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Engineering E-Collaboration Processes to Obtain Innovative End-User Feedback on Advanced Web-Based Information Systems *

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Abstract

In recent years, web-based information systems (WIS) and services have proliferated in all sectors of the economy. Unlike traditional IS, the development of WIS is evolutionary due to unceasing changes in the technological environment, regulation, and user needs. A new discipline, Web Engineering (WE), has emerged to promote systematic and disciplined approaches toward successful development of high-quality and ubiquitously usable WIS. User involvement is also a must for all organizations that aim to stay competitive and provide superior services for their customers. We have designed two structured e-collaboration processes for obtaining innovative end-user feedback on an advanced WIS under continuous evolution. Our feedback processes are purported for the perfective maintenance of WIS, where enhancements such as new functionality or increased efficiency are introduced continuously. We reflect on our experiences of two action research cycles through a Collaboration Engineering (CE) lens, and analyze the usefulness and suitability of the designed processes in these and other contexts. Our study contributes to the WE and CE streams of research by adding to the discussion of user-centered development and WIS evolution employing disciplined methods. For organizations, the developed e-collaboration processes offer novel means to involve end-users in their WIS development process. We believe that the designed processes may be applied in various WIS as well as in traditional IS contexts in different industries.

Keywords: *Web-based information systems, evolutionary information systems development, user feedback, Web Engineering, Collaboration Engineering, thinkLets*

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* Robert O Briggs, Gert-Jan de Vreede and Anne Massey were the accepting editors.

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Engineering E-Collaboration Processes to Obtain Innovative End-User Feedback on Advanced Web-Based Information Systems

1. Introduction

Digitalized services in the form of web-based information systems (WIS) have rapidly proliferated in all sectors of the economy. WIS have transformed many personal services into online self-services (e.g., e-banking and e-check-in), and provided unforeseen "pull" business models and opportunities for companies (see, e.g., Brown and Hagel, 2005; Sunikka and Bragge, 2006). WIS have even enabled organizations to employ totally novel forms of global, local, or restricted social communities.

WIS differ from traditional information systems (IS) in many respects. From the Web 2.0 perspective, WIS are services, not packaged software (Hintikka, 2007). Their users are oftentimes heterogeneous, widely geographically distributed, and unknown to the organization offering the service (e.g. Ramler et al., 2004). As opposed to traditional IS, WIS are also characterized by, e.g., compressed development schedules, emerging technologies, criticality of performance, insufficient requirements specifications, and constant evolution with shortened revision cycles (Deshpande et al., 2002). With WIS, traditional software release cycles have transformed into a "perpetual beta", where the product is developed in the open, with new features slipstreamed in on a monthly, weekly, or even daily basis (O'Reilly, 2005). In addition, users and external companies may even implement applets to open platforms themselves.

However, according to Murugesan and Ginige (2005), the development and maintenance of most WIS is, in general, chaotic and far from satisfactory. They conclude that "to successfully build and maintain large, complex web-based systems and applications, web developers need to adopt a disciplined development process and a sound methodology." As a solution they endorse a new discipline, *Web engineering (WE)*, that promotes systematic, disciplined, and quantifiable approaches toward successful development of high-quality and ubiquitously usable WIS.

Although the Internet and WIS have changed many people's daily lives in a far-reaching and profound way, Yang and Tang (2005) argue that there are surprisingly few studies that investigate the importance of developing WIS that meet the demands of those who use them. According to Fuccella and Pizzolato (1998), "real" online users have seldom been requested to participate in WIS development, and only a few publications discuss effective methodologies for integrating user-centered design into the overall Web design process. This may be due to the gap that still exists between methodologies addressing user participation and traditional IS development (ISD) methodologies (Iivari and Iivari, 2006; Markus and Mao, 2004; Pekkola et al., 2006). Several ISD methodologies discuss how to involve the users in systems design, but they do not explicitly point out the relevant phases of the ISD process, or how or when exactly user involvement should take place (Pekkola et al., 2006). As contemporary WIS become closer or equivalent to digital services, insights from the marketing literature – especially on new service development (NSD) and new product development (NPD) – could be taken into account in their development (Nambisan, 2003; Nambisan and Wilemon, 2000) in addition to insights from the ISD literature.

User involvement in the *post-implementation phase* of WIS or IS has so far gained very little attention, Ramler et al. (2004) being one of the few exceptions. The NSD literature classifies this phase under incremental innovations, e.g., service improvements, service line extensions, and style changes (Menor et al., 2002). Nevertheless, the discussion both in IS and marketing mainly concentrates on handling complaints and error notifications that are received unsolicited from users, and on tools and instruments for systematic (sequential and quantitative) user surveys and market research. However, existing users should be regarded also as a source of new needs and desires and even of innovative ideas for further development of existing WIS and web-based services. Users are frequently found to be good innovators, especially when developing new services or products (e.g. Magnusson et al., 2003; Matthing et al., 2006; Sawhney et al., 2005; Thomke and von Hippel, 2002), but one key problem is motivating them to propose their innovative ideas also *after* the implementation phase.

There are many feedback channels for unsolicited feedback available; however, the standard feedback forms and mailto-links provided in web services mostly produce complaints about the existing functionality (Ramler et al., 2004). Only the most satisfied or dissatisfied users are motivated enough to initiate feedback. In addition, the service must be of critical importance to users in order for them to feel compelled to give unsolicited feedback. Finally, the development process in web-based environments is necessarily evolutionary, as it is not feasible to fully specify all user requirements before implementation (Jazayeri, 2007; Murugesan and Ginige, 2005). Due to these reasons, it is still necessary to contact the users to solicit their feedback also, in face-to-face settings. It has been argued that traditional, personal interactions may help improve customer loyalty in situations where the e-services have become so depersonalized and commonplace that it is easy to switch the service provider (see e.g. Neslin et al., 2006; O'Loughlin and Szmigin, 2006).

Our paper addresses the gaps in user feedback literature by exploring how to solicit innovative feedback and development ideas from end-users during ongoing use, i.e., in the maintenance phase of an IS or WIS. Specifically, we focus on the majority of users that do not take the initiative to give feedback on their own or to participate in the evolutionary development of existing web-based IS and services. We suggest two alternative, repeatable e-collaboration processes for user feedback gathering, using a formal and disciplined approach, *Collaboration Engineering (CE),* as the basis of these processes. We compare the results of two action research cycles we conducted, and reflect on our findings with respect to WE and CE. Furthermore, our objective is to give suggestions for the appropriate use situations of the two alternative e-collaboration processes.

Our case web service is an advanced student information system that is used in 13 out of 21 Finnish universities, and managed by a consortium of the user universities (Bragge et al., 2005; Bragge et al., 2007a). Deshpande et al. (2002) characterize advanced web-based applications, as opposed to simple WIS, by their large volumes of information, dynamic web pages, integration with databases and other similar systems, vitality in user satisfaction, and preparedness for seamless evolution. Thus, the engineering of advanced WIS is much more complicated than that of simpler WIS, which may be characterized purely informational “brochureware” systems. The largest user group of our case WIS, students, is not motivated to give feedback on their own initiative. One reason might be the fact that they can always contact the registrar’s office to receive personal service instead of using the system. The quantity of unsolicited student feedback is small, and the quality is mostly poor (improper, even irrelevant). New means to involve student users are a necessity.

Our study contributes to the WE and CE streams of research by adding to the discussion on user-centered development and on evolving web-based IS and services through disciplined methods. For organizations, the developed e-collaboration processes offer novel means to involve users in their IS development process. The designed collaborative feedback processes and the feedback received have proved to be valuable for the continuous development of the WIS that we study. We have also successfully repeated the processes in several contexts. Thus, we believe that the designed processes may be applied in other WIS as well as in traditional IS contexts in various industries.

The remainder of this paper is structured as follows. Next, the literatures on web engineering, user feedback, collaboration engineering, and group support systems are reviewed. Then we present our methodology and describe the experiences of our action research on designing collaborative feedback processes. Thereafter, we give suggestions for the application of the designed feedback processes by reflecting both on our results and on the experimental ideation literature. Finally, we end with discussion and conclusions.

2. Web Engineering (WE) and User Feedback

In this section, we review the prior literature on web engineering and user feedback.

2.1. Web Engineering (WE)

Murugesan and Ginige (2005) state that the development of WIS is necessarily evolutionary: at the outset of their development, it is not feasible to specify fully what their requirements are or what they will contain. Moreover, the structure and functionality of the WIS will transform constantly over time,

and their content will change even from every few minutes to a couple of times a day (see also Albert et al., 2004; O'Reilly, 2005). The ability to scale the structure together with the functions provided is, thus, a key consideration when developing WIS. Hence, the only viable approach is to follow an evolutionary development process where change is seen as the norm and is catered to (Murugesan and Ginige, 2005).

However, according to Murugesan and Ginige (2005), the development and maintenance of most WIS is chaotic and far from satisfactory. They endorse a new discipline, *Web Engineering (WE)*, a solution that promotes systematic, disciplined, and quantifiable approaches toward successful development of high-quality, ubiquitously usable WIS. In particular, WE focuses on methodologies, techniques and tools that are the foundation of WIS development and support the design, development, evolution, and evaluation of WIS (see, e.g. Deshpande et al., 2002; Ginige and Murugesan, 2001; Murugesan and Ginige, 2005).

Murugesan and Ginige (2005) recommend an evolutionary process for WIS development (Figure 1). The iterative process with feedback loops starts from the contextual analysis to assist the developers in understanding the context in which the application will be deployed, and proceeds through the architecture design, process model, project plan, and web site development to the evaluation and maintenance of the WIS. Supporting processes concern issues related to project and quality management and documentation.

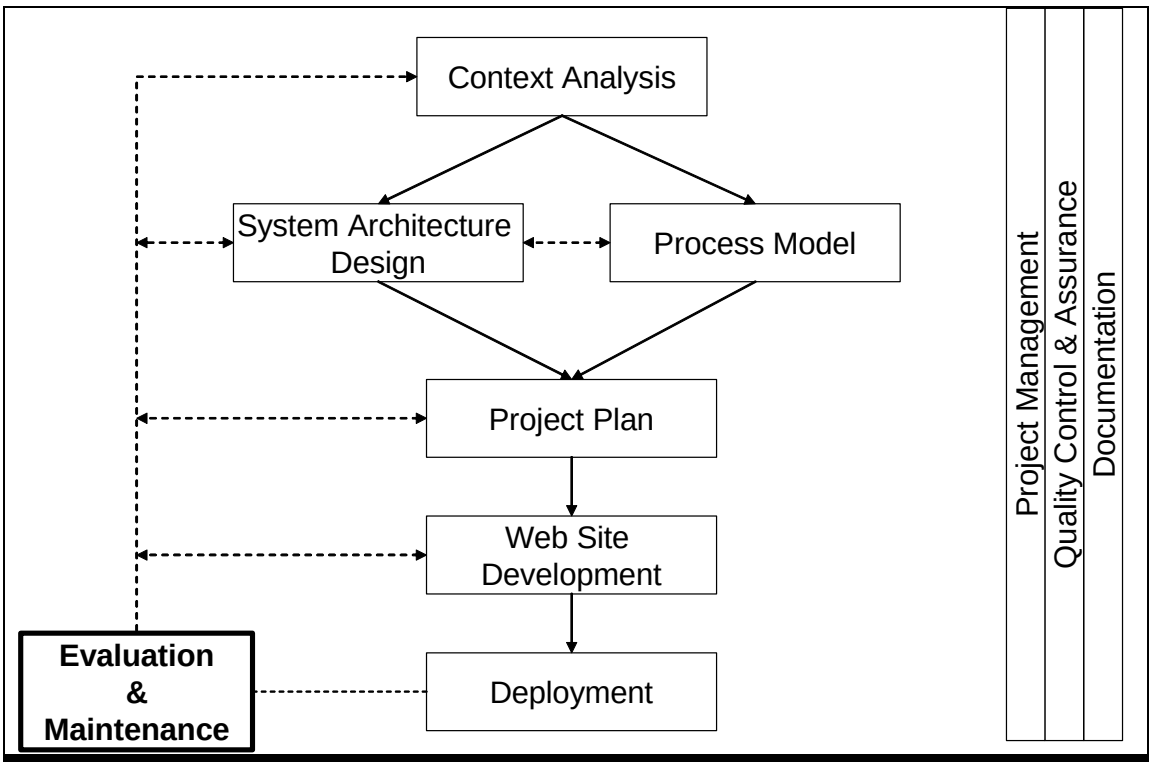

Figure 1. WIS Development Process (Murugesan and Ginige, 2005)

We focus on the Evaluation and Maintenance phase of the WIS development process. Besides everyday content maintenance, this phase consists of periodically updating and possibly redesigning the WIS due to new requirements that need to be considered. Ramler et al. (2004) distinguish four types of maintenance: corrective, preventive, adaptive, and perfective. *Corrective maintenance* fixes bugs and design deviations that have occurred, while *preventive maintenance* emphasizes the avoidance of these problems in the first place. *Adaptive maintenance* is needed when some change in the system's environment occurs such as a new Web browser. *Perfective maintenance,* on which we focus, introduces enhancements, e.g. new functionalities, or increases the efficiency of the IS.

2.2. User Feedback

Organizations are expected to seek feedback for customer care, improving current products and their development processes, and acquiring information for new product development. Thus, processing the feedback enables them to retain customers and to know their changing tastes and, ultimately, to stay competitive (Fundin and Bergman, 2003). In addition to customers and other external users that may be unknown to the organization, internal users are also a valuable source of feedback.

Communication with users or customers (used interchangeably in this paper) can be either company-controlled or customer-controlled (Floh and Treiblmaier, 2006). Automated monitoring and control tools provide information on the usage and technological aspects of the system, and this information should be combined with solicited and unsolicited feedback to get insights of real user opinions and needs.

Based on the role the user plays in the communication process, Romano and Fjermestad (2003) classify contact channels or technologies as *passive* (e.g., cookies and mailing lists), *active* (e.g., chat rooms and Internet surveys), or *interactive* (e.g., email and survey panels). User feedback is communicated through the organization both *codified* in databases and *personalized* in meetings and discussions. Feedback management systems should be able to capture both formal and informal complaints and comments as well as hidden needs and novel ideas (Fundin and Bergman, 2003).

According to Sampson's categorization (Sampson, 1996; 1998), an organization can solicit customer feedback actively or passively, or it can receive unsolicited, customer-initiated feedback. *Actively solicited feedback* is requested from specific customers or users. The organization may select a sample of certain customer groups using sampling or probability techniques. Lead users (see von Hippel, 1986; Franke et al., 2006) are often employed as user representatives and they are customarily selected using networking techniques. Thus, the organization has direct interaction with customers and can avoid non-response bias. *Passive solicitation of feedback* is an appeal to all users and customers, in general, whereas *unsolicited feedback* comes from users on their own initiative. Regarding passively solicited and unsolicited feedback, the respondents are self-selected and, thus, the organization has no control over the sample frame or non-response bias, because all who are willing to participate may do so. Response bias, i.e., extremely satisfied and dissatisfied respondents are inherently motivated enough to initiate the response, is thus expected. Unlike active solicitation, passive solicitation and monitoring unsolicited feedback is a continuous day-to-day task. Although biased, this type of feedback is extremely useful in monitoring and controlling the quality of the daily business operations and in identifying ideas for quality improvement. For example, findings about customer dissatisfaction often reveal customers' hidden needs (Fundin and Bergman, 2003).

Traditionally, unsolicited feedback has been received directly through personal contacts or indirectly via instruments like printed feedback forms (see methods, tools, and instruments in, e.g., Berry and Parasuraman, 1997; Maquire et al., 2007; Romano and Fjermestad, 2003; Sampson, 1998; Wirtz and Tomlin, 2000). Unsolicited feedback mostly relates to errors and faults in the service encounter and the offered products, whereas the open-ended, unsolicited feedback also includes new ideas and suggestions for improvement. With the emergence of WIS or online services, human interaction has diminished and the main feedback channel is now the online service itself (Floh and Treiblmaier, 2006).

3. Collaboration Engineering and Group Support Systems

Next, we will briefly describe the basics of Collaboration Engineering (CE), a disciplined research approach, and Group Support Systems (GSS), the supporting e-collaboration technology that we have applied in our research.

3.1. Collaboration Engineering (CE)

Collaboration Engineering (CE) is a new stream of research that has emerged from the GSS literature. CE is an approach for designing and deploying collaboration processes that can be executed by practitioners to accomplish high-value recurring tasks (Briggs et al., 2003; de Vreede and Briggs,

2005; Kolfschoten et al., 2006a). CE research identifies, develops, documents, and validates codified facilitation routines called thinkLets. A thinkLet is a named, packaged facilitation intervention that creates a predictable, repeatable pattern of collaboration among people working together toward a goal (de Vreede and Briggs, 2005). It describes the elementary group process from a leader's point of view by providing an explicit script of group prompts and by guiding the facilitator through the decisions that must be based on the group's behavior (Santanen, 2005).

There are six general pattern classes of thinkLets: *generate, reduce, clarify, organize, evaluate* and *build consensus* (Kolfschoten et al., 2006a). An example of a *generate* thinkLet is called *LeafHopper*. When using it, the participants see a list of several discussion topics, and they can hop among the topics to contribute comments guided only by their own interests and expertise (Briggs et al., 2003). As thinkLets provide detailed instructions and guidance for group process facilitators (see Appendix A), less experienced facilitators may also conduct successful meetings by applying thinkLets as sequential building blocks in both electronic and non-electronic meetings. Given the vast variety of ways GSS can be configured, thinkLets provide tested and straightforward advice to facilitators, and in this way facilitate the diffusion of GSS within organizations.

The ultimate goal of CE is to serve as a rigorous approach to develop repeatable thinkLets-based collaboration processes for high-value tasks, including phases such as designing, implementing, piloting, refining, monitoring, and updating the process (de Vreede and Briggs, 2005). Thus, the approach seems to be an appropriate problem solving method for developing disciplined WE processes that involve collaborative group efforts. We are not aware of any other structured and codified methods that would be helpful in designing this kind of group or collaboration processes.

3.2. Group Support Systems (GSS)

GSS belong to information technologies that support task-oriented collaboration (Bajwa et al., 2003). GSS are designed to help people work together toward a common goal or to carry out a common task. GSS aim to alleviate the problems related to group work, e.g., the domination of one person or the need to wait for one's turn to speak. Simultaneously, GSS aim to foster the benefits of group work, e.g., the synergistic effects of building on others' ideas (see Nunamaker et al., 1991; Steiner, 1972). The strengths of GSS-aided sessions are built on four elements: 1) simultaneous and anonymous contribution via computers, 2) a structured agenda lead by a facilitator, 3) voting and multi-criteria analysis possibilities, and 4) complete records of the electronic discussions, which serve as a group memory both during and after the session (Nunamaker et al., 1991). By using GSS, it is possible to alleviate or even avoid communication apprehension, unequal participation, and social conformity through anonymity and simultaneity. Also, the ideas presented tend to be evaluated on their own merits and not based on the person who presented them.

GSS can be utilized either synchronously or asynchronously. Both centralized (face-to-face) and decentralized (virtual) settings are available. The same time–same place mode has traditionally been the most common, but recent developments in web-based tools have focused extensive attention on virtual collaboration as well (Austin et al., 2006). A comprehensive meta-analysis of case and field studies utilizing GSS can be found, e.g., in Fjermestad and Hiltz (2000). Bragge et al. (2007b) provide a more recent profiling analysis of GSS research conducted in the last 25 years.

Our design employs GSS collaboration processes in face-to-face settings; thus, the processes are not applicable in decentralized settings. However, we will suggest modifications of their usage in virtual environments. Next, we will discuss our methodology.

4. Methodology

In this qualitative research, we took the experience of the users as the starting point, according to the traditional Scandinavian approach to IS development (Iivari and Lyytinen, 1998; Koskinen et al., 2005). This approach has a long history dating back to the 1960s, and it is characterized "by a humble attitude towards the expertise of the users of the software" (Dittrich, 2006).

We chose Action Research (AR) (Baskerville and Myers, 2004; Susman and Evered, 1978) as the main method for this study. In AR the researchers participate actively in the problem solving or software process improvement in a case organization and simultaneously apply scientific approaches. Based on the suggestions given in Checkland and Holwell (2007), Mingers (2001), and Lau (1999), we try to clearly explain our methodological choices and provide sufficient details on the AR interventions taken. We report our AR interventions according to the AR phases (diagnosing, action planning, action taking, evaluating, and reflecting) of Susman and Evered (1978).

Our contact, a systems designer, requested that we solve a persistent, practical problem of a Finnish business university: how to gain valuable and feasible feedback from students, the largest user group of its student information system. Despite multiple feedback channels (the system's feedback function, the university's IT helpdesk, and the student union's web chat), very few students were motivated enough to give feedback on their own initiative. In addition, the quality of unsolicited feedback was rather poor (irrelevant, even improper) consisting mainly of general complaints and acute problems with user accounts and passwords. It contained very few ideas useful for the evolutionary development of the system. Thus, we took the opportunity to conduct action research by developing two alternative feedback gathering processes based on CE and thinkLets.

The systems designer was a member of the case university's IT advisory board, which became acquainted with GSS-mediation in its meetings, and was interested in utilizing innovative group processes in other contexts. We used a centralized Group Support System (*GroupSystems*™ *MeetingRoom*) as the supporting e-collaboration technology. We conducted two GSS-aided feedback sessions with student users from a graduate-level Decision Support Systems course in November 2003. To further validate the process designs, we repeated the feedback gathering sessions in November 2004 with two additional student groups.

Our research data consists of various items, allowing for a triangulation of the data. First, we have the *feedback data* derived from the AR interventions as captured by the GSS. Second, we made detailed *field notes* based on observations of the participants and the flow of the sessions. Third, we collected qualitative and quantitative data concerning the *demographics of the session participants and their opinions* on the session settings. Fourth, we received written documents as well as other complementary *information on the student information system, its development process, and organizational arrangements*. Finally, we conducted 15 semi-structured theme *interviews* with 12 interviewees from the developer organization (with one to three persons in each interview) between November 2003 and September 2005 (see Appendix B). Seven of the interviews related directly to this research, while the rest, concerning our other studies with the same organization, provided us with valuable background information on the case. The interviews were recorded and transcribed, and the interviewees also validated the transcriptions by revising and accepting final versions. We supplemented the interviews with telephone discussions and emails if necessary.

Immediately after each feedback session, we gave the GSS reports to the university's CIO and to the designer responsible for the system, for further action. A few weeks later, we revisited the CIO and designer to gain their first-hand impressions of the feedback processes as well as the usefulness, quality, and quantity of the feedback received. We were also interested in tracing the effects of the feedback on the IS in question. One year after the first feedback sessions, we interviewed the systems designer and the CIO again to gain their longitudinal opinions on the success of the sessions and on the impact of the feedback received. After the second AR cycle, we also interviewed the main user of the system at the university's student administration to gain general insights and another perspective on its development and the effect of the feedback gathered.
We first analyzed the data individually, and thereafter discussed our insights. We compared the processes and results of the two AR cycles to evaluate 1) the success of the CE approach as a problem solving method and 2) the suitability and applicability of the two alternative e-collaboration processes in the case context and also in other contexts. We also leaned on the experimental ideation literature when building suggestions regarding alternative ideation techniques.

5. Engineering Collaboration Processes for WIS Feedback Gathering

In this section we first depict the case organization and the WIS in question. Thereafter, we describe our action research interventions in designing the two alternative e-collaboration processes using the AR phases of Susman and Evered (1978).

5.1. The Organization and WIS under Study

The organization and the specific system in this study are a business university, Helsinki School of Economics (HSE), and its student information system. HSE is a founding member of the Oodi Consortium, which jointly develops and manages the IS. The consortium consists of 13 out of 21 Finnish universities. It was created by five universities in 1995 to tackle the Y2K problem and to combine limited governmental resources.

The common IS, also called Oodi, is a 24/7 information system that supports studying, teaching, and student administration. The first two implementations took place in late 1999, rushed by the Y2K problem. At HSE, the system was implemented during spring 2001. Some universities, like HSE, use the whole system, while others use only parts of it. The Oodi system has three user categories: students (the largest user group), teachers, and administrative personnel. Each user group has a different interface. In this study, we focus on the students' web-based interface called WebOodi, which has been in use since May 2001. No other user group had a web interface available at the time of our study. In WebOodi, students may update their personal data, register for teaching events, check their registrations or credits, order a transcript of records, enroll in the university, and give and read course feedback.

The actual systems development work is outsourced to external vendors (four at the time of the study), one of them acting as the main vendor. The IS development began with a clean slate, since there was no appropriate packaged software available. As of 2009, the systems development has been going on for more than ten years. Yet, it has been estimated that the Oodi system is only in the early stages of its lifecycle and that it will be in use 10 to 15 years from now. The development is still very active due to, e.g., new and changing EU regulations and user needs. The consortium universities may build up the system jointly or independently, as it is possible for them to add their own modules to the IS. The universities have the option to negotiate with each other or with the consortium to acquire the independently developed modules.

5.2. Review of Two AR Cycles

We reported earlier in detail the first AR cycle of our research conducted in 2003 (Bragge et al., 2005). Here, we will highlight and compare the key phases of the AR cycles of 2003 and 2004.

Diagnosing the Problem and Planning the AR Interventions

In spring 2003, HSE's systems designer responsible for WebOodi contacted the university's GSS facilitator (one of the researchers) with a request to design an e-collaboration process for systematically gathering more useful, innovative student feedback on WebOodi. There were three main drivers for planning the electronic collaboration process: first, to motivate the participants to give innovative feedback that would be valuable for both HSE and the 12 other universities; second, to conduct interesting research under WE and CE domains, while helping the organization; and third, to keep the feedback submission as open and free as possible to avoid restricting the ideation to preset topics. In order to motivate and activate the student users to give relevant and proper feedback and ideas on WebOodi, we set up the sessions to be a part of HSE's graduate level Decision Support Systems course and gave the participating students points corresponding to 7 percent of their maximum course grade. We also gave the students a short presentation of the Oodi system so that they had some idea of the extensive use of the system in so many universities.

Due to the number of course participants and the limited number of computers in the class room, we arranged two sessions in both 2003 and 2004. Thus, we had an excellent opportunity to study CE application and simultaneously to explore both *interactive* (brainstorming) and *individual* (nominal)

ideation techniques. Both techniques can utilize electronic mediation. We chose interactive and individual techniques that do not portray preset topics or options (i.e., generate thinkLets "without seeds", see Briggs and de Vreede, 2001), are suitable for groups of 10-25, may be conducted electronically, and take two to three hours to conduct. Based on the suggestions given in the CE literature and thinkLet book manuscript (Briggs and de Vreede, 2001), these constraints considerably limited the set of available options, especially because we wanted to avoid information overload with relatively large groups.

We identified *Nominal Group Technique (NGT)* (Delbecq et al., 1975) and *FreeBrainstorm (FB)* as the best ideation techniques for our purposes (Briggs and de Vreede, 2001; Santanen, 2005; Santanen and de Vreede, 2004). It should be noted that FB is not equivalent to electronic brainstorming (EBS) as discussed by Santanen (2005). For example, FB (see Appendix A for a further description) allows arguing against a presented idea, while EBS does not, as it adheres to Osborn's (1957) brainstorming rules. There exists a sizeable literature on experimental comparisons of different ideation group types. However, the literature provides mixed results on which ideation techniques, interactive or individual, are the best under which conditions.

In November 2003, we prepared the two alternative agendas (with ideation techniques NGT and FB) for the first AR cycle. In the design of these agendas, we relied on the advice given in the ThinkLet book manuscript (Briggs and de Vreede, 2001), while also keeping in mind the supporting technology, Group Support Systems (Nunamaker et al., 1991), in a face-to-face setting. One year later, in November 2004, we repeated the feedback sessions with only slight changes in the processes and overall arrangements (see details in the following section).

Taking Action

In both AR cycles, the students selected the session they wished to attend. In the first AR cycle, both groups had two 1.5-hour feedback sessions in two consecutive weeks in November 2003. There were 19 participants in the NGT group and 13 in the FB group, in total 32 participants. In the second AR cycle in November 2004, the feedback sessions were conducted without any break, lasting around two hours each. This time there were seven participants in the NGT group and 11 in the FB group, totaling 18. Thus, altogether 50 students took part in four sessions that were managed by the facilitator-researcher and the other researcher.

The main question for the ideation was: "*How would you develop WebOodi – how would you improve its existing features or what new features would you like to have?*" This question formulation seemed to produce precisely the kind of input that was sought. Figure 2 illustrates, using the Facilitation Process Model notation (de Vreede and Briggs, 2005; Kolfschoten et al., 2006a), the two alternative e-collaboration processes, named NGT and FB after the ideation techniques used. The process model also includes our suggestions for the duration of the modules based on the two AR cycles (the break is optional). Most of the thinkLets we used has been reported in the literature (Briggs and de Vreede, 2001; Briggs et al., 2003). However, in NGT, we modified two established thinkLets with the prefix "Private", which adds a small privatizing effect to them (Kolfschoten et al., 2004).That is, instead of allowing the participants to see the others' idea submissions immediately (like in the FreeBrainstorm thinkLet), the ideas are first generated individually into private lists (calling it PrivateFreeBrainstorm). Thereafter, with PrivateFastFocus thinkLet, all participants select one idea at a time to be shown in the public idea list.

In the 2003 FB group, some participants complained that they were not able to see all the ideation sheets during brainstorming, which they realized only in the succeeding phase (FastFocus). Thus, in the 2004 FB group, we modified the process. We started with the *Next available discussion* configuration as we distributed the ideation sheets to the participants. When the ideation became slower after 15 minutes, we changed the method to *Discussion with new comments*, which led to more liveliness, because about half of the participants had not seen all the sheets before. Then, after some five minutes, we changed the distribution method again, to *Manual selection*. In this way, we ensured that all the participants were able to see every ideation sheet at least once during the ideation.

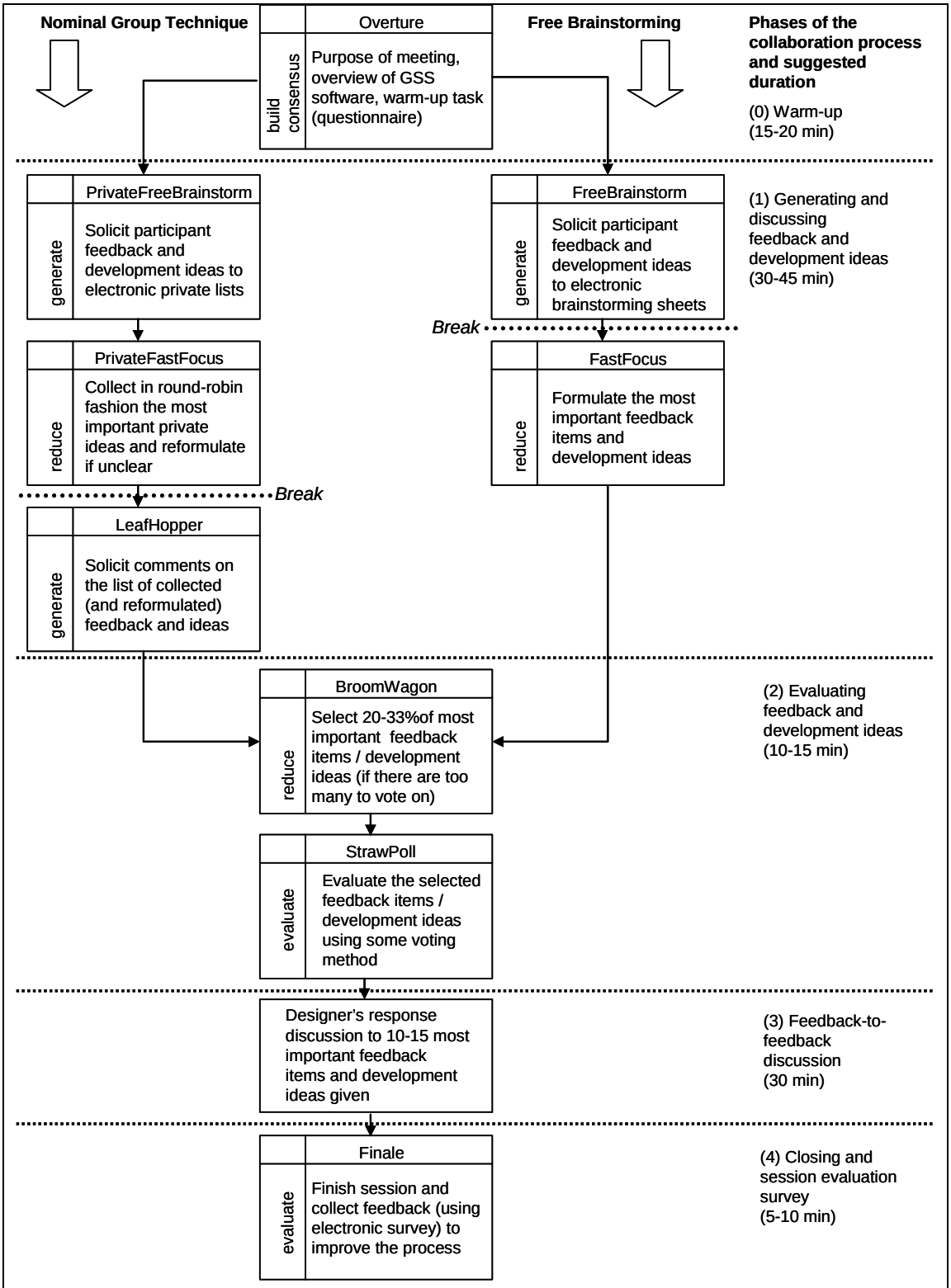

Figure 2. Two Alternative E-Collaboration Processes (Nominal Group Technique (NGT) and Free Brainstorming (FB)) for Gathering End-User Feedback (in Facilitation Process Model Notation)

Evaluating the AR Interventions

In this section, we evaluate our AR interventions by triangulating data from several data sources: participant observation memos and other field notes from our intervention, combined with GSS-produced session transcripts, participants' opinions, and the process owners' opinions (interviews).

Observation and Session Transcripts

In all the feedback sessions, one researcher and the facilitator observed the participants and the progress of the session. The participants had no problems in using the GroupSystems software. They worked very intensively and seemed to be interested in the topic and the novel way of interacting through the GSS software. The only exception was the 2004 FB group, where the participants seemed to be somewhat reluctant and uninterested in the feedback session. This 2004 FB group was also relatively silent, and no extra oral discussion arose at any phase of the feedback process, as it did in the other three groups. However, the collaborative process was still able to induce a rich text-based ideation also in this group, and the participants' opinions regarding the process itself were as commendable as those from the other groups (see details in the next section). In all the sessions, we kept to the time schedule without any problems.

According to the background questionnaires, the participants in all four sessions (two in 2003 and two in 2004) were relatively homogenous due to the session arrangements as part of a graduate level IS course. However, the participants represented well the authentic users of WebOodi, the students, and they also advocated well for the average users of WebOodi or any WIS. All participants had used WebOodi, usually a few times a month. Thirty-one of 50 students had experience with HSE's previous student IS or similar systems in other universities, so they were able to compare the systems. The participants were not accustomed to giving feedback on an IS (23 strongly disagreed giving feedback commonly, only 1 strongly agreed). Ten participants out of 50 had given feedback on WebOodi earlier, which is a rather typical result for an average end-user. Email (WebOodi's mailto-link) (7), IT-helpdesk (5), and phone (2) were the only feedback channels the participants had used (other options in this multi-choice question were survey, letter, chat, and others). The feedback submitters regarded their contacts either as error notifications (8) or minor improvement suggestions (4) in this multi-choice question. They had received a response to their feedback always (4) or almost always (6), and the response was either a receipt notification (5) or a detailed explanation on the subject (4) from Oodi personnel (both were multi-choice questions).

In the 2004 sessions, before the ideation began, we asked for participants' opinions on one additional statement: "The services offered by WebOodi are fully adequate." All participants found the services and functions of WebOodi relatively sufficient for their needs (15 out of 18 agreed, 3 strongly agreed).

The quantity of the feedback obtained varied due to the different ideation techniques used and the varying number of participants (7, 11, 13, or 19) in the groups. From the NGT sessions, we are not able to give the exact amount of all private ideas, since ideas were visible only to the participant listing them. We only saw the ideas that the participants selected to share on the public list. However, the NGT's collecting process continued as long as there were differing ideas left on the private lists. We naturally had to rely on the participants' judgment whether they still had new ideas on their private lists. We collected 51 ideas using NGT in 2003 with 19 participants and 30 in 2004 with seven participants. At the FB sessions, we were able to see all the individual ideas (including supporting comments), and to measure the pace of separate comments received. The total number of ideas and comments collected was 235 in 2003 with 13 participants and 147 in 2004 with 11 participants. Altogether, 36 and 19 unique ideas in 2003 and 2004, respectively, were filtered from the ideation sheets via group discussion (FastFocus).

At the end of the sessions, the designer gave his response to the 10-15 most important development ideas first voted on by the participants, and we registered his comments. With the exception of the 2004 FB group, the participants enthusiastically commented on and discussed the designer's commentary. The 2004 NGT group of only seven participants was particularly passionate.

We did not rate the unique ideas gathered in terms of goodness or idea quality measured by novelty, creativity, or feasibility, as is typical in some comparative ideation studies (see recent reviews by Dean et al., 2006; Reinig et al., 2007). Instead, we relied on the process owners' judgment of the

quality and usefulness of the feedback received (see the section Process Owners' Opinions).

Participants' Opinions

We finished the sessions with an electronic feedback survey to measure the participants' perceptions of the process in terms of its outcome, effectiveness, and efficiency. The objective of this survey was solely to solicit participant opinions on the processes, the session settings, and the use of computer mediation, for further improvement. The survey consisted of quantitative and open-ended questions. The quantitative questionnaire items and the descriptive statistics (means and standard deviations) of the NGT and FB groups in 2003 and 2004 are presented in Table 1. Overall, the results imply that the participants were very content with the feedback processes.

When considering the results of the groups, it should be noted that the DSS course students self-selected into the groups. Moreover, the 2003 NGT group was much larger than that of 2004 (19 vs. 7), whereas the FB groups were about the same size (13 vs. 11). Also the session arrangements were slightly different. In 2004, there was not a week-long break in midst of the feedback processes, and we also changed the FB's distribution method twice to ensure that all participants saw every discussion sheet.

Based on the results summarized in Table 1, we examined the differences between the NGT groups of 2003 and 2004, the FB groups of 2003 and 2004, and the NGT and FB groups. Measured by means and standard deviations, the differences in opinions on the sessions were minimal on any question and in any comparison. The personal preferences and characteristics of the participants are probably more important factors than the ideation techniques used to account for the small differences found. However, the survey gave us valuable insights that we factored into the fall 2004 sessions and will use as we further develop these techniques and new e-collaboration processes.

There were also a few open-ended questions in the questionnaire. In 2004 we added one question and changed the wording of the others slightly. The questions in 2004 were: "*What benefits were gained with a computer-aided GSS-session that could not have been reached by traditional feedback methods?*", "*What would you improve (or what was weak) in this feedback session?*", "*What was especially successful in this session?*", and "*Any other comments?*" As in 2003, the sessions were perceived as very successful, the processes worked well, and the feedback received was considered useful for the further development of WebOodi. The importance of anonymity, equality, voting options, and online reporting of the session and its results was again emphasized. The respondents found the designer's responses – feedback on their feedback – extremely interesting, valuable, and motivating (see also Question 6 in Table 1). Someone suggested that the designer could provide his feedback later via e-mail so that he would have time to work out the ideas more thoroughly. In 2004, there was only one complaint about the FB ideation process being too slow. As we used three different distribution methods in 2004, criticism about receiving the same ideation sheet many times was eliminated.

All in all, the participants' attitudes toward the GSS-aided feedback sessions were extremely positive, and all but one respondent thought they would recommend the use of the GSS tool to others (see Question 10 in Table 1). Unfortunately, most of the participants would not have participated if the sessions had not been part of the course and beneficial for the course grade (see Question 9 in Table 1). Clearly, proper incentives are required to entice participants, at least with students.

Process Owners' Opinions

The process owners were the systems designer and the CIO of HSE. We had three theme interviews with the designer, two weeks and one year after the 2003 sessions, and two months after the 2004 sessions. With the CIO, we had two theme interviews, three months and one year after the 2003 sessions.

The designer regarded the feedback received as valuable for guiding the future development of Oodi and WebOodi. Some of the ideas had been raised through other feedback channels, but the real value of the processes was that they revealed the relative importance of those ideas for the users. This knowledge of user preferences also helped to make and justify decisions on the future development of the system. In addition to ideas about Oodi and WebOodi, many of the suggestions

Table 1: Results of the Participant Questionnaire on the E-Collaboration Sessions

Questionnaire items (answering scales)	Groups using Nominal Group Technique		Groups using Free Brainstorming	
	2003 N = 19 (Session 2) Mean (SD)	2004 N = 7 Mean (SD)	2003 N = 13 (Session 2) Mean (SD)	2004 N =11 Mean (SD)
SCALE: LIKERT 1-7				
1. How well were the objectives of the feedback session achieved? (1 = extremely poorly... 7 = extremely well)	5.63 (0.81) n = 16	5.67 (1.03) n = 6	5.38 (0.96) n = 13	5.64 (0.67) n = 11
2. Do you think the results will be useful? (1 = totally useless… 7 = extremely useful)	5.59 (0.87) n = 17	5.43 (1.27) n = 7	5.62 (1.19) n = 13	5.73 (0.47) n = 11
3. How effective do you regard this feedback process (e.g., thinking of the innovativeness of the feedback, or the readiness of the ideas)? (1 = very ineffective… 7 = extr. effective)	Not asked	5.57 (1.13) n = 7	Not asked	5.09 (0.83) n = 11
4. How efficient do you regard this feedback process (e.g., when comparing the results to the time used or the number of participants)? (1 = very inefficient… 7 = extr. efficient)	Not asked	5.86 (1.07) n = 7	Not asked	5.55 (0.69) n = 11
5. How well did the process help in effectively focusing the discussion on essential matters? (1 = extremely poorly… 7 = extremely well)	5.35 (1.17) n = 17	4.71 (1.50) n = 7	5.38 (1.19) n = 13	4.91 (0.70) n = 11
6. How important did you regard that you were able to hear feedback on the most important development ideas (immediately)? (1 = fully unimportant... 7 = extr. important)	6.41 (0.94) n = 17	6.00 (1.15) n = 7	6.23 (0.73) n = 13	6.18 (1.25) n = 11
SCALE: LIKERT 1-5				
7. Would you use GroupSystems (or similar GSS) again in a comparable (feedback) situation? (1 = certainly not… 5 = definitely yes)	4.24 (0.66) n = 17	4.57 (0.53) n = 7	3.85 (0.80) n = 13	4.00 (0.63) n = 11
8. Would you rather participate in a similar but virtual session, e.g., from your own computer? (1 = certainly not.... 5 = definitely yes)	3.53 (1.23) n = 17	3.71 (0.95) n = 7	4.00 (0.71) n = 13	4.18 (0.75) n = 11
9. Would you have volunteered to participate in a comparable WebOodi feedback session (if not enrolled to the DSS course)? (1 = certainly not…5 = definitely yes)	2.71 (1.21) n = 17	3.71 (0.95) n = 7	2.15 (0.99) n = 13	1.91 (0.54) n = 11
SCALE: DICHOTOMOUS YES/NO				
10. Would you recommend (the use of) GroupSystems to others? (1 = yes, 0 = no)	0.94 (0.24) n = 17	1.00 (0.00) n = 7	1.00 (0.00) n = 12	1.00 (0.00) n = 11

focused on some other IS or administrative function. Thus, in addition to ideation about one IS, the processes could be useful in the evaluation of other existing IS and IS-based and traditional services.

The designer suspected that the sample, graduate students, probably affected the feedback. He thought it would also be valuable to arrange a feedback session with first-year students or Ph.D. students to get various views of the system.

In the designer's opinion, in 2003 the results of the FB session were more innovative than those of the NGT group. In 2004, he regarded the NGT group's results more valuable, partly because the participants raised lively discussions with him in the feedback-on-feedback phase, and challenged him to think about new aspects of the system. Although this is a subjective evaluation, we highly value the process owner's opinions regarding the results.

The CIO confirmed that the feedback gathered had had a significant effect on the development of WebOodi. As there exist several means to receive end-user feedback, it is often difficult to point out the original source of a development idea. This feedback method is, however, the most systematic way to gather and process user feedback. The results had been forwarded to the university consortium for further action. However, due to the current unanimity requirements of the consortium's decision making, the joint modifications have been implemented very slowly. Yet, based on the feedback, HSE has integrated some new modules to WebOodi on its own. Several other member universities of the consortium have already inquired about the possibility of acquiring and implementing those modules. Decisions have also been made to include some of these new modules into the core WebOodi in due course.

Both the designer and the CIO regarded the feedback sessions as very valuable for the further development of Oodi. They did not state any clear preference for the results obtained with either of the ideation techniques. They agreed upon the need to continue gathering feedback from different groups of students regularly using either of the process designs. They also suggested that a favorable timing for the next feedback sessions with graduate students would be after the new functions just under development had been implemented and used for a while.

Reflecting on the Results

In the following, we reflect on the results in terms of CE and thinkLets, the ideation technique, participant selection and motivation, and computer-mediation.

CE and thinkLets

Based on our experiences, thinkLets are undeniably able to convey the best practices of professional facilitators in an easily replicable format. We were able to start utilizing the CE concepts on our own based only on the valuable advice provided by the thinkLet book manuscript (Briggs and de Vreede, 2001). Furthermore, the thinkLets and the Facilitation Process Model notation were valuable in communicating the process designs between the researchers and other collaboration engineers as well as with the process owners.

The two alternative collaboration processes described and implemented in this paper provide ready-to-apply CE recipes (supplemented with knowledge on thinkLets) for various types of organizations that seek to utilize the power of end-users in their evolutionary IS development. The processes may be conducted by professional or novice facilitators or even by practitioners themselves inside the organization (Kolfschoten et al., 2006b). Although the designed processes may need slight adaptation when used in different contexts, we are convinced that the constructions may be reapplied as such in similar settings.

Ideation technique, Participant Selection, and Motivation

With mid-sized groups of seven to 20, both NGT and FB ideation techniques seem equally appropriate. Both techniques supported group working and ideation well and produced plenty of ideas that both the users and the owners of the case system valued. Thus, the particular ideation technique used is not the most critical variable in the process.

It seems that for the success of the feedback process, the selection and motivation of the participants is the most critical factor. However, participant selection, that is, finding and involving representative participants who are both willing and capable of producing valuable feedback and ideas, is a great challenge in all contexts. A representative group should be heterogeneous, consisting mainly of average end-users but also including some beginners, experienced users, and lead users, thus reflecting the normal user population of an information system. The anonymity and parallelism features of GSS support such heterogeneous groups very well.

The motivation of the participants is of utmost importance. Based on our experiences, a proper incentive is clearly needed, at least with university students, to compel participants to even show up to the sessions. With student users, receiving points toward credit seems to be an appealing compensation for the use of their limited time. Care should be taken when deciding on incentives for other participants. Too lucrative incentives might draw participants who are not genuinely interested in the task itself. Thus, a balance should be sought. In addition to suggestions in the extant focus group method literature, insightful advice about incentives can be found in the open source software literature. It discusses, for example, the intrinsic factors that motivate OS user-developers to contribute without monetary compensation (e.g. Bitzer et al., 2007; Hertel et al., 2003).

Computer-Mediation

We believe that the process designs per se are important with respect to the enhancement of creativity in participant feedback. However, computer mediation also adds its own effect to the whole. Marakas and Elam (1997) found that while the process employed enhances the level of creativity in the solution response, the software serves as more than a mere delivery mechanism for the embedded process model. In other words, an appropriately designed process that is backed up with software support is better than either the same process without the supportive software or the software support without an appropriately designed process. It is left for future research to study whether our results would change without computer mediation.

The changes we made to the feedback processes for the 2004 sessions were successful, and they made the processes more satisfactory from the participants' as well as the facilitator's point of view. A session without a long break was more efficient and effective for both participants and facilitators. Also the use of several sheet distribution methods in FB during the ideation was necessary to motivate the respondents. Overall, the participants praised the computer mediation as an interesting experience.

6. Suggestions for the Application of the Feedback Processes

In this section, we present our suggestions on how to apply the designed feedback processes in other contexts. The recommendations are based on our AR intervention cycles, but we also draw advice from the experimental ideation literature, when applicable. This research stream does not explicitly state whether interactive or individual ideation techniques are superior, and in which circumstances. The theoretical arguments behind both techniques seem valid, and they have been reported to produce close to equal results as measured, e.g., by the quantity and quality of the ideas. We also found both interactive (FB) and individual (NGT) ideation techniques equally applicable in our AR interventions.

Group Size

Briggs and de Vreede (2001) originally recommend that FB should not be used with a small number of participants (six or less). We fully agree with this advice. Thus, FB is better suited for larger groups that have more potential for lively group dynamics with the circulating electronic sheets. NGT would be a better choice for small groups. We see that both FB and NGT would be equally applicable with mid-sized groups (eight to 25). However, there is some evidence that EBS with Osborn's (1957) rules is superior to nominal brainstorming with groups of nine to 18 participants (Barki and Pinsonneault, 2001; Dennis and Valacich, 1999).

With really large groups (35-100) NGT, unlike FB, would cause the facilitator and participants to be overloaded with information in the phase where the privately produced ideas are collected into a common public list (one from each participant at a time using the PrivateFastFocus thinkLet). This

would mean that 35-100 new private ideas would become visible at the same time. It would be burdensome to go through the collected ideas to detect duplicates and unclear wordings before proceeding to another round of idea collection. NGT following the round-robin style would not be a suitable technique even verbally with so many participants.

Process Goals

Pinsonneault et al. (1999) find that nominal groups outperform EBS groups (using Osborn's rules), if the purpose of the brainstorming is to produce *as many unique ideas as possible*. However, if the *satisfaction* or *task interest of the participants* is the most important criterion, then they find EBS as an interactive method better. Pinsonneault et al. (1999) learn that participants are more satisfied, interested, involved, and aroused when they generate ideas interactively in groups, compared with individual ideation. They also speculate that interactive (vs. individual) ideation would be more suitable for purposes like obtaining consensus, creating a group dynamic, group understanding, or buy-in.

Potter and Balthazard (2004) state that the circumstances in some cases may require interactive brainstorming, with its sociopolitical ends justifying the lower productivity of ideas found in some studies. We believe that this finding could be taken as suggestive when choosing between the ideation techniques, although we used a variation of group brainstorming different from the above studies in our feedback sessions.

Facilitator's Personal Preferences

Depending on the personal characteristics of the facilitator, one technique or the other might feel more natural and much more comfortable for him/her. In case there are no compelling factors that would resolve the selection, the facilitator's personal preferences should be taken into account. Regarding the cognitive load for the facilitator, NGT could be judged as slightly more demanding than FB with 15-25 participants. The PrivateFastFocus phase necessitates the facilitator, with the help of the participants, to quickly piece together and possibly reduce a long list of similar ideas submitted simultaneously.

Cause Cueing

The designed feedback processes could be extended with a technique called "cause cueing" (Potter and Balthazard, 2004). The participants are asked to individually consider possible causes for a problem closely related to the topic of the actual idea generation. This extension is supposed to lead to the generation of more solution ideas and should take no more than five minutes to conduct. In our case, we could first ask the students to find reasons for a related problem "*Why isn't WebOodi used more often by students?*" before the generation of new development ideas. We have already tested this extension in one of our subsequent feedback sessions with Ph.D. students, and it seemed to be worthwhile.

Virtual (Distributed) Feedback Sessions

In virtual sessions, both processes would have to be backed up with audio conferencing or VOIP (voice over Internet protocol) technology to support the sections requiring verbal discussion. In our processes there are two modules that would require these supporting technologies: in NGT, the PrivateFastFocus for merging and reformulating the private ideas collected one round at a time, and in FB the FastFocus for inquiring about the most important feedback items/development ideas to be filtered from the brainstorming sheets.

In a virtual setting, both NGT and FB ideation processes should be conducted synchronously, that is, the participants have to be online at the same time. If asynchrony is wanted, other types of ideation processes would be necessary. For example, the Delphi ideation technique (Delbecq et al., 1975) could be used when asynchronous ideation to private lists is wanted. In case the ideas entered asynchronously by others are wanted to be publicly seen, the OnePage or LeafHopper generate thinkLets combined with complementary reduce, organize, and evaluate thinkLets could be employed (Briggs and de Vreede, 2001; Briggs et al., 2003; de Vreede and Briggs, 2005). The LeafHopper thinkLet would also be suitable in synchronous virtual settings without audio conferencing support.

7. Discussion

McKeen, Guimaraes and Wetherbe (1994) state that in ISD cases with a substantial degree of task or system complexity, it is crucial to involve users as active participants in the ISD process. Users tend to be more satisfied if they *perceive* (regardless of the level of their actual participation) that they have a significant degree of influence or effective communication with the system developers. The users likely feel that they are being heard and that they can make a difference (McKeen et al., 1994). Such a participative environment would be beneficial for organizations to foster. In addition, Deshpande et al. (2002) state that user-centric online methods have an unrealized potential to arrive at better systems.

In this paper, we have described two cycles of a continuing action research intervention during which we have employed Collaboration Engineering in designing two alternative e-collaboration processes for gathering end-user feedback on an advanced WIS. We have compared the two alternative processes and especially their ideation modules NGT and FB, based on our own research findings and on the experimental brainstorming and ideation literature. We suggest that the NGT ideation technique should be chosen if the number of participants in the feedback session is small, that is, six or less. For large groups of 35-100 participants, FB would be the only practical choice. If the goal of the session is to produce as many unique ideas as possible, then NGT might be a better choice. On the other hand, FB might outperform NGT if the satisfaction, interest, or involvement of the participants is equally or particularly important.

7.1. Reliability, Validity, and Generalizability

The reliability and validity of action research can be judged by how well interested outsiders can recover the research process. The basic prerequisite of recoverability is to clearly state the epistemology of the research, that is, the set of ideas and the process in which they are used methodologically (Checkland and Holwell, 2007). In our research, we have paid special attention to these aspects to meet the recoverability criterion.

We increased the construct validity (Yin, 1989) of our research by using multiple sources of evidence. Moreover, our key informants (process owners) reviewed all reports written on this research. Regarding the external validity (Yin, 1989), we replicated the two full AR cycles reported here with comparable results, and conducted yet another NGT feedback session within the case organization in April 2005 with Ph.D. students. In November 2005, we were requested to collect student feedback on a new Oodi module, an electronic course feedback function. This time, we decided to employ a distributed e-collaboration process via web-browsers in the same time-different place mode, as we believe that the general willingness to participate voluntarily in feedback sessions is stronger if unnecessary traveling is eliminated. The designed processes were simplified for a distributed session, as we used no audio or video-conferencing tools. We repeated the distributed session in October 2006, as the course feedback system was extended in a major way. All these feedback sessions have produced highly valuable content for the further development of the case WIS.
Based on the above, we believe that the developed feedback gathering processes are reliable and valid. Although these results may not hold universally in all topics, organizations, or industries, we do believe that they may be generalized to other web-based and traditional information systems.

7.2. Limitations and Future Research

There are limitations in this research. According to the ultimate goal of the CE approach, the collaborative feedback processes should be transferred to a practitioner (process owner) inside the organization. In our case, the systems designer was willing to facilitate the sessions himself. However, shortly after these two AR interventions, he was assigned to another project and soon resigned. So far, his replacements have filled in on short, temporary assignments. Hence, we have not yet been able to transfer the processes and the facilitation to a practitioner in our case organization.

Our research focuses on developing and utilizing the feedback processes and selecting an appropriate ideation technique for the case context. We emphasize the importance of finding representative participants and motivating them to give feedback in this context. The problems of

participant selection and motivation are universal, and our research offers one solution that is applicable when users may be unmotivated and even reluctant to get involved, and there is no means for making the participation mandatory. In addition, mandatory participation probably seldom produces results of good quality. Thus, we do not offer any universal solutions for this difficult problem that is worth further study, especially regarding non-organizational users (e.g., consumers, common people).

Our processes are originally designed for face-to-face GSS environments. Hence, they are more suitable for but not restricted to organizational WIS, whose end-users are easier to reach. A broader range of participants can be achieved with truly virtual feedback processes (see a comprehensive comparison of different mode-media variations in Kontio et al., 2007).

Finally, the communication of feedback in the case organization and in the university consortium is heavily person dependent, because no systematic method or practice for the communication and utilization of the received feedback exists. A formal feedback management system is clearly needed to further elaborate and utilize user feedback, regardless of how it is received – unsolicited or solicited, electronically or personally.
In the future, we will continue our research in the fields of WE and CE. We will further improve and validate the existing e-collaboration processes in different contexts: organizations, systems, and users. Besides conducting more AR cycles, controlled laboratory experiments would provide more rigorous insights regarding the two ideation techniques used. In the case organization, we would like to transfer the existing processes to be facilitated by the process owners. We are also interested in the concrete effects of user feedback in an organization. Therefore, we will explore in detail how the feedback is managed and actually utilized when developing IS and business functions. Finally, our aim is to employ CE in designing new e-collaboration processes, both face-to-face and virtual, in order to support the development of web-based information systems and services.

7.3. Conclusions

Our study contributes to the field of Web Engineering by developing a formal CE-based method for gathering user feedback on a WIS. It also adds to the academic discussion on the specific features and requirements of WIS and on user involvement in their development. For practitioners, our CE recipes offer one means for involving users in the ISD and new service development processes. We also believe that the designed processes may be applied in other WIS as well as in traditional IS contexts in various industries. We even see that the processes could also be utilized as an evaluation tool throughout the WIS development process.

In sum, it is evident that carefully crafted e-collaboration processes for gathering feedback on IS are highly meaningful and advisable for organizations. We believe that new means are continuously needed to help organizations better involve different stakeholder groups into the development of traditional and web-based information systems and services in different phases of ISD. This is especially important with web-based services and IS for which there exist direct competitors in the market. According to our experiences, CE is able to provide efficient tools for this undertaking. However, even the best feedback processes or tools are useless if the users are not willing and motivated to get involved and influence the IS, processes, and services that they either use voluntarily or must use for some reason. Compared with traditional IS users, the users of web applications are assumed to be more engaged with the WIS they use (Jazayeri, 2007), a fact that provides encouraging outlook for end-user involvement practice and research.

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APPENDIX A. Description of the FreeBrainstorm thinkLet (Briggs and de Vreede, 2001)

Choose this thinkLet…

to cause the group to diverge quickly from comfortable patterns of thinking, to push them farther and farther afield in search of new ideas.
to eliminate information overload during brainstorming in teams of 6 or more people.
to cause team members with narrow, parochical views quickly to see the big picture, to quickly create a shared vision in a new, heterogeneous team.

Do not choose this thinkLet…

if your group has fewer than 6 members. Consider using OnePage thinkLet instead.
if you are pushing for depth rather than breadth in the resulting ideas. Consider using ComparativeBrainstorm thinkLet instead.

Overview

In this thinkLet the team members brainstorm ideas in response to a single question or prompt. The team members are working on separate pages that are circulating among them. They contribute ideas to the pages or reactions to previous ideas.

Inputs

Clear understanding of the purpose for brainstorming.

Outputs

A large number of unstructured brainstorming comments spread across a number of electronic pages.

How to use FreeBrainstorm

Setup

1 Create brainstorming pages in Electronic Brainstorming:
  a) One page for each participating team member, plus one extra
  b) An additional page for each 10 participants.
  c) Examples:
    i For 6 participants create 7 pages (6 + 1)
    ii For 10 participants create 12 pages (10 + 1 + 1)
    iii For 20 participants create 23 pages (20 + 1 + 2)
2 Enter the Brainstorming question into the EBS tool.

Steps

Say this:
Please click the “Go” button. The system will bring you an empty electronic page.
Each of you now has a different electronic page. You will each start on a different electronic page.
You may each type one idea, up to 400 characters long onto that page. Then you must click the submit button to send the page back to the group.
The system will randomly bring you back a different page. That page may have somebody else’s ideas on it.

When you see a page with somebody else’s ideas on it, you may respond in three ways:
i You may agree with an idea by adding detail to it
ii You may argue against an idea.
iii You may be inspired to contribute a completely new idea.

You may type exactly one idea on the new page. Then you must send that page back to the group. The system will bring you a new page.
We will continue swapping pages and submitting ideas (until you run out of ideas / for X minutes).
Any questions? You may begin.

Appendix B. Background and session feedback interviews

Table 2: Background and Session Feedback Interviews

ID	Organization	Date	Purpose of interview	Interviewees	Roles
1	Consortium	Oct 29, 2003	Background	Project manager	Consortium administration
2	Case university	Nov 27, 2003	Background	CIO, acting in the consortium's steering committee	Consortium and university administration
3	Case university	Dec 2, 2003	Background	Systems designer	Systems development
4	University 1	Dec 11, 2003	Background	CIO, systems designer, and student administration manager	University administration, systems development
5	Case university	Dec 19, 2003	Session feedback	Systems designer	Systems development
6	Consortium	Jan 7, 2004	Background	Manager	Consortium administration
7	University 2	Jan 15, 2004	Background	CIO and systems designer	University administration, systems development
8	Main vendor	Jan 29, 2004	Background	Project manager and systems designer	Project administration, systems development
9	Case university	Feb 26, 2004	Session feedback	CIO, acting in the consortium's steering committee	Consortium and university administration
10	Case university	Oct 25, 2004	Session feedback, longitudinal	CIO, acting in the consortium's steering committee	Consortium and university administration
11	Case university	Oct 28, 2004	Session feedback, longitudinal	Systems designer	Systems development
12	Case university	Feb 3, 2005	Session feedback	Systems designer	Systems development
13	Case university	Feb 3, 2005	Session feedback	Officer	Student administration
14	Consortium	May 11, 2005	Background, longitudinal	Project manager	Consortium administration
15	Case university	Sept 2, 2005	Session feedback	CIO, acting in the consortium's steering committee	Consortium and university administration
Total	5	15	4	12	6

About the Authors

Johanna Bragge holds a PhD in Management Science from the Helsinki School of Economics, and currently acts there as a Professor of Information Systems Science. In her dissertation she applied decision and negotiation analytic methods while pre-mediating an escalated dispute regarding energy taxation in Finland. The results of the mediation endeavor contributed to the start of an ecological tax reform in Finland. Dr. Bragge is the coordinator and main facilitator of HSE's Electronic Decision-making and Groupwork Environment. Her current research interests include themes related to e-collaboration, digital marketing, and text mining. She has published, among others, in *IEEE Transactions on Professional Communication*, *Group Decision and Negotiation,* and *European Journal of Operational Research*.

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