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# DESIGNING COMMUNITY ATMOSPHERE BAROMETERS

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## ABSTRACT

*The World of learning is undergoing radical changes. Increasingly Information and Communication Technologies (ICT) support new temporal and spatial learning configurations. Traditional face-to-face learning situations offer a variety of ways for people to provide informal feedback contributing to the establishment and maintenance of a community atmosphere. ICT supported distance education presents a challenge for the establishment of community. This paper explores the design criteria for mechanisms compensating for the loss of informal feedback in a real-life distance educational setting by codifying and visualising the community atmosphere. This is accomplished by two case studies each designing, implementing and evaluating a web-based community atmosphere barometer. The results indicate the importance of providing ICT support with sufficient flexibility allowing the community to engage in collective processes of sensemaking when jointly expressing the atmosphere.*

## 1. INTRODUCTION

How can Information and Communication Technology (ICT) support the ways in which we learn from each other? This question is currently creating immense interest within the academic community as well as in commercial organisations. Continuous learning is deemed essential and increasingly ICTs support inter-personal and group communication, thereby facilitating the creation and maintenance of geographically dispersed networks of individuals. Using asynchronous and or synchronous text, video, sound, and images we can engage ourselves in interaction both with other people and with shared digital resources [Braa et al. 2000]. In an educational setting, such technology can mediate flexible forms of collaboration and learning that reach beyond the traditional teacher-designed collaborative educational practices, for example through facilitating informal peer-to-peer communication amongst learners. The learners can engage in a rich spectrum of collaborative activities that involves joint construction of solutions to problems, exploration of options through argumentation, or simply perceiving and using each other as educational resources [Fjuk 1998]. In this sense technology has the potential of empowering the learners - an important dimension of technology mediated education closely related to the learners' motivation and engagement [Nuldén, 1999]. Sillén [2000] advocates that empowered learners also are more autonomous and capable of assessing their needs, which in turn is related to the ability to reflect upon ones learning and modify actions accordingly. Learners and

instructors using ICT for communication and collaboration purposes can be viewed as constituting a learning on-line community.

Evaluation is here an essential activity in order to assess the learning experience and is in the educational context often associated with conscious and formal activities directed towards formative or summative purposes [Oliver 1997]. However, in the traditional setting there are additional subtle and informal sources of evaluative feedback that constantly reach the members of a classroom. The air is literally filled with unobtrusive and ephemeral queues that can be interpreted in terms of feedback [Schmidt & Simone, 1996]. The students can express their degree of interest and concentration through the way they sit, the expression on their faces, where they look and through other discrete expressions. There is a significant difference between a student looking directly at the teacher, nodding the head and smiling, and a student with the arms crossed over the chest, staring at the ceiling with a bored yawn. The role of ICT in a learning community should therefore not be restricted to task-oriented systems and tools that directly aim at supporting individual and collaborative learning. The formal systems and instruments for evaluation can easily be transformed and perhaps even enhanced by the use of ICT, but the equally important informal feedback is to a great extent lost in the virtual classroom. It is therefore essential to explore how ICT can promote learning *indirectly* through the support for informal social processes and inter-community relations that enhance motivation and engagement. The specific aim of this paper is therefore to explore one such aspect, namely the *community atmosphere* — the prevailing emotional tone or attitude within the community. This is accomplished by supporting students and teachers within a learning community to continuously monitor, interpret and evaluate shared experiences.

Providing full compensation through ICT for the loss of informal feedback within the virtual classroom is probably not possible, but previous research shows that a discursive media such as a threaded discussion-board for students and teachers can support rich and frequent feedback. This type of public, asynchronous text medium can express aspects of the community atmosphere [Svensson 2000, Hall 1998]. However, research has reported a disproportional number of lurkers — users who only read messages — compared with the number of users posting messages [Gallagher et al. 1998]. A critical aspect for the success of a tool that aims at visualising the community atmosphere is the degree of acceptance and use. Prior research discusses this aspect in terms of a threshold effect and a problem of obtaining critical mass [e.g. Bradner et al 1999]. Others focus on how technology must make collective sense to the would-be users [Orlikowski & Gash, 1994; Henfridsson, 1999; Weick 1995]. Consequently, community atmosphere mechanisms should provide possibilities for subtler and less demanding means of expression — supporting general asynchronous measurement of a virtual community atmosphere.

The primary research question explored in this paper is: *What are the design criteria for mechanisms compensating for the loss of informal feedback in a real-life distance educational setting by codifying and visualising a community atmosphere?* This question is explored through the design and evaluation of two prototypes used by distance education BSc Students within Systems Analysis a at a Swedish University college. The students were distributed across six remote locations and taught from the university using video conferencing and a proprietary web-based distance learning system. The results tell a story of both adoption and rejection. The first prototype was generally accepted and frequently used by the community. The users felt that the application supported social awareness throughout the community. The failure of the second prototype is equally interesting, demonstrating that the specific features of such systems are crucial to the outcome. The results suggest that an important characteristic of systems supporting social processes is the affordance of space for negotiation of common sense-making. This 'system-plasticity' supports the community in gradually adapting to the rationale of the tool, thereby reducing the risk of rejection. Furthermore, the results point to a tension and potential trade-off between visibility and privacy in ICTs supporting the awareness of collective social settings.

The next section presents theoretical approaches related to social information in collective systems. Section three presents and discusses the two trials. Section four explores the implications for design of systems supporting social processes, and the findings are summarised and concluded in section five.

## 2. RESEARCH ON SOCIAL INFORMATION IN ON-LINE COMMUNITIES

Virtual Community [Rheingold 1993] is a term often used to describe a variety of aspects where a social dimension is present in ICT-mediated settings. The fact that scholars from many disciplines (e.g. Sociology, Cultural studies, Informatics etc.) pay attention to social aspects of cyberspace contribute to a somewhat heterogeneous image of what this concept encompasses. Many of the definitions depart from how communities are perceived in real life. According to Coyne [1995], the term "virtual" suggest an absence of some of the real life aspects of a community, instead being replaced by something that looks, sounds or feels as if it is real, when it in fact is not. Erickson [1997] criticizes the use of the community metaphor as a generic description of on-line discourses and supports the critique with several examples from the web where fundamental aspects of a community, such as membership, shared value, commitment and interpersonal relations, makes little or no sense. Social information is in this context often associated with notion of awareness. Awareness is a multifaceted phenomenon, containing aspects such as being able to see other people, interpret their actions and act upon them. Dourish [1997] states that "*The primary role of awareness information is to make one's activity visible to others.*" This aspect is explored from a number of perspectives in various academic fields. Social Navigation, for example, explores how social information enhances the quality of navigating in information spaces [e.g. Dieberger & Höök 1999]. Other approaches focus on grouping users with similar behaviour [Maes, 1994], supporting informal conversations in distributed work settings [e.g. Whittaker et al., 1994], and on techniques for visualizing text-based conversations [Donath et al. 1999].

Erickson and Kellogg [2000] argue that social translucency characterized as "*visibility, awareness and accountability – which enable people to draw upon their social experience and expertise to structure their interactions with one another*" is an important feature of systems for communication and collaboration. They discuss three different approaches for designing translucent systems. The *realistic approach*, where rich media such as videoconferencing is used in an attempt to represent the experience of face-to-face interaction as close as possible. However, videoconferencing provides poor support for non-verbal communication such as body language, glances and head nods [Heath & Luff 1992, 2000], and factors such as the distance between camera and monitor as well as the delays between action and reaction also affects the interaction negatively [Gaver, 1992]. The *mimetic approach* aims as literally as possible at re-representing social cues from the physical world within the digital domain, for example by including 2-D and 3-D avatars that through conscious actions from their master can mimic, often unconscious, expressions from the physical world. The *abstract approach*, implies using text, images and graphs to illustrate social information in ways that are not guided by the corresponding physical utterances. To some extent the use of emoticons in text communication can be viewed as such abstract representation of social information [Galagher et al, 1998].

Within the field of Computer Supported Collaborative Learning (CSCL), awareness is forwarded as impacting on students' collaboration [Fjuk, 1998]. Similarly, the term *grounding* is used to describe processes by which students construct and maintain common understanding essential for the completion of joint activities [e.g. Baker et al. 1999]. Grounding involves levels of contact, perception understanding and attitudinal reactions. Furthermore, it is argued that the affordances and constraints of the media, in terms of for instance co-presence, co-temporality and sequentiality are important in the grounding process [Baker et al. 1999].

## 3. THE BAROMETER TRIALS

University of Trollhättan Uddevalla (UTU), Sweden, has since 1998 taught a three-year distance education BSc. in Systems Analysis. Classes are divided into smaller groups each attached to one of the five or six learning centres that take part in the programme each year. Each centre hosts a group of 5-20 students, thereby creating a setting where students are co-located with a few peers, but

geographically separated from the rest of the community — the teachers and students at other sites. The technological support is a mix of synchronous and asynchronous media. Weekly lectures are delivered using a multiparty videoconference system with studios at each of the participating learning centres. The distribution of course material and the communication with teachers and students at other sites are supported through an asynchronous course web-site (<http://www.udd.htu.se/dl/>). The course web-site with associated configuration functionality had Ultimo 2001 been used within the UTU in around 300 courses spanning more than 6000 students. Students and teachers from two different classes of the distance education programme constituted the user-communities in the interventions reported in this paper. Both interventions involved the implementation of a web-based application, called the Barometer<sup>1</sup>, addressing the loss of informal feedback in the virtual classroom. The first trial (the Alpha-Barometer) was conducted in the spring of 1999, and involved three teachers and 52 students located at six learning centres. The second trial (the Beta-Barometer) was conducted in the fall of 2000, with two teachers and 41 students within five learning centres. Both student groups were in their first semester at UTU. Each experiment was concluded with a survey of student perceptions of the prototype.

### 3.1. The Alpha-Barometer

The design rationale for the two community atmosphere barometers is to integrate a simple feed-back mechanism into the existing web-based distance learning system. This facilitate students voicing their experience of the course and provide a mutual awareness of how others' experience it.

The application supports through a simple interface an individual indicating his or her present mood or attitude through selecting either a green rectangle, labelled "positive" or on a red rectangle labelled "negative" and subsequently submitting the verdict [Fig. 1.]. It is also possible to add textual comments as annotations to the mood-indication. The barometer displays cumulative statistics of the mood-indications made during the course. A submission without explicit green or red indication is interpreted as a neutral mood. The time-stamped text-entries are presented in descending chronological order. The text is colour-coded in green or red corresponding to the mood-indication. To the right of the list there is a graph showing the total number of positive, neutral and negative indications.



Figure 1. The course site, with the Alpha-Barometer interface (bottom left) Integrated into the course web-site. The list with student's comments and a graph showing the frequencies of positive, neutral and negative indications

<sup>1</sup> The Alfa- and Beta-barometers were implemented by two different groups of students as a part of their graduation work. Thanks to "Team-Alpha": Magnus Gadd, Robert Andersson and Anders Johnsson, and to "Team-Beta": Abdirashid Diini, Andreas Eriksson & Elisabet Hagebjer A.

### 3.2. The Extensive Use of the Alpha Barometer

The barometer was introduced to the web-site six weeks after the start of the first course of the programme (January 1999) and was used by the students until the end of the course four weeks later. The study included a survey aiming at monitoring student attitudes toward their possibility to exercise influence over their learning context, before and after the implementation of the barometer. The survey also includes questions directed towards an evaluation of the interface of the application. As a tool for categorizing and describing the text entries, each submission is coded using a coding scheme inspired by Orlikowski and Yates [1994] with respect to indicators for: (i) Structure (smileys, capital letters, exclamation etc.); (ii) Language (humour, sarcasm, etc.); and (iii) Purpose (mood-indication, explicit feedback etc.). The entries coded as having a primary purpose of giving explicit were then analysed using the following nominal scale. (1) Agree/Disagree with other author, (2) Success/Failure-report, (3) Explanation and (4) Suggestion for change.

The four weeks of use resulted in a total of 213 submissions, of which 63 included a text-comment. The number of comments per day varied from 4 to 15 during weekdays with no obvious ascending or descending trend over the time-period. 57% of the comments were coded in red, 10% neutral and 33% positive. Most comments are short and have an informal, structure and language. The use of smileys, capital letters and (repeated) exclamations and question marks were very common, but opening salutations and signoffs were not used. Categorising the entries with respect to primary purpose reveals that 63% exclusively served the purpose of expressing the author's "mood".

Example 1 *"Now I start to get the hang of this, and tomorrow it's time for a new module... \*sigh\*"*

Example 2 *"Can it get any worse?"*

Example 3 *"I hope I can use this later, or else I will vomit"*

Example 4 *"I'm actually on top of things, GREAT!!!!!"*

Example 5 *"Tired!"*

27 % of the comments contained an evaluative content — sometimes added to a mood-indication — providing feedback on the learning technology, teacher performance and course content. This feedback was classified as reports of success (6 entries), reports of failure (8) agreeing with a previous entry (1) and suggestions for change (3).

Example 6 *"Probability theory is rather fun!"*

Example 7 *"Great teachers make this course worth taking, so shouldn't I feel glad?"*

Example 8 *"Is it possible to sort the course material in order of the date it is published /on the web-site, authors' comment/, so we don't have to search for the latest file."*

It is interesting to notice that the colour code was not always coherent with the text of the message. Several entries reported on great difficulties to keep up with the pace of the course, but were still coded in green, and one entry (ex 7, above) gave positive feedback on teacher performance coded in red. For most of the period, the mood indications and coloured text comments appeared more or less in random and heterogeneous sequences with a mix of red, black and green submissions. However, at one particular stage, shortly after an introductory lecture in Logic, the alpha prototype was unambiguously filled with red text comments on the horrors of and difficulties of Logic, sets and relations. Also, at the end of the course, the red mood indications dominated accompanied by text entries commenting on the upcoming exam.

The results from the survey showed that students in general were satisfied with the barometer, and only a few students reported to not having used the system. The following quote mirrors how several students perceived the system as a support for the mediation of their shared experience:

*"...a splendid way of seeing how other students experiences the course. If it feels to much, you can see that after all you're not the only one feeling that way – that gives you an extra push to sit down with the books again"*

### 3.3 The Beta Barometer

During the fall of 2000 a follow-up experiment was conducted using a redesigned application also aimed at visualizing the course atmosphere. The Beta-Barometer implemented significant changes compared to its predecessor, both with respect to the submission of mood-indication and regarding the visualisation of the community atmosphere. The Beta-Barometer did purposefully exclude the possibility for adding textual comments to mood-indications. Instead the number of mood indicators was increased from the previous three to the following five: “angry”, “neutral”, “happy”, “worried” and “tired” [See Figure 2]. Furthermore, the barometer was moved from its prior position in the navigation frame of the course-site, and instead constituted the default-starting screen. In order to proceed to the normal interface, the system forced the user to submit a mood indication. The neutral mood was marked as the default. The visualisation of cumulative mood-indications [See Figure 3] had a temporal dimension, allowing the user to view the tallying for “today”, “this week” or “entire course”.



Figure 2. Five moods to choose from

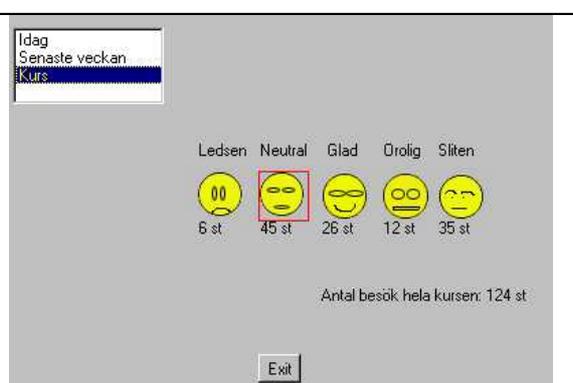


Figure 3. Cumulative statistics of mood-indications

### 3.4 The Rejection of the Beta Barometer

It is difficult to compare the Alpha and Beta Barometers since submitting a mood indication was voluntary with the alpha, and (more or less) mandatory with the beta. The Beta Barometer log-file showed a slow but steady decrease in number of mood-indications made by the students over the four week period. After two weeks, 215 submissions were recorded, and at the end of the course two weeks later, the total was 308. This is not believed to indicate that the course-site was less visited by this second batch of students, but rather that students found ways of avoiding the mandatory barometer start-screen, using bookmarks that pointed to pages further down in the course site. The possibility to do so in order to avoid the barometer was hinted by a student at the class discussion forum only a few days after the trial started. This is however not the only indication of user rejection of the Beta Barometer. Studying the frequency of the default neutral mood indication show a very clear trend, increasing from 30% the first day, to over 60% after two weeks and ending up close to 80%. This can be interpreted as a clear sign of the user rejecting to “use” the system for its intended purpose, and instead quickly moving on by accepting the default setting. This interpretation is indirectly supported when comparing with the results from the Alpha Barometer, where the anxiety and negative mood indications increased significantly towards the end when approaching the examination period.

Textual comments provided in the survey revealed some explanations for the Beta Barometer rejection. Most commonly cited was a lack of appreciation of the purpose of using the tool. Most students stated that the barometer did not add any value to their study situation and was therefore useless. The following comments shows how the Beta Barometer was perceived as invading the privacy of the user

*“This is too personal!”*

*“I already know how the people I care about feels, I don’t need to find out from the computer”*

A few of the comments were more aligned with the positive responses from the Alpha-Barometer trial

*“Cute gadget! Made me stop and think, how DO I feel at the moment?”*

*“Comforting to see that others are having as tough a time as I have!”*

## 4 DISCUSSION

Erickson [1996] discusses how social cues could be used in order to navigate hypertexts. In a similar way, the Alpha and Beta Barometers invite the user to leave explicit marks on the web-site, thereby providing social signals to be picked up and interpreted by other members of the community. The bar-charts and the list of red and green text-comments of the Alpha-Barometer and the five counters of the Beta-Barometer show a snapshot as well as the history of these signals that, when interpreted by the users, provides some social awareness of the course-atmosphere and the adoption and continuous use of the barometer is critical. The experiences from the alpha-trial indicate a need to connect and socialize with remote peers beyond the few situated in the same learning centre. The motives for doing so stretch beyond the goal- and task-oriented rationality discussed by Baker et al. [1999], regarding grounding. What happened in the alpha case could be understood using a social rationality, where relations between dispersed members of a community is a goal in itself. The motivation for these activities is subsequently to strengthen the learning community through adding to the shared history and shared experiences that constitute a necessary prerequisite for any community. The actions are signs of the students perceiving themselves as members of a community, only then does it make sense to express how you feel, and take interest in being aware of the feelings of other members of the community. Individuals acting as members signify the processes by which the community is established, maintained and enforced – it is processes of social grounding or “communitising”. The indirect effect of communitising can hopefully improved quality of student learning — not only in relation to an increase in engagement and motivation, but also through mechanisms of improved performance that comes from being aware of others working with similar tasks, [Ackerman & Starr 1995].

### 4.1 Implications for design

The rejection of the Beta-Barometer cannot be interpreted solely as a sign of this group of students being less of a community, and lacking the motivation to ‘communitise’ (although this with the given data can not be ruled out). Instead we suggest explanations that are more closely related to the design of the Beta-Barometer application. Collective sensemaking is a process that involves negotiations and reaction to other members’ way of using the system [Orlikowski & Gash, 1994]. The Beta Barometer did not provide any space for the users to jointly shape and adapt the tool into use that made sense to the community. Consequently, the application would either have to make sense immediately to, or be rejected by, its users. In contrast the voluntary text-comments of the Alpha-Barometer constituted such a space, thereby adding ‘plasticity’ or malleability to the system, thus allowing for asynchronous collective sensemaking. An important aspect of this plasticity, is that the activities of each user were visible. If the individual sensemaking is not visible to the rest of the community, the user is left with mere assumptions about how others perceive the purpose. In contrast to Erickson and Kellogg [2000] we do not believe that this visibility is necessarily connected to a need for accountability. The Alpha-Barometer was primarily a collective system, with no sign of the individual member of the community, apart from anonymous text entries. Ericksson and Kellogg [2000] argue that there is a corresponding tension between the visibility and the privacy of a socially translucent system, which in our case is supported by the fact that the Beta-Barometer with richer and more precise mood-categories were perceived as leaving the collective community sphere and intruding on private territory. Both barometers visualised social information using what Erickson and Kellogg [2000] characterise as abstract techniques. However, the nature of the social information to be captured makes it impossible to generate automatically, leaving the user with the problem of having to attend to the

process of lifting these signals from the more or less unconscious level of body language to a level of conscious action. In this process from subconscious to conscious there is of course a risk of losing some of the genuine nature of informal feedback, thereby reducing the validity and reliability of the social information.

### 4.3 The barometer as an instrument of evaluation

One of the triggering thoughts behind the barometer initiatives was that teachers participating in the distance education programme, complained over the loss of not being able to “read” the group and sense if the students understood, or if they needed additional explanations. The results do not provide substantial support for the idea that the barometer could constitute a central instrument for evaluation. At most a barometer could add a quantitative dimension that could estimate the magnitude of negative or positive climate within the group, but then again this implies a high degree of use throughout the community. In the two experiments there were only one occasion where teachers reacted in response to activities on the barometer, shortly after the “horror-lecture” in Logic reported above, the teachers responded with publishing a file with elucidative examples and explanations.

## 5 CONCLUSION

The experiments reported in this paper shows how a system aiming at supporting the visualization of the atmosphere within a learning community can be adopted and appreciated as a means of creating, maintaining and enhancing the strength of a community. We believe such processes of social grounding or ‘communitising’ to be important with respect to engagement and motivation for the members of such a community, and subsequently are likely to have a benign effect on the quality of learning. Furthermore, we conclude that the adoption and acceptance of such social systems is dependent on the outcome of joint construction of sense-making regarding the use and purpose of the system. An important characteristic that is argued to enhance the possibility for acceptance is a system-plasticity that affords common sense-making through negotiations and visibility of user actions.

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