public administrations of Sweden.. The analysis identifies two interrelated challenges for large scale e-learning projects: Heterogeneity of participant and the situated nature of practice. It is concluded that these challenges needs to be addressed with a techno-pedagogical design approach where technological and pedagogical aspects are closely integrated with the existing and the future work practices.

Key-Words: e-learning, situated learning, work-integrated learning, geographical information systems

1 Introduction

Today's public organizations have to cope with rapidly changing context and conditions. Innovations and new areas where ICT can be applied inevitably challenges existing work practices, organizational structures and services demanded by the public [1]. This inevitably leads to an increased demand for effective training and education of staffs. Paradoxically, there is at the same time a tendency to turn to technology when looking for new ways to address the problem of increased need for learning [2]. Computer mediated education in various forms, often referred to as e-learning has rapidly manifested itself as an area of great interest within this context.

The existing body of research in the field of Educational Technology has to a large extent focused on the conditions in traditional classrooms or distance educational settings. However, there is a growing interest in the specific nature of IT-mediated training an education in organizations. Scholastic learning at work can in many ways be argued to give rise to a new set of questions and issues concerning for example the relationships between learning, technology and existing work practices [3,4,5], the inherent conflicts of interest between workers, employers and owners [6] or the correlation between flexibility in work practice and flexibility in learning [7, 8, 9]. This paper reports from a study of a Swedish e-learning project that was launched as a nation wide initiative in 1999. For three years the project advanced through three stages all directed towards increasing the knowledge of how modern geographical information Systems (GIS) could innovate services in the public sector of Sweden.

The Conclusions are based on semi-structured interviews with a sample of course participants of stage three and a survey that was sent to GIS-coordinators in all participating municipalities and regions (stage two participants). In order to understand the complicated relationships between technology, learning and practice socio-cultural views of learning were used as the primary analytical lens. The analysis point to two major challenges that need to be addressed.

- *Heterogeneity of participants:* Large scale project stresses the need for flexible integration of education and work. This challenge involves issues such as: Strategies to re-engage participants that are falling behind, flexibility to adapt to individual's needs and available resources, etc.
- *The situated nature of work:* Resolving the inherent tension between abstracted theoretical knowledge and the situated concrete contexts where knowledge is to be applied. It also involves issues regarding organizational change, in order for practice to e changed through education it is central to create arenas where practice can be collectively renegotiated, and there through successfully innovated.

Finally, we conclude that these challenges along with an underlying understanding of existing practices should guide a design approach of a techno-pedagogical system. The next section presents the StrateGIS e-learning project. Section three briefly outlines socio-cultural theories of work-integrated learning Section four presents the methods for data collection. In section five, the findings are presented and discussed. The paper

concludes with a summary of the findings and implications for further work.

2 The StrateGIS Case

In 1999 the government instructed the 21 county administrations of Sweden to coordinate and launch a nationwide education project that should enhance the use of geographical information systems (GIS) in counties and municipalities. The project was labeled StrateGIS, and was organized as cooperation between the county administrations, a large number of municipalities and two national governmental offices. The project ran from 1999 to 2002 and was divided into three different stages, each with specific objectives and a specific target group (See table 1.)

Stage	Target group	Focus
1	Decisionmakers	Benefits of GIS
2	GIS-coordinators	Implementation of GIS
3	End-user	Usage of GIS

Table 1. Overview of the three StrateGIS stages

Central to the educational design of all three stages was a web site called StrateGISwebben (<http://www.o.lst.se/strategis/>). The site was a redesign of a learning management system developed by the Laboratorium for interaction technology at the University of Trollhättan Uddevalla. The site hosted learning material, discussion forums and an online GIS application called Tittskåpet (fig. 1). StrateGISwebben also allowed for modification and extra material to be made by local tutors.



Figure 1. Interface of The Tittskåpet web-application (Tittskåpet was awarded the Innovation price by the Swedish cartography association)

The Tittskåpet served the dual purpose of introducing the user to GIS, and was also the tool in which course exercises and assignments were made. The functionality of Tittskåpet included zooming, searching, panoramic overviews, measuring of lengths and areas, and showing of information (fig 2). Furthermore, the application was modified so that it could be used also by municipalities that at the time of the education had not yet launched their local GIS-systems.

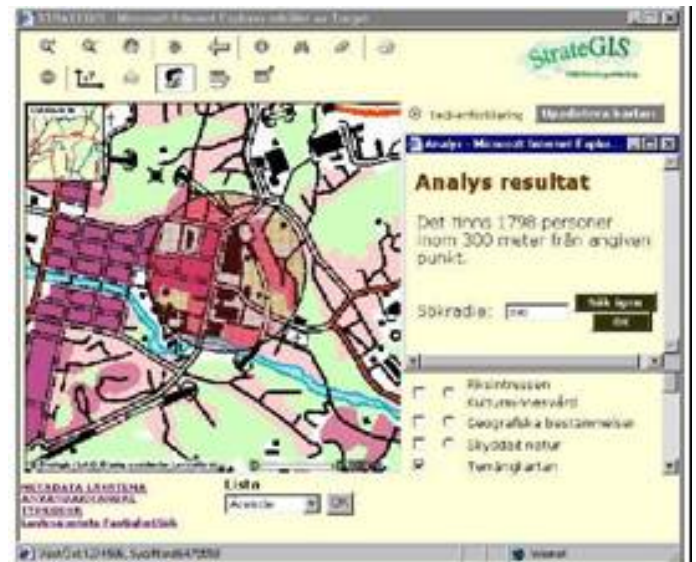


Figure 2. Zooming with Tittskåpet. The picture shows the result of an analysis counting the number of residents within a 300 m radius from a given coordinate

The first stage (started in 1999) was targeted on decision-makers and policy-makers in regional and municipal public organizations. Approximately 100 teachers throughout Sweden organized seminars that were supported by online material. The seminars aimed at highlighting the potential benefits of introducing GIS-based services. The course involved four activities: Information and motivation material, local (off-line) seminars, follow-up discussions, and self-regulated experiments with the Tittskåpet system. TO some extent this stage was about trying to anchor the project at management level before proceeding to more operational levels in the organization. The evaluation of stage 1 indicates that 60% of the target group was successfully reached.

Stage two educated local so called GIS-coordinators. The course focused on issues relating to implementation, maintenance, and user training. The aim was to educate at least one GIS-coordinator in each municipality (larger municipalities educated up to four people with responsibility for smaller areas of the administration). Subsequently, the coordinators had a central role as teachers and project managers of the final stage of

StrateGIS. The course consisted of three parts: Introduction to GIS-technology, regional GIS management seminars, and practical application to local organizations. The course material that was distributed via StrateGISwebben and was divided into 16 modules. Different regions choose different strategies for conducting the seminars, but in all cases the local complements adaptations of the course material were highly appreciated.

The third stage (ended in 2002) was aimed at end-users in different areas of municipal and regional public administrations. Local GIS-coordinators were encouraged to make local adaptations to the material in order to incorporate knowledge of the way GIS was used in the organization at that time. Some of the participants also completed an advanced course module that included hands-on training in existing GIS applications.

3. Socio-Cultural Perspectives on learning and Practice

There are a number of theoretical traditions within the field of workplace studies [10], all of whom prescribe to socio-cultural views on learning where learning is regarded as a situated phenomenon. Such a standpoint, can according to Engeström [11], imply a weak link between learning and context or a stronger link between learning and practice.

Socio-Cultural views on Learning emphasize the situated nature of learning (e.g. [12]). This implies an inseparable relationship between human learning and the cultural and institutional context in which learning occurs - Learning should be understood as something we do in Communities of practice [12]. Wenger [13] identifies three central processes or activities that are characteristic for communities of practice: (1) Mutual Engagement, where members in various manners pays attention and give interest to whatever is in common in the community. (2) The Negotiation of Joint Enterprise stresses the fact that available resources and boundaries must not be perceived as static, but rather as objects of constantly ongoing debates, interpretations, and change. Finally, a community is characterized by its (3) Shared Repertoire, where the mutual history constitutes the foundation for knowledge of shared norms, tools, language genres etc. that distinguishes the insider from someone outside or in the periphery of the community.

A second theme that is strong in socio-cultural theories is the idea of mediation [14]. Cultural ideas are mediated through artifacts, signs and language [14]. The close connection between human thinking and reasoning on the one hand, and our use of technologies on the other also implies that a change in technological use will lead to changes in practice.

When technologies change, so does the nature of human thinking and learning and so do our [14, p. 9]

A socio-cultural perspective on radical organizational change and innovation is often related to instability, rather than stability of the organization [11]. However, Brown & Duguid [15] advocate that organizations need to be enacting, i.e. an organization that through experiments and trials not only adopts to changes in the environment, but also is proactive in shaping the context in which they function.

4 Method

The case study reported in this paper is a part of a larger action-oriented research project (see [16]) called distributed work-integrated learning (deWIL).

As a first phase of data collection, a survey was sent to all 143 municipalities that participated in the project. The questionnaires were addressed to the local GIS-coordinator (target group for stage two). The objective was to briefly monitor regional differences with respect to for instance motivation, engagement, expectations, available resources, and outcome. 58 municipalities (41 %) answered the questionnaire. This was later completed with a sub-sample (Hansen-Hurwitz) of 17 phone interviews.

The primary source of data collection for this paper was a series of 11 semi-structured interviews with course participants that completed stage 3 of the StrateGIS education project. Interviews were made via telephone and lasted between 20 and 40 minutes and covered interview themes such as expectations, interactivity, motivation, course structure etc. All interviews were recorded on tape and later subscribed. The interviewees were targeted through a stratified selection process where four municipalities were chosen on the basis of size of the municipality and region. The selection also strived for a representative geographical dispersion. From each of the chosen municipalities three participants were selected at random (In one of the towns only two interviews were possible to schedule). The quotes that are presented in the next section are all translated from Swedish with the ambition to preserve the tone of the statement.

5. Work-Integrated e-learning

The GIS-coordinator survey showed that a majority of the municipalities were satisfied with the way the StrateGIS project was managed and carried out. However, the results also highlights that differences with respect to how the course were perceived exist (See fig 3). These differences are in a way natural given that stage three was to a great extent organized according to local preferences and resources. The interview material

partly echoes these differences in terms of end-users' attitudes. In the following sections the interview data is used as source for exploring differences in project outcome and subsequently to identify critical challenges and potential obstacles.

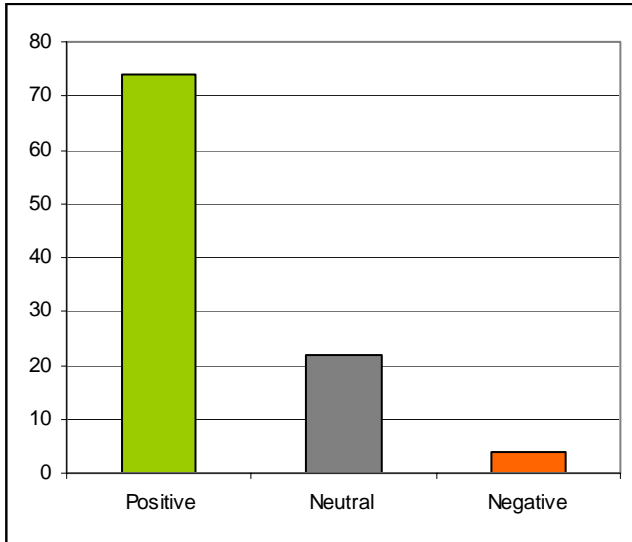


Figure.3 Attitudes towards the relationship between Organizational needs and course content

5.1 Heterogeneity of participants

Up-scaling of an e-learning project implies potential benefits with respect to efficiency and scope, but as this study shows, also implies a series of potential problem that needs to be addressed. 'Large-scale' inevitably means heterogeneity with respect to a number of factors such as context, knowledge, perception, etc. Firstly, this heterogeneity is related to the fact that the conditions for learners vary to a large extent. Using e-learning means that participants don't share the same context of study. It is therefore important to provide an educational design that is sensitive to differences with respect to how students are able to integrate periods of learning with periods of regular work.

"I can come to work in the morning, check my email and make some calls and then "go to school" until four o'clock. Then there is still time for some work in the afternoon"

"I wouldn't trade this [e-learning] for traditional education. We were suppose to cope with our regular work in parallel"

Differences with respect to prior experiences and knowledge of the subject area are also expressed by the interviewees as a problematic issue. It was therefore appreciated that online material was divided into distinct

modules that could be studied in more or less arbitrary order.

"I think it's great when you can pick and choose the modules you are interested in. We all have different levels of expertise"

"The more I know [of a subject] the more I appreciate to pick and chose"

High demands on flexibility should not be perceived as an absence of structure. The respondents gave several indications that it was crucial to have firm structures that frames course activities and implicitly enhances motivation to find time for studies.

"It is great to know what the course is aiming at, and what you are suppose to learn"

"On introductory courses I prefer to have a course syllabus."

Analyzing challenges that are raised through increased heterogeneity of a project with a socio-cultural lens puts a natural focus on the integration between working practice and learning (educational) practice. Participants of the e-learning project are forced to deal with the discontinuities and conflicts between everyday work tasks and course obligations [17]. Given the differences in work situation between participants this implies that the educational design needs to be highly flexible and allow for freedom in time and space. An additional crucial element is for learning to be an accepted and legitimate sub-practice of the organization. This involves difficult issues such as being able to concentrate on studying without constant disruptions. Colleagues, even the ones not engaged in the course, are important for negotiation of meaning [13] of the course content. Mutual engagement [13] is a central for a functional community of practice.

5.2 Situated Nature of Practice

In more or less all of the interviews the importance of situating the learning material and the course objectives in existing practice surfaced as a central theme. One of the respondents, who was quite dissatisfied with the project outcome, stated that she found the course to be too abstract and only focused on long-time strategies and future plans,, there through neglecting the immediate use of GIS as a tool to develop existing services. This tension between theoretical (abstract) and practical (concrete) course content was also evident in the following quote.

"I would have preferred more practical exercises. It wasn't really about getting to much theory, rather

getting too little that related to practice. These aspects were not in balance as I see it."

Teachers and tutors can, especially in classroom seminars, be instrumental in contextualizing and applying abstracted facts. However, the extent to which this was done by the GIS coordinators varied according to two of the respondents

"It was as if they [the lecturers] lectured for the sake of lecturing –for me this was theory coming in through one ear and going straight out the other"

"The references you can get from an expert that is about how knowledge can be applied in a larger perspective is invaluable."

The Educational design of StrateGIS did indeed involve a number of initiatives that aimed at contextualization of course content. In stages two and three local organizers were encouraged to make local adaptations to the material and the exercises. Such initiatives are of course resource demanding, but judging from the response of the respondents this seems to have been well invested efforts. The two quotes below illustrate how respondents valued group discussions in order to problematize their knowledge. Through communication with others learning had the potential of becoming situated in and related to existing practices.

"When solving problems you need a discussion in order to find new angles."

"Jointly reflecting on what your doing creates knowledge. It is in a sense a sort of 'barfoot-research'. Change, development and learning is like a big jig-zaw. You cannot take a technology like for instance e-learning and think that this is it. It has to be adapted to the big picture – the context in which the organization is functioning"

The call for discussions among participants is very much inline with what Wenger [13] refers to as negotiation of meaning. This is seen as a constant process in a community of practice from which shared values, work practices and behaviors originate. Wenger [13] argues that meaning is socially constructed through the duality of reification and participation. The participative elements of StrateGIS focus mainly on face-to-face seminars with local peers and tutors. This could be argued to constitute a risk of the learning outcome to be more oriented towards incremental exploitation rather than radical exploration [18] of existing services. Perhaps, if stages two and three had explored the potential of online seminars and computer conferences

the negotiations of meaning could have benefited from comparisons between different practices in different regions and municipalities, and subsequently provided a better foundations for radical changes. Finally, the close contacts with tutors and experts are important in order for learning trajectories to be what Lave and Wenger [12] refers to as legitimate peripheral participation.

6 Conclusion

Heterogeneity and situatedness are important issues to be dealt with in any educational design. However, in a large scale e-learning project, such as the StrateGIS project, the importance of these issues seems to scale up with the size of the project. The discussion above reveals that together these challenges include a number of techno-pedagogical tensions between: Flexibility versus structure, theory vs. practice, information vs. communication and exploitation vs. exploration of practice. We conclude that these challenges and tensions can not be addressed through a separation of pedagogical and technological design choices, but rather through an integrated techno-pedagogical approach where choices with respect to instructional design is firmly rooted in a rich knowledge of existing practices, and a clear vision of educational goals.

References:

- [1] Braa, K & Sørensen, C & Dahlbom, B (2000) *"The Planet Internet: Challenges Facing Informatics"*, Studentlitteratur, Lund, Sweden
- [2] Svensson, L., (2002) *"Communities of Distance Education"* Doctoral Dissertation in Informatics, Report no 25, Göteborg University, Sweden.
- [3] Trentin, G. (2002) "From Distance Education to Virtual Communities of Practice: The Wide Range of Possibilities for Using the Internet in Continuous Education and Training", *International Journal on E-Learning*, Jan-Mar 2002
- [4] Folkman, K. (2002) "Integrating distributed Learning in Work Situations: A Case Study", *Educational Technology and Society*, 5(2).
- [5] Radcliffe, D., F. (2002) "Technological and Pedagogical Convergence between Work-based and Campus-based learning", *Educational Technology and Society* 5(2)
- [6] Spencer, B. (2001) "Changing Questions of Workplace Learning Researchers", *New Directions for Adult and Continuing Education*, no 92, pp. 31-39
- [7] Fenwick, T. (2001) "Tides of Change: New Themes and Questions in Workplace Learning", *New Directions for Adult and Continuing Education*, no 92, pp. 3-17
- [8] Grundén, K. (2003) "A Case Study of Work-Integrated E-learning". Callaos, N., Sciuillo, A.M.,

- Ohta, T., Liu, T-K. (red.) *Proceedings of The 7th World Multiconference on Systemics, Cybernetics and Informatics* (SCI2003), Orlando, Florida. Juli 27-30
- [9] Grundén, K. (2003) "An Evaluation Model for Work-integrated E-learning", I Rossett, A. (red.) *Proceedings of E-Learn 2003*, World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education. Nov. 7-11, Phoenix, Arizona.
- [10] Lave, J. (1993) "The Practice of Learning". In S. Chaiklin & J. Lave (Eds.) *Understanding Practice: Perspectives on activity and context*. Cambridge, Cambridge University Press, pp.3-34.
- [11] Engeström, Y. (1999) "Situated Learning at the Threshold of the New Millenium", In *Learning Sites: Social and Technological Resources for learning*, (Edited by Bliss, Säljö & Light), Elsevier Science Oxford, UK
- [12] Lave, J & Wenger, E (1991) "*Situated Learning: Legitimate peripheral participation*". Cambridge University Press, Cambridge United Kingdom
- [13] Wenger, E. (1998). "*Communities of Practice: Learning, Meaning and Identity*". Cambridge U P, New York, USA
- [14] Bliss, J & Säljö, R. (1999) "The Human-Technological Dialectic", In *Learning Sites: Social and Technological Resources for learning*, (Edited by Bliss, Säljö & Light), Elsevier Science Oxford, UK
- [15] Brown, J. S. & Duguid, P. (1991). "Organizational Learning and Communities-of-Practice: Toward a unified view of Working, Learning and Innovation." *Organization Science*, 2(1).
- [16] Braa, K. & Vidgen, R. (2000) "The Action Case", In *Planet Internet* (Braa, Sorensen, Dahlbom eds.) Studentlitteratur, Lund, Sweden
- [17] Svensson, L., (2004) "Inter-Regional Cooperation on Work-Integrated e-Learning: The Case of the Swedish Academy of County Administrations", *Journal of Workplace Learning*. 16(8), pp. 492-502.
- [18] Robertson, M., C. Sørensen, and J. Swan (2000): "Managing Knowledge With Groupware: A Case Study of a Knowledge-Intensive Firm". In *Proceedings of the 33rd Hawaii International Conference on System Sciences* (HICSS-33), Maui, Hawaii, ed. R. H. Sprague Jr.