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Abstract

Contemporary information systems (IS) products and services must fulfill the needs of consumers that are more widely scattered than traditional organizational end-users. New ways to incorporate these wide-audience end-users in the IS development are required. The lead-user method used in new product development is a promising approach to tackle this problem. However, the finding and recruiting of the lead-users has been found very burdensome for the firms. We propose lead-users to be found and recruited from virtual communities. This paper provides a conceptual framework that makes use of the Internet's possibilities – not only in recruiting the lead users - but also when collaborating with them utilizing distributed Group Support Systems. Moreover, we report on our preliminary field tests.

Key words: Lead-users, virtual communities, collaboration, information systems development, new product development, requirements engineering, Group Support Systems.

1. Introduction

The environment in which businesses have to operate has radically and very rapidly changed, along with the proliferation of the Internet and other Information and Communication Technologies. We are embarking upon the Knowledge Economy (Amidon, 2003), where the management of knowledge and intellectual assets is a must to firms who desire to survive in the turbulent and ever more global business environment. Firms are no longer able to get superfluous surpluses from selling their products, as the customers' awareness of competing products in the market has risen dramatically through the Internet's search and social computing properties. Hence, the products and services offered must fulfill the various needs of the customers more accurately, as the consumers are easily able to find other alternatives.

A proposed solution for finding customer needs is to tighten the relationship between firms and their customers by creating and/or making use of virtual community places in order to foster the collective creation and sharing of knowledge (Franz and Wolkinger, 2003; Füller et al., 2004; Nambisan and Baron, 2007; Nambisan and Nambisan, 2008; Sawhney et al., 2005; Verona et al., 2006). Especially we should be concerned of the "fuzzy-front-end" phases of the development activities (Montoya-Weiss and O'Driscoll, 2000; Kim and Wilemon, 2002; Herstatt and Nagahira, 2004; Alam, 2006), the area where information systems development (ISD) and marketing disciplines meet. In ISD, it has been claimed that the mistakes at the early phases regarding e.g. customer need requirements may lead to catastrophic failures later on, and it is extremely expensive to correct the errors (Davis, 1990; Davis, 1982).

In marketing science, these issues have been discussed in the field of new product development (NPD). NPD has tried to solve problems first by process development (Calantone and Dibenedetto, 1988; Cooper and Kleinschmidt, 1993). Later the interest turned to the improvement of communication and co-operation in product development (Calabrese, 1997). Nomura (2002), however, claims that knowledge sharing and creation (Nonaka and Takeuchi, 1995) is seriously insufficient in organizations, and he claims that typical R&D people in particular are overwhelmingly lacking contact with customers and communication with other companies. This is

related to the problem of "sticky" local information coined by von Hippel (1998) in the NPD context. The product development is by nature complicated as the sticky need information (what the customer wants) resides with the customer, and the solution information (how to satisfy those needs) lies with the manufacturer (Thomke and von Hippel, 2002).

The current research priorities set by the Marketing Science Institute for 2008-2010 still reflect these difficulties, as revealed in their list: 1) accountability and ROI of marketing expenditures, 2) understanding consumer/customer behavior, 3) new approaches to generating customer insights, 4) innovation, 5) marketing strategy and 6) new media (MSI, 2008). Regarding innovation and NPD, especially service innovation is emphasized to require attention. This has actually been initiated in a recent side-stream of NPD research coined 'new service development' (see for example Alam, 2002; Alam, 2006; Bouwman and Fielt, 2008; Kristensson et al., 2008; Matthing et al., 2006; Matthing et al., 2004), although NPD as a term is still more often used - regarding both services and products. Furthermore, although many companies have developed "co-creation" approaches to integrate their customers into the innovation process, MSI priorities still reveal that "*continued interest is high in new approaches to testing product concepts with an eye toward forecasting their demand*" (MSI, 2008).

In this paper we are exploring ways of bringing together the information systems and marketing sciences' best insights regarding ISD and NPD in order to advance software products' NPD processes, and especially of those products that are targeted at wide audience end-users (Tuunanen, 2003) – that is, to every one of us. Examples of such products are embedded advanced applications for new generation mobile phones, digital TV applications and also the myriad of web-based services. Through a literature review we propose a conceptual framework for this purpose. The aims of our framework are to speed up the IS development process and to lower the failure risk through customer involvement.

In our framework, innovation is fostered employing lead users (von Hippel, 1986) in the requirements engineering (Nuseibeh and Easterbrook, 2000) phase of ISD. Rogers (1995) has characterized lead-users (LU's) as those who are among the first to adopt new products or services. Lead users' needs may be used for

predicting what the masses desire later on. Our purpose is thus to actively engage the leading edge consumers to the development of the new software products. We believe that the active involvement and integration of the customers is necessary to discover the sticky need information (von Hippel, 1998) that resides in them.

Nambisan (2003) has portrayed that NPD has evolved noticeably during the last decades, and it can now be seen as an *IT-enabled innovation process* with key themes covering knowledge management, support for collaborative/distributed innovation, integrated process and project management. In our framework, we take advantage of that development that has recently started. We believe that the success of software products can be considerably increased with a wise integration of participatory design approaches and virtual communities supported by Group Support Systems (GSS) in the requirements engineering phase of IS development.

This paper is structured as follows. In Section 2 we review the literature to provide basis for our proposed framework. In Section 3 we present the framework after which we provide a research agenda for applying the framework in practice in Section 4. Finally, we conclude by briefing on our pilots on testing the framework, and offer suggestions for future research in Section 5.

2. Review of the literature

In this section we review the literature in participatory information systems development, communities in new product development and Group Support Systems (GSS) – the three corner stones of our framework

2.1. Involving consumers to the ISD process

In the discipline of information systems development, the involvement of end-users[1] has been a lively topic. In development process oriented literature, the issue has long been recognized in the form of getting feedback (Boehm, 1988). However, we see that plain feedback is not enough for the involvement of end-users to ISD. As

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[1] In this study we use the terms "end-user" and "customer" interchangeably throughout the paper.

Wanninger and Dickson (1992) argue, one-on-one communications produce only "local" views and fail to produce an understanding of the complete system with interactions involved and necessary tradeoffs to be made. McKeen et al. (1994) have argued that user participation improves the quality of the system in several ways, and they list the following: 1) more accurate and complete requirements, 2) information about how the organization supports the system, 3) avoiding unimportant features, and 4) improving end-user understanding of the system. However, there is no common definition how the users should be involved in the ISD process (Carmel et al., 1993; Iivari and Iivari, 2006; Isomäki and Pekkola, 2005). The literature usually offers two main options, bottom-up and top-down approaches.

In the bottom-up approach the decision-making is taken to "the floor" and it is thus said to be a democratic and participative way of involving end-users to the systems development (Bjerknes and Bratteteig, 1995). In this approach it is possible to reconnect the designer and user again (Grudin, 1991). For example Kujala (2003) offers a review of the benefits and challenges of user-involvement in the field of requirements engineering. In the top-down approach the view is that the management knows what is best for the organization (Rockart, 1979). Also the usability specialists may serve as "surrogate users" in the design process (Iivari and Iivari, 2006). In this case user involvement is informative or consultative at the most, as the users do not actively participate in process (Iivari and Iivari, 2006). Lately, however, researchers have sought for building consensus on these approaches and they have recommended considering wide participation of stakeholders from different places of the organization or user-space (Peffers et al., 2003; Vidgen, 2002). We concur with this view and see that we should encourage comprehensive end-user participation in the early stages of system development.

Requirements engineering RE (Pohl, 1994; Nuseibeh and Easterbrook, 2000) has emerged specifically for finding answers to requirements gathering and analysis regarding software products and services. The number of techniques and methods developed for requirements gathering and analysis is almost unlimited (Nuseibeh and Easterbrook, 2000). We see it necessary that the method should reach and understand the widely distributed end-users (Tuunanen, 2003) who may not have strong ties with the development, or are diversely distributed geographically. It should also incorporate all three dimensions of RE: specification, representation and

agreement (Pohl, 1994). Based on the literature and also on our own practical experiences, we believe that the application of web-based and distributed (decentralized) Group Support Systems (Herlea Damian et al., 2000; Ocker et al., 1995-96) offer very promising tools for this purpose (more in Section 2.3).

However, the Group Support Systems (GSS) literature is vague in how to select the participants to the ISD process as traditionally we have been dealing with very selected end-users from organizations (Karkkainen et al., 2003). If we consider the consumer markets there are no established options at the moment how to recruit and select participants to a distributed GSS session. We see a solution in using the lead user (LU) concept developed by Rogers (1995) and von Hippel (1986). Rogers has claimed that the diffusion of innovation follows a pattern, which can be used to forecast the entire diffusion. The key argument is that the recognition of what the lead users demand from innovative products could lead to forecasts of what the masses desire later on (von Hippel, 1986). Gruner and Homburg (2000), among others, found in their study that the lead user characteristics of the customers involved in NPD increase new product success (see similar results also in Franke et al., 2006; Matthing et al., 2006). The LU concept has been employed also within IS in combination with new emerging methods of IS planning (Peffers et al., 2003). Furthermore, it is very common in the software industry to use lead users for product testing and currently also for providing peer-to-peer online support (Franz and Wolkinger, 2003; Nambisan and Baron, 2007). However, how to find the lead users is a problem of its own, and the need for new approaches for finding them has been put forward (Nambisan and Wilemon, 2000).

The traditional approach for finding LU's has been the networking or snowball-selection of participants according to their knowledge (von Hippel et al., 1999). However, the burden related to this process has been claimed to be as one of the barriers for organizations to adopt the LU concept (Olson and Bakke, 2001). To find solutions to this, we review the literature on virtual communities in the following section.

2.2. Communities in new product development

An extensive literature on virtual communities and their role in social life exist (see e.g. Renninger and Shumar, 2002; Putnam, 1996; Rheingold, 1993). Communities can be defined as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their understanding and knowledge of this area by interacting on an ongoing basis" (Wenger et al., 2002). Various concepts that adapt a special context (e.g. learning or knowledge creation) into communities exist. The concept of "communities of practice" (Wenger, 1999; Wenger et al., 2002) stresses informal and practice-based learning, in which a set of people having mutually defined identities and shared stories learns. Zager (2002) presents coalitions as temporary collaborative forms constituting individuals and teams that are connected by shared interests. Nonaka and Konno (1998) have coined the Japanese term *Ba* to express this. *Ba* is defined as "…a shared context in motion, in which knowledge is shared, created and utilized" (Nonaka and Toyama, 2003).

Among others Sawhney and Prandelli (2000) and Sawhney et al. (2005) stress the shift from a perspective of exploiting customer knowledge by the firm to a perspective of knowledge co-creation with the customers. Prahalad and Ramaswamy (2004) add that informed, networked, empowered, and active consumers are increasingly co-creating value with the firm. In the previous section we discussed participatory approaches in which the end-users are involved in the early stages of the system development. However, how to establish and maintain an innovative relationship and collaboration between the firm and the customers already in the early phases of the NPD is a question that requires further studies. One proposal is utilizing virtual customer communities (Franz and Wolkinger, 2003; Füller et al., 2004; Nambisan and Baron, 2007; Nambisan and Nambisan, 2008; Sawhney et al., 2005; Verona et al., 2006). Jeppesen and Molin (2003) have claimed that there are practically three types of consumers in virtual communities, the first type of which is best characterized as lead users: they use the product and develop innovative applications, they have relatively in-depth and specific knowledge of certain aspects of the product and they keep themselves up to date by interacting with peers. Franz and Wolkinger (2003) and Piller et al. (2004) confirm that virtual communities are a perfect source for lead

users. However, designing such a community requires a careful plan and adaptation to the situation (Kristensson et al., 2008; Nambisan, 2002; Nambisan and Baron, 2007; Nambisan and Nambisan, 2008; Sawhney and Prandelli, 2000).

A number of researchers have presented preliminary results of employing lead users from virtual communities in new service development with promising results. For example, Franz and Wolkinger (2003) employed a web survey complemented with hybrid conjoint analysis (Dahan and Hauser, 2002) to differentiate between preferable product offerings. They found that community members and especially the identified lead users are very willing to provide the necessary information to develop new products. Füller et al. (2004), in turn, introduced the concept of Community Based Innovation, which is founded on social exchange and interaction theory. They have emphasized the importance of the selection process of lead-users. Sawhney et al. (2005) highlight with two organizational examples how the Internet can serve as a powerful platform for collaborative innovation with leading edge customers. They state that in virtual environments firms can better select lead users or, even, let them self select. Matthing et al. (2006) explored the identification of innovative customers and the effectiveness of employing them in generating new service ideas in a technology-based setting. They employed the 4-dimensional 'Technology Readiness Index' of Parasuraman (2000), and discussed also its similarities with the lead user concept. For example, an individual with a high degree of 'optimism' and 'innovativeness', and a low degree of 'discomfort' and 'insecurity', is likely to be a lead user of new technologies. They found that such lead users with a high degree of TRI (so-called 'explorers') should be asked to participate in the user involvement endeavor, as "*they adopt technology-based offerings earlier than others, have a strong propensity to seek out new technologies and enjoy tackling problems associated with those technologies, and are willing to participate in the process of developing new technology-based services*". Franke et al. (2006) found that a high intensity of lead user characteristics (especially the dimensions of being ahead of the trend, and obtaining benefit from the innovation) displayed by a user has a positive impact on the likelihood that the respective user yields a commercially attractive innovation. Finally, Jeppesen and Frederiksen (2006) surveyd the motivation of innovative users to contribute to a firm-hosted community (www.propellerhead.se, providing software-based

solutions for music instruments). They found that especially the recognition from the hosting company – and not so much from the peers, although firm recognition indirectly also leads to peer recognition – is extremely important for the users to innovate "on demand" to serve manufacturers. Thus, company managers should think of ways how to best "allocate" recognition to motivate users.

Sawhney and Prandelli (2000) have listed the prerequisites for the design of communities related to the creation of new products. These are: a common interest, a sense of belonging, a shared language, ground rules for participation, an explicit economic purpose, a sponsor, mechanisms to manage intellectual property rights, physical support of the sponsor, and co-operation as a key success factor. The first four can be easily recognized as foundations for any community. However, the five latter ones starting from an explicit economic purpose are questions that companies need to address in the NPD context, as in our proposed framework. Also the twelve principles of collaboration (MongooseTechnology, 2000) offer guidelines for designing Internet platforms that support group collaboration. These 12 principles are titled as purpose, identity, reputation, governance, communication, groups, environment, boundaries, trust, exchange, expression and history. Although the guidelines behind these principles are not specific for NPD collaboration purposes, they offer very useful practical level insights. Nambisan and Baron (2007) urge companies to think how to incorporate new organizational design elements (positions or even units) to manage virtual community initiatives. They mention that firms such as Microsoft and SAP have established new organizational roles (for example, Virtual Customer Environment Managers, Online Customer Liaison Managers) to connect the customers and the internal entities (product development teams) involved in innovation and value creation. Surely, if companies invest in these types of resources, the success potential of virtual customer community initiatives is more probably enhanced. In the next section we review the literature on group support systems that provide appropriate tools for group collaboration in the Internet.

2.3. Distributed Group Support Systems

Group Support Systems (GSS) belong to collaborative information systems that support *task oriented* collaboration (Coleman, 1999; Bragge et al., 2007). GSS pursue to alleviate the problems related to group work, e.g. the domination of one person or the need to wait one's turn to speak. Simultaneously, GSS aim to foster the benefits of group work, e.g. the synergistic effects of building up ideas on others' ideas (Nunamaker et al., 1991). This efficient mode of group work can be achieved though a structured agenda, parallel (and anonymous) input of the users via computers, real-time voting and multi-criteria analyses and on-line reports of the group work sessions. Distributed GSS is a technology, which supports group work where the participants are located in different places and sometimes in different time zones also (Turoff et al., 1993).

The development of GSS has started already in the late 1980's, and combined field research results on GSS show savings up to 50% of person hours and project time when compared to regular meetings (Fjermestad and Hiltz, 2000). But what is new is the resurgence of interest towards GSS tools and methods that has been seen during the last few years (Chapman, 2003). One of the main reasons for this is the commercialization of the Internet, which has enabled more flexible collaboration through the Internet browser, without needing to install any special software for the participants' computers. Munkvold and Zigurs (2005) have evaluated several categories of e-collaboration technologies in terms of the various modes (e.g. same time and different time), media (e.g. text and video), and structures (e.g. consensus building and anonymity) that they support. First, they defined a collaborative technology to be integrated if it combines support from more than one mode, medium or structure. They found that only GSS clearly provide support for different types of structures (Munkvold and Zigurs, 2005). Similarly, also Austin et al. (2006) argue that GSS are good at bringing discipline (i.e. structure) to various types of web meetings.

The synchronous same time–same place setting has traditionally been the most common mode of applying GSS. We recommend the use of synchronous but distributed RE sessions, i.e. the same time - different place mode, to enable dynamic build-up of comments although the participants are dispersed (see discussion of the

merits of various modes e.g. in Klein et al., 2005). The level of distributedness can naturally vary from partial to total. With this setting the LU's can participate to the RE session from their own computers, which only need to have Internet browsers, no special software. The software NPD team can be either distributed or meet in a face-to-face decision-room setting.

GSS have been earlier used for requirement elicitation in several studies (e.g. Briggs and Gruenbacher, 2002; Davison, 2000; Elfvengren et al., 2003) and some also in distributed settings (Ocker et al., 1995-96; Herlea and Greenberg, 1998). GSS are said to be very adaptable to this problem environment, but the integration of the GSS and software engineering process has been seen as a hindering factor in the dissemination of GSS in the industry. As a response to this, Briggs and Gruenbacher (2002) have created a solution that integrates a WinWin spiral model of software development (Boehm, 1988) to GSS. However, in distributed settings, somewhat more simplified processes than their EasyWinWin might be needed for RE, see argumentation also in Elfvengren et al. (2003). One solution could be to develop a repeatable and predictable process for the distributed RE purpose according to the principles of the Collaboration Engineering design approach (Briggs et al., 2003; Kolfschoten et al., 2006; Bragge et al., 2005). During the GSS session the lead users' needs and requirements (that easily count to hundreds) are gathered and organized in a few manageable classes, and finally prioritized. Using this information the aim is that the software NPD team, possibly together with the lead users, could be able to suggest product/service constructs for evaluation. In the evaluation phase tools like web-based conjoint analysis (Dahan and Srinivasan, 2000; Dahan and Hauser, 2002) might be employed with a larger end-user selection than the lead-users.

3. Framework for involving customers in IS development

Knowledge management researchers such as Hult (2003) emphasize that in today's fast-cycle-time environment those firms, who have the right knowledge at the right time in the right format and in an accessible form hold an important intangible asset for them, and this also contributes to the firms' competitiveness in the

long run. Firms thus have to solve the following problems related to the fuzzy-front-end of the software NPD process:

- How to have the right knowledge?
- How to have the right knowledge at the right time?
- How to have the right knowledge in the right format and in an accessible form?

That is, how to improve the probability of new product successes and also speed up the process of doing so? To respond to the challenging situation firms are facing today we are proposing a framework called *Virtual User Collaboration in Requirements Engineering* (VUCORE). The proposed VUCORE framework is aimed to help the software NPD team. It derives its basis from the fields of information systems development (ISD) and new product development (NPD). It is founded on the motivated lead-users' voluntary work and knowledge embedded in a community (Wasko and Faraj, 2000). This means that the process contains both emergent and controllable aspects as suggested by Sawhney and Prandelli (2000). The lead users' involvement is supported by structured groupware tools.

The first task entity in our framework is to *characterize and search the right lead users* to join the virtual collaboration. According to a longitudinal case study of Olson and Bakke (2001), NPD's lead user method has seemingly failed to catch on more industries and firms despite favorable attitudes towards the method. The researchers learned that finding, qualifying and recruiting the lead users was seen by companies as the most burdensome tasks. However, Olson and Bakke used in their case study traditional networking (mouth-to-mouth) methods for finding the lead users. Our idea is to make this phase much easier by *locating and utilizing established virtual communities in uncovering the lead users*. For example, in some virtual communities information about the rank or status of the members is readily provided next to their user names. Also tools such as Netscan can be used to mine community user activity data (Nambisan and Baron, 2007).

Next in the VUCORE framework, the purpose is to *invite the lead users to a "gated community"* (Sawhney and Prandelli, 2000) *to participate in the RE activities*. According to Nambisan (2002) customers may perceive membership in such "exclusive" communities itself as a reward for their contributions, and the like-mindedness

of the members should facilitate more open sharing of knowledge and innovative ideas, thereby enhancing the overall interaction experience and the associated benefits (Nambisan and Baron, 2007). Füller et al. (2004) give useful practical-level advice on how to contact the lead users. Most often an initial contact to the webmaster is advisable, but the netiquette, if available, might also inform how the community reacts to external inquiries.

As virtual community members are already comfortable with computer-mediated communication environments, we propose *the use of distributed and web-based GSS in the RE collaboration activities*. Web-based GSS that can be applied for this purpose are for example *FacilitatePro, MeetingWorks, GroupSystems ThinkTank, Grouputer* and *WebIQ* (Austin et al. 2006). They offer more sophisticated and structured tools for collaboration and group decision-making than e.g. a plain discussion forum does. See, for example, Munkvold and Zigurs (2005) or Bajwa et al. (2003) for classifications of collaborative IS, and Anson and Munkvold (2004) for a field study on electronic meetings in different time and place modes.

Summarizing the above, as much as possible of the VUCORE framework's software NPD process is organized at the Internet, i.e. "in the air". Utilizing the Internet is claimed to speed up the process and cut the costs of it, and bring a larger base of customers, among other things (Ozer, 2003). Regarding the VUCORE, however, it is also possible to do some of phases of the process also "at the ground level" (e.g. in a GSS decision room) if the process calls for it. In Table 1 below, we have gathered the solutions we propose with our VUCORE framework to the questions phrased earlier at the beginning of this section. After that we discuss the critical phases of applying the framework in practice in Section 4.

Table 1. Proposed solutions of inviting virtual lead users to co-create innovative information systems services

Problem in software NPD	VUCORE element	Suggestions to the NPD problems
How to have the right knowledge?	Participatory Design approaches, Lead users, Distributed and web-based GSS, Requirements Engineering	Involving customers / wide audience end-users to the software development process. Creating innovative knowledge together with leading edge customers utilizing distributed and web-based GSS. Employing RE methods for needs elicitation.

How to have the right knowledge at the right time?	Communities, Lead users, Distributed and web-based GSS	Utilizing the flexibility and speed of the Internet as much as possible: finding the lead users from established virtual communities, speeding up the process utilizing distributed and web-based GSS sessions for RE.
How to have it in the right format and in an accessible form?	Distributed and web-based GSS, Requirements Engineering	Highly converged and prioritised knowledge from GSS sessions. Reports of the GSS sessions automatically generated and stored. Languages and rules of writing and documenting requirements.

4. Critical phases of applying the VUCORE framework in practice

We reckon that there are four critical phases in applying our VUCORE framework. The **first two intertwined phases** (P1 and P2 in Figure 1) concentrate in characterizing, searching and locating the lead-users. Literature traditionally offers snowballing or networking (Olson and Bakke, 2001) as a solution where peers recommend others as lead-users. The networking technique relies heavily on finding the 'right' starting points for participant recruiting. This method has been used succesfully by Peffers and Tuunanen (2005) in information systems planning, but also they recognized similar challenges as Olson and Bakke (2001) did. It is often difficult and resource demanding to keep on finding the lead-users again and again. For this, recent studies utilizing virtual communities show promise (e.g. Franz and Wolkinger, 2003; Füller et al., 2004), but it remains open how we portray the potential participants. In the case of planning innovative mobile financial applications Peffers and Tuunanen (2005) used simple market segmenting first to set the scope of participant selection for networking. Another option could be a pre-study for determining what kind of users would be potential for the target product or service. Clearly, this area requires further studies.

After recognizing who is our target audience, that is, potential lead-users, the process continues by locating or even creating the right virtual communities for them. This by itself is a demanding task if the company pursuing innovative IS services does not have its own established community (see Muniz and O'Guinn, 2001 for

discussion on brand communities) or otherwise a strong product brand to support the advertising-based search. If this is the case, it might be appealing to use virtual communities for complementary products or services. This area would also benefit from a well-planned pre-study.
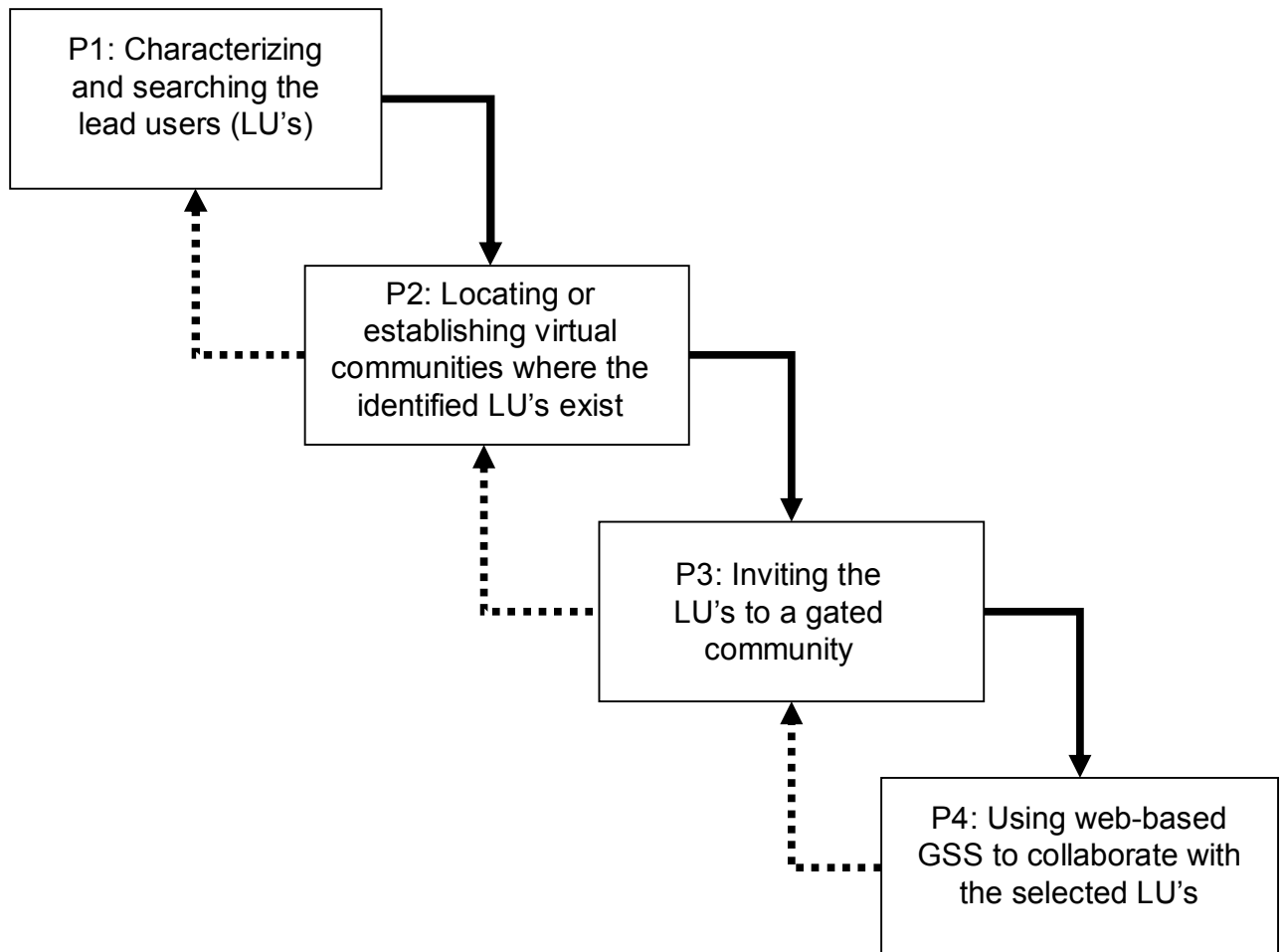

Figure 1 Four critical phases of applying the VUCORE framework

The **third critical phase** (P3 in Figure 1) is based on the characteristics of the identified lead-users. After locating (or establishing) the appropriate user communities (or a single community), the lead-users from them should be invited to a gated community for taking part in the actual requirements engineering activities. For example Füller et al. (2004) provide a questionnaire with which the lead-users can be distinguished from the other users (see also Morrison et al., 2004; Morrison et al., 2000).

Recently, marketing researchers have begun to use web-based conjoint analysis for involving consumers to new product development (Hauser and Rao, 2003). The usage of these tools that allow rich media virtual prototypes has raised considerable interest (Dahan and Srinivasan, 2000; Dahan and Hauser, 2002). Also Franz and Wolkinger (2003) used web-based conjoint analysis tools in their study. Von Hippel and Katz (2002) have put forward a second way of involving the external users to the development process by using online toolkits. Participants can use these toolkits online to create a product to fit their needs like in the case of creating mobile games studied by Piller et al. (2004). Our VUCORE framework suggests a different approach as the **fourth critical phase** (P4 in Figure 1). We propose collaborating with the LU's using distributed and web-based group support systems GSS to elicit the requirements of a new product or service. Our view is that by using a more open-ended approach for innovation we are able to create more radical innovations compared to conjoint analysis and toolkits, as the product attributes in them must be defined beforehand.

Naturally, using GSS also creates demands for high-end technical solutions, like sophisticated software and a broad enough network bandwidth. In addition, we should not forget the need of a trained session facilitator (Clawson et al., 1993; Niederman et al., 1996). The potential benefits, however, are exciting. With the use of web-based GSS we are able to collaborate and brainstorm with our customers without physical or geographical barriers. Secondly, as shown by previous research in requirements engineering (Briggs and Gruenbacher, 2002), GSS has great potential in providing also the RE documents in a usable fashion for the designers. Moreover, web-based conjoint analysis may well be used in a later phase of the ISD process, once the innovative software prototypes are ready for evaluation, using a larger selection of users than just the lead-users.

5. Discussion and conclusions

Our literature review and the proposed Virtual User Collaboration in Requirements Engineering (VUCORE) framework present that involving communities into organizational development processes brings new facets that have to be dealt with in advance. These are related e.g. to motivation/incentive mechanisms, trust, power and

intellectual property rights. However, we believe that the advantages provided by the VUCORE framework - emphasizing the knowledge co-creation with innovative customers and the utilization of the Internet's possibilities as social media - are much larger than the disadvantages related to increased amount of preparation and coordination work. Early signs of the benefits provided by open collaboration and innovation approaches can be seen from the 2008 McKinsey global survey regarding the usage of Web 2.0 tools and technologies in companies (Bughin et al., 2008). According to these results, based on almost 1.500 respondents, 38% of companies report that Web 2.0 technologies have changed the way they communicate with customers and suppliers, and more specifically, 23% of the companies who report highest satisfaction with the usage of social media employ it for getting customers to participate in product development: "*some are taking steps to open their corporate 'ecosystems' by encouraging customers to join them in developing products and by using new tools to tap distributed knowledge*" (ibid, p. 2). However, after an initial period of promise and trial, some companies have also come to understand the difficulty of realizing some of the Web 2.0's benefits and even stopped using certain technologies altogether. Thus, it is evident that careful planning and procedures are needed.

In some cases there does not exist a virtual community from where to start searching for the lead users. In that case it is possible to make an initiative to set up a virtual community first, if it does not exist *ex ante*. Naturally, this strategy takes more time, which can be seen as a limitation to the framework. However, companies launching products or services without customer contacts are taking risks that are partially avoidable by capturing user needs wisely. It is quite customary that companies read regularly and extract ideas from the discussion forums concerning their products and services. However, this is not enough in today's competitive environment, which demands going beyond merely importing the "voice of the customer" through traditional market research mechanisms (Sawhney et al., 2005). The customers need to be *involved*. Matthing et al. (2006) review the various strongly allied concepts of customer involvement (lead user method, co-development, co-opting customer competence, user involvement, consumer involvement and customer interaction) and build a definition for customer involvement in service innovation: "*The processes, deeds and interactions where a*

service provider collaborates with current (or potential) customers at the program and/or project level of service development, to anticipate customers' latent needs and develop new services accordingly". They claim that customer involvement especially in service research is preached but not practiced, although the collaboration with customers has become a foundational premise of the service-dominant logic (Kristensson et al., 2008; Lusch et al., 2007).

We believe that the VUCORE framework lends itself both to the development of embedded high-tech applications (found e.g. in mobile phones) as well as to the more traditional software products/services and web-based applications. Boedker and Carstensen (2004) say that especially the web-based IS have become more complicated posing new challenges for example to the division of labor. They argue that the primary benchmark for quality is customer perceptions (see further discussion in Bragge and Merisalo-Rantanen, 2008). The VUCORE as presented in this paper is a preliminary conceptual framework. In order to verify the applicability of the VUCORE construct and to deliver a more detailed process description, we are currently conducting further studies testing the framework.

We see that our research-in-progress will contribute to the field of information systems development by providing an advanced technology-based platform for collaborating with wide-audience end-users. We have started a multi-phased research program, the first phase of which studied the possibilities of using virtual communities in the recruitment of lead-users. The preliminary results were promising. This mobile technology related case study showed that 1) we were able recruit qualified lead-users through virtual communities and that 2) the recruited participants provided an equivalent amount of feature and product ideas as the users recruited using the traditional snowballing method in another location. In this case we employed the laddering interviewing technique (see e.g. Peffers et al., 2003; Tuunanen, 2003; Peffers and Tuunanen, 2005) to elicit user requirements, as we did not have the possibility to utilize web-based GSS at that time.

We continue our research agenda with investigating the complexities involved in inviting the virtual lead-users to a gated community for more interactive collaboration with web-based GSS tools. Since our first phase pilot, we have gained more experience from facilitating synchronous but distributed brainstorming sessions with web-

based tools, using both real organizational teams as well as student teams. These sessions have proved us that the web-based GSS technology is extremely promising. However, depending on the exact RE process to be developed for the collaboration (for example employing the Collaboration Engineering approach of Briggs et al. 2003), the process might need to be complemented with multi-party web-conferencing tools allowing inexpensive IP-based video and voice transmission (Austin et al., 2006; Bragge et al., 2007). With the recent developments regarding the Skype, Microsoft Messenger and other similar tools, this type of communication is already quite common in one-to-one communication between individual consumers.

Even though our preliminary findings provide a good starting point for continuing the study we also see limitations in our work. First of all, our VUCORE framework remains conceptual at this stage. We have not yet field trialed it as a whole, and there are probable challenges in engaging the recruited lead-users in a meaningful collaboration in product/service development. For example, what kind of rewards we should offer the participants and how we can retain their interest enough to complete at least one full cycle of the VUCORE intervention. Conceivably, the design of the web interface may be a crucial issue in this. It remains to be seen whether we can use off-the-shelf Group Support Systems etc. software for this, or do we need to conduct a separate design science research effort (Hevner et al., 2004) for accomplishing the effort. In addition, we need to study more about what we can learn from the marketing science literature and the use of focus group participant pools for creating a big enough reservoir of lead-users for continuous use (see discussions e.g. in Klein et al., 2005; Kontio et al., 2007). Finally, it remains to be seen whether distributed and web-based GSS tools will be the most suitable ones for engaging the lead-users in a gated community. There might be other techniques or tools that are equally feasible or even better, especially if the community members are accustomed to some other advanced or Web 2.0 collaboration technologies. There is an evident need to conduct more research to understand these issues better.

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