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EVALUATING INFORMATION NETWORK UTILIZATION AND ELECTRONIC COMMUNICATION IN ENTERPRISES

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ABSTRACT
In this paper, we develop and test methods for evaluating information network utilization and electronic communication in enterprises. First, we present a holistic model for evaluating the e-level (level of electronic information network utilization) of a company. The model consists of seven factors: communication, integrity, presence, strategy, resources, business operations, and networks. The managers of 71 companies evaluated their companies’ use of electronic network by completing a web questionnaire with 21 questions (three for each factor) developed based on the model. The analysis of the data showed that the developed methods were successful in eliciting both differences and correlations between the different factors for the participating companies. The results of a subsequent questionnaire showed that the company representatives evaluated both the model and the questionnaire as mainly successful. Second, we developed methods for further examining the communication functions of enterprises. The managers of 52 companies successfully evaluated their companies’ electronic communications using a questionnaire, which studies the use of different communication technologies systematically on three factors: internal vs. external communication, office vs. mobile use, and synchronous vs. asynchronous communication. We suggest that both the developed methods are useful for individual company managers and regional developers providing support services to enterprises.

KEYWORDS

1. INTRODUCTION
The recent rapid advances in information and communications technology (ICT) have created many possibilities - but also challenges – for enterprises. Many companies, especially small and medium-sized enterprises (SMEs), are lacking knowledge related to information network usage. The managers of these companies puzzle over questions such as “Is our company getting the benefits that information networks can provide?”, “Are we making correct ICT-related investments?”, “Should we invest more on the information network?”, “Are we on the same level in ICT-related aspects as our competitors?”, and “Should we hire an ICT- consultant?”. Answering to these kinds of questions is especially difficult for management personnel in companies, whose core business is not in an ICT-related field. Many of these companies do not have management level ICT personnel to make strategic plans about the investments; instead operational management personnel without sufficient knowledge of ICT have to make ICT related decisions. The
existing literature, however, focuses mostly on companies, which already have an e-business up and running. In this paper, we aim at developing methods for evaluating the level of information network utilization of all companies regardless of their current level. We provide self-evaluation tools for managers to position their company regarding the different aspects related to the use of the electronic information network.

A holistic model of information network utilization must be based on the most important aspects available in the existing literature. The first step in evolving an e-enterprise is supporting the company’s external communications with suitable ICT solutions (Earl, 2000). It is a key factor when responding to customer needs in both business to business and business to customer relations. The next step is to look into internal communications. The information network can provide new – typically more effective – possibilities to distribute the work of a team or arrange the work of a single employee. For example, work teams can be distributed independent of geographical location and one worker may be part of several different parallel teams. Supporting internal communication with suitable ICT solutions is one of the key aspects in providing this type of flexible distribution of the workforce (Watson-Manheim and Belanger, 2002). Besides the division to internal and external communication, an important distinction can be made between stationary office communication and mobile communication. The latest developments in mobile technology have enabled mobile virtual enterprises with the access to the enterprise operations anywhere, anytime (Pulli et al., 2003). In computer-mediated communication, another frequently reported categorization is made between synchronous (e.g. Internet telephony) and asynchronous (e.g. e-mail) communication (see e.g. Johnson, 2006).

Another important aspect in information network utilization is the integrity of the company system. Is data consistent across the system? Are database updates, document formats, and releases between the applications compatible? (Earl, 2000). Do the company’s Intranet and Extranet work well together? Most companies today have a web presence. The website of a company is nowadays its most important multimedia marketing tool – it truly serves customers globally (Watson et al., 2000). However, it is very important that the potential customers will find the information what they are looking for and that the site responds to the customer’s needs (Chen et al., 2005; Bjørn-Andersen and Elliot, 2005). However, successful use of the information network requires planning and looking ahead (Wassenaar and Katsma, 2004). An organisation should not only invest in hardware and software but also in strategic planning in how to use ICT in the future to support its core business operations. This can lead to successful high potential e-commercialisation (Shi and Wright, 2003). Investing in software, hardware, personnel training, and network connections are the resources a company has to invest in to fulfil its ICT implementation strategy successfully on all levels (Bakry and Bakry, 2001).

After including ICT into its strategic plans, a company needs to incorporate information network usage into its everyday business operations including the production of goods/services and, for example, after sales services of the company. These kinds of tactical and support operations are important to take into account when trying to measure and model the company’s e-business maturity (Xirogiannis and Glykas, 2007). Information network applications should not be stand-alone technologies but should be integrated into the overall value chain (Zhang and Gai, 2005). Connecting a company’s operations such as billing, delivery, and logistic services is especially important in business to business operations. Using this kind of ICT networking solutions between businesses can considerably reduce costs due to more transparent and faster product/service delivery (Xirogiannis and Glykas, 2007). In the information age, it is also more and more important for the companies to utilize the information network to acquire new expertise to aid in the core business operations of the company and also in many other activities required to run a successful enterprise.

While the information network has been used in companies for a relatively long time, there is no universally agreed concept to describe the capability of a company to utilize the information network effectively. In some instances, the concept of e-maturity has been used to describe the current state of using e-services or the e-readiness of an organization. However, this concept has been used mostly in pedagogical contexts and it is not established as a scientific concept in the system sciences. A concept of e-business maturity has been used to analyse mostly companies, which already have an e-business. We define a concept of e-level to denote the level of information network utilization in any company. By information network, we mean both the wired and mobile Internet and any related services. Thus, we exclude for example mobile telephony and Short Message Service (SMS). However, these technologies are also studied, for comparison, in the second study of this paper, which addresses electronic communication in enterprises.

The aim of the current paper is to present simple and efficient methods for managers to evaluate the level of information network usage and electronic communication in their companies. First, we aim at creating holistic methods for evaluating information network utilization. These methods could be useful for all...
companies regardless of their domain or current level of information network usage. Consequently, the questions of the self-evaluation questionnaire were designed so that the most important different aspects related to information network utilization could be covered as well as possible. Second, we developed methods for evaluating electronic communication in enterprises. Using these methods, company managers can estimate the utilization of ten categories of communication technologies in internal and external communication as well as in office and mobile use. To test the developed methods, we conducted two questionnaires for company managers in the Oulu South region, Finland.

2. STUDY ONE

2.1 Participants

Managers from 71 companies participated in study one by filling in a web questionnaire. The demographic information of the participating companies is presented in section 2.6.1. After the results had been analyzed, all participating companies were sent a company-specific feedback by e-mail together with a link to a subsequent feedback form. Managers from 12 companies filled in and submitted this form, which evaluated the questionnaire and the company feedback.

2.2 Seven factors model

Based on existing literature and practical experiences with enterprise information systems, seven important factors related to information network utilization were identified. The seven factors are:

- **Communication.** The level of information network usage in communication within the company and with the collaborators of the company (e.g. clients and suppliers).
- **Integrity.** The integrity level of the information system of the company. The level of streamlining the internal and external systems and communication solutions (e.g. Intranet/Extranet/Internet).
- **Presence.** The quality and findability of the company web site. The level of marketing using the information network.
- **Strategy.** The level of taking information network utilization into account in the strategy and future plans of the company.
- **Resources.** The available computer equipment, software, and the IT related skills of the personnel.
- **Business operations.** The level of information technology and network usage in the main business operations and support services of the company.
- **Networks.** The level of utilization of external electronic networks of companies or people, for example, in logistics, payment transactions, and knowledge acquisition.

2.3 Questionnaires

2.3.1 Main questionnaire

The questionnaire included 21 evaluations: three evaluations for each factor. The outline of these evaluations is presented in Table 1. A scale from 1 to 9 was used in each evaluation, in which 9 denoted the positive end of the scale. In addition to these evaluations, there was one open question, in which the participants were instructed to enter any comments related to the utilization of the information network in their companies. Particularly, they were instructed to think of barriers for effective information network utilization or public services, which could facilitate the process of moving into more effective information network utilization.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Target of evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>The level of information network usage in internal communications.</td>
</tr>
<tr>
<td>Communication</td>
<td>The level of information network usage in external communications (e.g. with clients or collaborative partners).</td>
</tr>
<tr>
<td>Communication</td>
<td>The number of different communication channels or methods used.</td>
</tr>
</tbody>
</table>
**Integrity**
The interoperability of different systems used.

**Integrity**
Avoiding the need for manually moving information between systems.

**Integrity**
The streamlining of internal and external systems (e.g. Intranet/Extranet/Internet).

**Presence**
The level of utilizing information network in marketing.

**Presence**
The findability of the company website or company information.

**Presence**
The quality of the company website.

**Strategy**
The role of information network utilization in the strategy of the company.

**Strategy**
The plans for strategically improving the level of information network utilization in the future.

**Strategy**
The plans for investing in new computer equipment, software, network connections or training.

**Resources**
The state of the current computer equipment from the viewpoint of effective information network usage.

**Resources**
The state of the current software from the viewpoint of effective information network usage.

**Resources**
The state of the current IT skills of the personnel from the viewpoint of effective information network usage.

**Business operations**
The level of utilizing the information network as part of the main business operations.

**Business operations**
The level of utilizing the information network to support to the main business operations.

**Business operations**
The level of utilizing the information network to provide support services (e.g. product support or technical documents).

**Networks**
The level of utilizing electronic networks in deliveries and logistics.

**Networks**
The level of utilizing electronic networks in payment transactions, billing, and accounting.

**Networks**
The level of utilizing electronic networks in gaining expertise and knowledge.

Based on their answers in the main questionnaire, each participating company received a company feedback as an e-mail attachment text file. The company feedback consisted of an explanation of the purpose of both the questionnaire and the feedback, explanation of the seven factors, and a numeric table, which contained the questionnaire scores. The table included the scores of the company on the seven factors and the overall e-level of the company. For comparison, the table also included the averages scores of all participating companies and all the companies in the same company size category on all scales.

### 2.3.2 Response questionnaire
The company feedback e-mail also contained a link to a response questionnaire. The response questionnaire contained three questions with a 1 to 9 scale and two open questions. The managers were instructed to evaluate the extensiveness of the questionnaire in covering the central issues in information network utilization, the usefulness of the categorization to seven factors, and the usefulness of the company feedback. In the open evaluations, the participants were asked to evaluate the correctness of the company feedback and to report any inaccuracies in the feedback. They were also prompted to enter any comments on the questionnaire or the feedback and to present any ideas for important issues in information network utilization or other ideas to develop the questionnaire further.

### 2.4 Procedure
A link to the questionnaire was sent to representatives of 405 companies in Oulu South region, Ylivieska subregion, Finland. These companies were selected from a comprehensive portal of companies in the region. Very small companies were excluded. If the managing director’s e-mail was available, the e-mail was sent to her/him. Otherwise the e-mail was sent to another manager (e.g. local manager) of the company. If neither of these e-mail addresses could be found, the e-mail was sent to the general e-mail address of the company. The e-mail included a request to forward the e-mail to the managing director, IT manager, or another manager. Each company was assigned a unique ID and using this ID it was controlled that each manager had a possibility to submit the answers to the questionnaire only once. It was told in the e-mail that the companies were expected to submit their answers to the questionnaire within two weeks of the day when it was sent. Three weeks later a reminder e-mail with similar content was sent to the companies, which had not submitted the questionnaire by then. These companies had a possibility to submit their answers to the questionnaire for a further week.
2.5 Data analysis

The data was categorized so that for each company, an average score was calculated for each factor based on the answers in the questionnaire. The e-level of a company was calculated as the average of these seven scores. In the statistical analyses, a Friedman’s rank test was used to test for statistical differences between the different factors and Wilcoxon’s matched pairs signed ranks tests were used in the pairwise analyses. Spearman’s coefficients were used in the reported correlations.

2.6 RESULTS

2.6.1 Demographics

Company size. The size distribution of the participated companies (in terms of number of employees) is presented in Table 2.

![Table 2](table.png)

Respondents. 42 of the persons who responded to the questionnaire were managing directors of their companies. 9 respondents were IT managers, and 20 of the respondents were persons with a managerial status other than managing director or IT manager.

Domain. 22 companies categorized their domain as ‘industrial’, while 28 companies categorized themselves as ‘services’, and 8 companies categorized themselves as ‘information technology’. The rest did not specify a domain.

2.6.2 E-level

The average scores of all companies on the different factors are shown in Figure 1. Even though the average scores on the different factors were approximately on the same level, there was relatively much variance in the data both between the different companies and within companies on the different factors of information network usage.

![Figure 1](figure.png)

*Figure 1. The average scores of all companies on the seven factors and the average overall E-level.*
The statistical analysis of the data revealed significant differences between the seven factors $\chi^2 = 23.1$, $p < 0.01$. The following pairwise differences were significant: resources – communication $Z = 2.9$, $p < 0.01$; networks – communication $Z = 3.7$, $p < 0.001$; resources – integrity $Z = 3.6$, $p < 0.001$; networks – integrity $Z = 2.7$, $p < 0.01$; resources – presence $Z = 2.6$, $p < 0.05$; networks – presence $Z = 2.4$, $p < 0.01$; and networks – business operations $Z = 2.5$, $p < 0.05$. The analysis of the correlations between the different factors showed that the highest correlations were: communication – business operations $\rho = 0.75$, communication – networks $\rho = 0.75$, networks – business operations $\rho = 0.73$, and communication – strategy $\rho = 0.71$, all significant at the $p < 0.01$ level.

The results analysed by company size are presented in Figure 2.

![Figure 2. The average levels of all companies on the seven factors and the average overall E-level by number of employees.](image)

In the open questions, the respondents pointed out the following issues as barriers for effective information network usage: the capacity of provided network connections, integration of software from different developers, the lack of time resources to train employees and to use the services provided by the information network, and excessive need for maintenance.

2.6.3 Response questionnaire

The results of the response questionnaire are presented in Figure 3. The scales were the extensiveness of the questionnaire in covering the central issues in information network utilization (1 = not at all extensive, 9 = very extensive), the usefulness of the categorization to seven factors, and the usefulness of the company feedback (1 = very useless, 9 = very useful). In the free evaluations of the feedback, seven respondents commented on the accuracy of the feedback. Six respondents thought that the feedback was accurate, while one respondent commented that e-communication in his company is more extensive than the feedback score indicated.
3. STUDY TWO

3.1 Participants

Representatives from 53 companies participated in study two by filling in a web questionnaire. Data from one company had to be discarded, because only a small part of the questionnaire was filled. Thus, the reported data is based on 52 responses. The demographic information of the companies is presented in section 3.6.1.

3.2 Questionnaire

The purpose of study two was to study the frequency of use for different communication technologies and usage contexts. The questionnaire consisted of 42 questions and three demographic questions. 40 of these questions were constructed systematically from three factors influencing computer-mediated enterprise communication: internal vs. external communication, office vs. mobile use of the communication technologies, and synchronous vs. asynchronous communication. These questions concerned the use of ten different communication techniques: 1) Mobile telephony 2) Internet calls (e.g. Skype) 3) video conferencing, 4) real-time chat (e.g. Skype chat, MS Messenger, real-time web-based chat rooms) 5) e-mail, 6) Short Message Service (SMS, mobile text messages), 7) discussion forums (e.g. web-based forums with discussion threads, blogs with discussion features), 8) World Wide Web (WWW) forms (e.g. for customer feedback or request for contact) 9) groupware (e.g. software for group editing of documents or group drawing of diagrams), 10) Applications (communication within other applications, which have a main function other than communication, e.g. billing, accounting etc.). Some of the selected technologies are based on a detailed list of communication technology implementations by Chi and Holsapple (2005). In the current study, we excluded methods used only for electronic publishing (e.g. sharing documents on a web page).

Five of the above mentioned technologies (1, 2, 3, 4, 9) typically represent synchronous communication and the other five technologies typically represent asynchronous communication. The use of these ten technologies was studied in both internal communication (between company employees) and external communication (communication with clients, cooperating companies etc.). The use of the ten technologies was also studied in both office use and mobile use. Office use was defined as the use of communication technology, when the employee is at his/her usual work location (e.g. private office at workplace or a desk for distance work at home). Mobile work was defined as any other location including use outside the company premises and use within the premises of own company, but outside the regular working location. Video conferencing formed an exception, if video conferencing technology was used in a specific location within one’s own company (a video conferencing room or a meeting room with a static video conferencing
system), the respondents were instructed to categorize the usage as office use. In addition to the 40 questions explained above, there were two questions, which studied the use of wired telephones in internal and external communication.

A 1-9 scale was used in all 42 evaluations. Using this scale, the respondents estimated the frequency of use for the different communication technologies in their companies from 1 (not used at all) to 9 (used extensively). In order to streamline the answers, the respondents were instructed to think of nine as usage, which occurs multiple times every working day, and five (the middle point of the scale) as occasional use occurring, for example, once or twice a month. The questions were presented to the respondents so that the two questions concerning wired telephony were first and after that the questions were in blocks of four questions so that each of the ten communication techniques was studied first in internal communication and office use, then in external communication and office use, then in internal communication and mobile use, and finally in external communication and mobile use. The order of the blocks was as numbered above.

3.3 Procedure

A link to the questionnaire was sent to representatives of 381 companies in Oulu South region, Ylivieska subregion, Finland. These companies consisted of the same set of 405 companies as in study one with the exception that companies unreachable by e-mail were removed. The procedures for selecting the company e-mail address, to which the invitation e-mail was sent, and for controlling that each company answered only once, were identical to those of study one. In study two, the company representatives had a week to submit their answers to the questionnaire.

3.4 Data analysis

Averages were calculated separately for each usage frequency estimation of the questionnaire. The data was also averaged so that average estimations were calculated for the use of all technologies in internal communication, external communication, office use, and mobile use. Wilcoxon’s matched pairs signed ranks tests were used in the pairwise analyses comparing the use of communication technologies in internal vs. external communication as well as in office vs. mobile use. Synchronous vs. asynchronous communication was not compared statistically due to the different nature of the techniques within the two categories.

3.5 Results

3.5.1. Demographics

Company size. The size distribution of the participated companies (in terms of number of employees) is presented in Table 3.

<table>
<thead>
<tr>
<th>Employees</th>
<th>0-4</th>
<th>5-9</th>
<th>10-19</th>
<th>20-49</th>
<th>50-99</th>
<th>100-249</th>
<th>250-999</th>
<th>1000-</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of companies</td>
<td>15</td>
<td>11</td>
<td>11</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Respondents. 34 of the persons who responded to the questionnaire were managing directors of their companies. 1 respondent was an IT manager, and 11 of the respondents were persons with a managerial status other than managing director or IT manager. 6 respondents were company employees with a non-managerial status.

Domain. 13 companies categorized their domain as ‘industrial’, while 18 companies categorized themselves as ‘services’, 7 companies categorized themselves as ‘business’, 2 companies categorized themselves as ‘information technology’, and 11 companies categorized themselves as ‘other’. One company did not select a domain.
3.5.2. Enterprise communication

The communication technologies and their usage categories that the company representatives estimated as the ten most frequently used technologies are presented in Figure 4 (office = office use; mobile = mobile use; internal = internal communication; external = external communication). The average numerical values for all communication technologies and contexts are presented in Table 4.

![Figure 4. The communication technologies and their usage categories, which were estimated as the most frequently used.](chart)

Table 4. The estimations for the frequency of use for the different communication technologies

<table>
<thead>
<tr>
<th>Technology</th>
<th>Office, internal</th>
<th>Office, external</th>
<th>Mobile, internal</th>
<th>Mobile, external</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile phone</td>
<td>6.4</td>
<td>7.7</td>
<td>5.6</td>
<td>6.4</td>
</tr>
<tr>
<td>Internet calls</td>
<td>1.5</td>
<td>1.6</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Video conferencing</td>
<td>1.2</td>
<td>1.4</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Real-time chat</td>
<td>1.5</td>
<td>1.8</td>
<td>1.3</td>
<td>1.6</td>
</tr>
<tr>
<td>E-mail</td>
<td>6.0</td>
<td>7.9</td>
<td>3.8</td>
<td>4.3</td>
</tr>
<tr>
<td>SMS</td>
<td>3.9</td>
<td>3.8</td>
<td>3.7</td>
<td>3.5</td>
</tr>
<tr>
<td>Discussion forums</td>
<td>1.5</td>
<td>1.6</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>WWW forms</td>
<td>1.9</td>
<td>3.2</td>
<td>1.9</td>
<td>2.2</td>
</tr>
<tr>
<td>Groupware</td>
<td>1.4</td>
<td>1.3</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Applications</td>
<td>3.9</td>
<td>4.9</td>
<td>2.6</td>
<td>3.0</td>
</tr>
<tr>
<td>Wired telephone</td>
<td>2.7</td>
<td>4.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Internal vs. external communication.** The average ratings for the frequency of use averaged for all technologies in internal communication were 2.65 and in external communication 3.12. The statistical analysis showed that the enterprises used communication technologies significantly more for external communication than for internal communication $Z = 4.3$, $p < 0.001$. The only technologies that had higher average usage frequency estimates for internal than external communication were SMS and groupware technologies.

**Office vs. mobile use.** The average ratings for the frequency of use averaged for all technologies in office use were 3.22 and in mobile use 2.48. The statistical analysis showed that the enterprises used the different communication technologies significantly more in office use than in mobile use $Z = 5.4$, $p < 0.001$. Wired telephony was excluded from this analysis, because it was only studied in office use.
4. CONCLUSION

The results of study one showed that the developed methods were used successfully by the managers of several different companies. The analysis of the data showed differences both between companies and within companies on the different factors of the seven factors model. The results suggest that resources and the use of electronic networks are the most developed aspects of information network utilization in the target company population. Some factors were also relatively highly correlated with each other. In particular, the relationship of the communication and networks factors was interesting: the ratings were significantly higher on the network factor as compared to the communication factor; nevertheless there was also a relatively high correlation between the factors. The differences between these factors should be made clearer for the respondents in the future version of the questionnaire.

When the results were categorized by company size, it was noticed that the e-levels were highest for the largest companies, but the smallest companies also got relatively high scores. The e-level was lowest for companies, which employ 10-19 employees. We think that this reflects a change in the enterprise structure of the Oulu South region. Large traditional companies have invested quite much in information technology and information network utilization. On the other hand, there are new small companies, some of which have taken the Internet as a strategic basis for their operation. As it is now, these companies employ mostly 1-9 employees. The companies in the 10-19 employees category mostly represent traditional industrial or service sector companies, which are not especially dependent on information network usage. Taking the domain structure of the companies into account, these results suggest that the enterprise profile of the region is changing from the traditional industry and service enterprises to more information-intensive companies.

For this study, a new concept of e-level was introduced. By e-level we mean the level of information network utilization of an enterprise calculated in a holistic way from various different viewpoints. To our knowledge, this concept has not been used before in the same sense as in the current study. In our approach, there is one important issue, which should be noticed before making inferences based on the e-level of a company. As we define it, e-level is sensitive to the domain of a company. An example of a company, which gets an e-level of nine, could be a dot.net company with a virtual organization, in which remote workers collaborate using the information network. In contrast, a traditional industrial company could utilize the information network very well relative to its goals, and still get an e-level of five, because there is no need to utilize the information network more effectively in its main business operations or to build the company strategy more on information network usage. Thus, using the current methods it is important that managers can proportion the feedback they get to the domain and goals of their company.

The fact that the presented methods for determining the e-level of a company are related to the company domain opens new possibilities. In addition to companies interested in developing their information network utilization, the presented methods could be used by regional developers and information society researchers. The existence of a program, which aims at promoting the information network utilization in companies using the presented methods, could be very beneficial, because it draws the attention of the managers to important issues related to different aspects of information network utilization. An example of such a program is described in this paper.

Considering the difficult nature of providing public regional services to enterprises, the results of the feedback questionnaire can be considered as promising. It should be noted that the feedback, which was given to the companies in the first phase consisted mainly of the average scores for their company, and – for comparison – the average scores of all companies in the region and companies in the same company size category. Consequently, after receiving the feedback, the managers were aware of the level of information network utilization in their company, but they were not given any advice yet on how to improve the issues related to the different factors and the e-level of their company. This was a probable reason for the average scores in the evaluations of the company feedback, and one manager also pointed it out in the free-form evaluations. Managers need simple and easily understandable guidance on how to improve the different aspects of information network utilization.

In order to focus more closely on information network utilization in companies we started by further examining the communication factor of companies. The purpose of study two was to develop and test new methods for studying the electronic communication in companies. The results indicated that the developed methods were again successful in providing important information from company managers regarding
electronic communication in their companies. The results also indicated that both synchronous and asynchronous communication techniques are utilized relatively much in most participating companies. As it is now, most synchronous communications are carried out using mobile phones, while e-mail is the most often used method for asynchronous communication. The results also indicated that office use of communication technologies is still more common than mobile use. However, this might change in the future as some companies already utilized the different communication technologies more in mobile use. The result that on average the companies used electronic communication more for external than internal communication suggests that electronic communication (especially e-mail) is already an important part of company relations.

The results also suggest that the companies in the current target area are relatively well networked with their clients and collaborators.

While it is probably true that managers cannot be aware of the communication technologies that each and every employee uses, we still suggest that the results of study two can be taken with some confidence. First, the focus of the study was on professional communication, and the managers are probably more familiar with the technologies used in professional communication (e.g. with the manager him/herself) than, for example, those utilized in leisure or casual use. Second, the participating companies were mostly SMEs (and the majority were small companies), in which the managers knows each communication process and also each employee personally much better than in large companies. Third, the differences in the average usage frequency estimations were quite high and systematic especially between the different communication technologies, which indicates that the managers had relatively clear conceptions of the usage frequency of the different communication technologies, when they gave their estimations.

We plan to use the results of study two as a starting point for improving corporate communications in our target area. We provide the managers with similar feedback to that of study one. In that feedback, the managers are shown their estimations together with the average estimations of other managers. This way the managers can identify weak points in the utilization of electronic communication technologies in their companies. We also aim at providing company-specific feedback, in which the managers are sent information about the communication technologies that they do not currently use. For example, by using free Internet telephony software for internal communication instead of mobile phones at the office, a company could save significant amounts of money in their telephone costs.

In sum, the two studies gave us important information about the state of information network utilization and electronic communication in our region. As it is now, most companies in developed countries have an Internet connection, and an e-mail address. This makes it possible for regional developers to reach a large number of companies with moderate effort by using methods similar to those presented in this paper. If the companies are also provided with carefully designed company-specific feedback, we believe that the companies will gain significant benefits by improving their information network utilization.

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