# Developing digital competence - learning, teaching and supporting use of information technology

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Ten golden rules for improving IT users’ competence

1. Provide users with detailed instruction sheets or videos, also during training.
2. Provide a variety of learning material.
3. Make sure users understand the usefulness of the IT.
4. Train users so that they understand IT use. Confront misunderstandings.
5. Train users so that they can solve problems and learn on their own.
6. Organise training at the same time as the system is installed.
7. Identify, organise, authorise and cultivate super-users.
8. Include IT, information and use competence in support and training.
9. Provide a variety of support channels and frequency.
10. Train local groups of users, not only individuals.
Chapter 13. IT user competence standards

The range of technology, information and business fit which users have needed has evolved over the years. In the 1980’s, the file system, individual office applications and possible business information systems constituted the typical collection of IT for users to master. The 90’s brought local networks and the Internet, with servers, browsers and e-mail added to the standard repertoire. During the last ten years, Web 2.0, mobile phones, tablets, digital cameras, music players and a number of other personal gadgets have sparked a diversification of modes of interaction as well as hardware. Business systems have moved into the browsers or migrated to enterprise resource planning software.

The continuous expansion of IT applications disables any stable description of the range of IT, information and business fit competence. However, some comprehensive guidelines for IT user competence have been developed, either for the general public, for special occupations or pupils at school.

13.1. Standards and guidelines

An approach to the latter is the FITness (Fluency with IT) report, which describes a comprehensive set of skills, concepts and capabilities, see Table 13 (Committee on Information Technology Literacy, 1999). This set of competences includes the three subject matter areas of IT, information and business fit, although business fit is less specified. Contrary to many textbooks on software use, it addresses concepts and principles. FITness go even a step further, by including programming and algorithms, which is considered beyond IT user competence as described in this book.

Most organisations depend on their employees being capable of operating business critical systems. For example, the cashier needs to be able to check out goods and register payment, police officers need to know how to use the communication equipment, and the air traffic controller must be fluent in the IT system mapping the flights. In the latter case, and in other high risk tasks like handling surgical equipment and nuclear power plant control, the operators might have to be certified. A detailed specification of the competence, including information technology, business fit and information competence, will be required for constructing certification tests.
Table 13. IT user competences as described in FITness (Committee on Information Technology Literacy, 1999)

<table>
<thead>
<tr>
<th>Intellectual Capabilities</th>
<th>Information Technology Concepts</th>
<th>Information Technology Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Manage complexity.</td>
<td>2. Information systems</td>
<td>2. Using basic operating system features</td>
</tr>
<tr>
<td>3. Test a solution.</td>
<td>3. Networks</td>
<td>3. Using a word processor to create a text document</td>
</tr>
<tr>
<td>4. Manage problems in faulty solutions.</td>
<td>4. Digital representation of information</td>
<td>4. Using a graphics and/or artwork package to create illustrations, slides, or other image-based expressions of ideas</td>
</tr>
<tr>
<td>5. Organize and navigate information structures and evaluate information.</td>
<td>5. Information organization</td>
<td>5. Connecting a computer to a network</td>
</tr>
<tr>
<td>6. Collaborate.</td>
<td>6. Modelling and abstraction</td>
<td>6. Using the Internet to find information and resources</td>
</tr>
<tr>
<td>7. Communicate to other audiences.</td>
<td>7. Algorithmic thinking and programming</td>
<td>7. Using a computer to communicate with others</td>
</tr>
<tr>
<td>8. Expect the unexpected.</td>
<td>8. Universality</td>
<td>8. Using a spreadsheet to model simple processes or financial tables</td>
</tr>
<tr>
<td>9. Anticipate changing technologies.</td>
<td>9. Limitations of information technology</td>
<td>9. Using a database system to set up and access useful information</td>
</tr>
<tr>
<td>10. Think about information technology abstractly</td>
<td>10. Societal impact of information and information technology</td>
<td>10. Using instructional materials to learn how to use new applications or features</td>
</tr>
</tbody>
</table>

Standards are operationalised through curricula and tests. Competence tests are used in level 2 evaluation of training, see Section 12.2. General tests of competences are presented below.

13.2. Tests

Both commercial and other organisations have developed IT user competence tests, see (Covello, 2010) for an overview. Three major ones are:

- Educational Testing Service is a US based, non-profit organisation, known for its Test of English as a Foreign Language (TOEFL). They offer the iSkills Assessment, which measures IT literacy (Educational Testing Service, 2011)

- Certiport is a commercial actor, also providing courses and tests for software professionals. (Certiport Inc., 2011)

- ECDL Foundation is a non-profit organisation providing the European Computer Driving License, also known as International Computer Driving License (ICDL). It was founded in 1995 by the Council of European Professional Informatics Societies in order to improve digital literacy across Europe. Later, it has gone intercontinental, and 11 million people have conducted tests given in 41 languages. (ECDL Foundation, 2011)
We will look at some sample questions to see how the tests are constructed. The ECDL is divided into 13 modules, mainly according to software types. In addition, there are three general modules:

- Concepts of ICT
- IT Security
- Project Planning

About Module 1, the ECDL / ICDL Sample Part-Tests (ECDL / ICDL, 2009 Module 1, p 1-2) says:

<table>
<thead>
<tr>
<th>Module 1 Concepts of Information and Communication Technology (ICT) requires the candidate to understand the main concepts of ICT at a general level, and to know about the different parts of a computer. The candidate shall be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Understand what hardware is, know about factors that affect computer performance and know about peripheral devices.</td>
</tr>
<tr>
<td>- Understand what software is and give examples of common applications software and operating system software.</td>
</tr>
<tr>
<td>- Understand how information networks are used within computing, and be aware of the different options to connect to the Internet.</td>
</tr>
<tr>
<td>- Understand what Information and Communication Technology (ICT) is and give examples of its practical applications in everyday life.</td>
</tr>
<tr>
<td>- Understand health and safety and environmental issues in relation to using computers.</td>
</tr>
<tr>
<td>- Recognize important security issues associated with using computers.</td>
</tr>
<tr>
<td>- Recognize important legal issues in relation to copyright and data protection associated with using computers.</td>
</tr>
</tbody>
</table>

Assume that we constructed open ended test questions for these learning objectives, like:

What is the Internet?
Karl responds:

_A network through which we access all places in the world_

Karl is describing a function of the Internet, so he is at the IT functional understanding level. His understanding may be limited, since he does not specify the different types of functionalities, like the www, email, chat, etc. The ECDL has multiple choice questions for testing understanding (ECDL / ICDL, 2009 Samle Part-Test 1.2, p 3):

<table>
<thead>
<tr>
<th>Which one of the following statements about the Internet is TRUE?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. The Internet is a global network that links many computer networks together.</td>
</tr>
<tr>
<td>b. The Internet is a private company network.</td>
</tr>
<tr>
<td>c. The Internet is a visual representation of linked documents.</td>
</tr>
<tr>
<td>d. The Internet is a network operating system.</td>
</tr>
</tbody>
</table>

The statements a-d describes the Internet at the IT conceptual level. Given that Karl responded like above, he would most likely tick the a alternative, so his test result would show that he understands the Internet at the IT structural level.
Concerning software, the spreadsheet module is selected as an example (ECDL / ICDL, 2009 Module 4, p 1):

Module 4 Spreadsheets requires the candidate to understand the concept of spreadsheets and to demonstrate an ability to use a spreadsheet to produce accurate work outputs. The candidate shall be able to:

- Work with spreadsheets and save them in different file formats.
- Choose built-in options such as the Help function within the application to enhance productivity.
- Enter data into cells and use good practice in creating lists. Select, sort and copy, move and delete data.
- Edit rows and columns in a worksheet. Copy, move, delete and appropriately rename worksheets.
- Create mathematical and logical formulas using standard spreadsheet functions. Use good practice in formula creation and recognize error values in formulas.
- Format numbers and text content in a spreadsheet.
- Choose, create and format charts to communicate information meaningfully.
- Adjust spreadsheet page settings and check and correct spreadsheet content before finally printing spreadsheets.

The learning objective specifies a series of skills, which are described in some detail. The “concept of spreadsheet” is not explained, so the understanding part of the goal is unclear. The tests are mainly of the practical kind, for example (ECDL / ICDL, 2009):

Enter a formula in cell F5 with an absolute cell reference for one cell only that divides the content of cell E5 by the content of cell E11. Copy the formula in cell F5 to the cell range F6:F10.

So the goal of skills seems to correspond to the test type. An open ended question which addresses understanding is also included (ECDL / ICDL, 2009):

Which of the two cells F4 or F5 displays good practice in totalling a cell range? Enter your answer in cell B14.

Answers to open ended questions like this one can be assessed right or wrong or according to a scale, for example skill – functional understanding – structural understanding.

Responses to multiple choice tests are easy to assess. Assessing whether the candidate has written a correct formula in a spreadsheet also requires only a quick view. Reading, interpreting and grading an open ended answer is much more tedious.

ECDL’s division of IT competence into software types hinders questions which relate concepts from two IT tools. For example, the following question could not be included:

What is the similarity between master slides in presentation programs and styles in text processors?

a. They guide the printer.
b. They provide information for the table of contents.
c. They enable coherent formatting of the file.
d. They enable import of slides into word processors.
Also differences between concepts could have been included if the tests could span more applications, for example:

What is the difference between tables and column layout in a text processor?
   a. Tables are imported from a spreadsheet, while column layout is generated within the text processor.
   b. Tables are only found in spreadsheets.
   c. Column layout is the vertical sequence of cells in a table.
   d. Tables are composed of separate cells of text, while column layout means that the text is displayed in sequential, vertical stripes.

The Instant Digital Competence Assessment (iDCA) is a recent test aimed at 14-18 year olds (Calvani et al., 2012). It is organised in the three dimensions technology, cognitive and ethics, instead of the organisation according to IT applications found in the ECDL. Technology corresponds to the IT subject matter area. The cognitive dimension addresses management and evaluation of data, which belong to the information area. Ethics covers general principles and constrains for IT and information use and is a part of the business fit subject matter area. Since iDCA is not compartmentalised into software products, it could cater for the two questions above.

iDCA consists of multiple choice questions and does not address skills by asking the respondents to carry out operations on the computer. Its technological area addresses problem solving.

**Competence tests versus self-reporting**

Performance on competence tests have been compared with students’ self-reporting of their competence level. The latter was gauged by users responding to statements like:

- My spreadsheet skills are good.
- I am a more experienced spreadsheet user than most of my peers.
- I feel competent to use a range of applications.
- I feel comfortable opening and saving spreadsheet files.

The respondents would agree or disagree on a scale.

Most studies conclude that there is no correlation between how people self-report their level of IT competence and how they perform in tests (Larres et al., 2003, Merritt et al., 2005, Sieber, 2009, van Vliet and Kletke, 1994, Ballantine et al., 2007, Sink et al., 2008, Grant et al., 2008). Low performing users overestimate their capabilities. On the other side, one study found a correspondence between self-reporting and test results of IT competence (Hakkarainen et al., 2000), and this is in line with the general findings that school students have a very accurate conception of their level of achievement (Hattie, 2009). In school, students are used to comparing their work with grades, which provides a good basis for reliable self-reports. Since IT use is a minor topic in schools, people may not have had such
experience concerning their IT competence, however. Since the majority of IT competence studies do not find correlations, we consider self-reports and levels of competence uncorrelated.

A consequence of users overrating their competence is that trainers and educators who rely on self-reporting assume a higher entry level than what is the case. For example, in a study of 173 college students 75% perceived their word processing proficiency as high and 20% as average (Grant et al., 2008). In the skills test, questions were grouped as basic, moderate and advanced. Table 14 shows the ten tasks which the researchers had characterised as moderately difficult. Tasks with correctness rank 1-7 are operations on the main document text flow, so no understanding of the data structure of document files is necessary. Tables and headers (rank 8-10) introduce independent text flows, requiring the students to alter their structural understanding of a document as a single sequence of characters to a multi sequence model. The majority of students seem to be stuck in the single text flow understanding, even though they characterise themselves as average or highly proficient.

Table 14. Performance of college students in the US on word processing tasks (Grant et al., 2008)

<table>
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<tr>
<th>Moderate tasks</th>
<th>Correct performance</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count words</td>
<td>91%</td>
<td>1</td>
</tr>
<tr>
<td>Add bullets</td>
<td>88%</td>
<td>2</td>
</tr>
<tr>
<td>Highlight text</td>
<td>82%</td>
<td>3</td>
</tr>
<tr>
<td>Find and replace text</td>
<td>60%</td>
<td>4</td>
</tr>
<tr>
<td>Use the Thesaurus</td>
<td>57%</td>
<td>5</td>
</tr>
<tr>
<td>Insert a date</td>
<td>54%</td>
<td>6</td>
</tr>
<tr>
<td>Justify a paragraph</td>
<td>47%</td>
<td>7</td>
</tr>
<tr>
<td>Enter data in a Word table</td>
<td>33%</td>
<td>8</td>
</tr>
<tr>
<td>Insert rows in a table</td>
<td>27%</td>
<td>9</td>
</tr>
<tr>
<td>Create a document header</td>
<td>8%</td>
<td>10</td>
</tr>
</tbody>
</table>

Although the competence tests do not distinguish clearly between a skill and understanding level, this test indicates that college students have a limited IT understanding. They might base their high self-confidence on their skills in getting a document produced.

13.3. IT competence levels

This book has described three levels of individual user competence: skills, understanding and problem solving in the three subject matter areas. Results of measurements of IT user skills worldwide follow their own ways of grading competence.

In an iDCA study in Italy, the teenagers scored higher on trouble shooting than understanding IT concepts (Calvani et al., 2012). This indicates that people learn some trouble shooting skills before they acquire understanding of many IT concepts.

An international survey of digital reading competence at school level 5 concerned the pupils’ ability to navigate and find appropriate web pages efficiently (OECD, 2011). Also, they were assessed on their skills in evaluating the information retrieved. The study therefore mainly addressed the information subject matter area. Interestingly, South Korean children outperformed the students from the other countries, including New Zealand and Australia,
Japan, European and South American countries in this ranking. Africa and North America were not represented. While a common opinion may be that people in the newly industrialised countries in Asia are well versed in electronics, while the European children are more literate in the original sense, this OECD study only partly supports such a view. Korean students perform better in digital than in print reading, while the opposite is true in Eastern Europe and South America.

Girls outperform boys in both digital and print reading (OECD, 2011). The same is found in a study of college students in the US (Hignite et al., 2009). An ICT literacy test amongst 6 and 10 year old children in Australia included a range of tasks typical for the age groups. Both technological and business fit competence were tested (MCEEDYA, 2010). Also in these areas of competence girls performed better than boys. A test of high school students in China with iDCA showed no performance difference between the sexes (Li and Ranieri, 2010), while the opposite is true in Eastern Europe and South America.

The findings that girls outperform boys on technological topics contrast the results from more than 30 previous studies summarised in (Cooper, 2006). One reason for this difference could be that the former IT assessments were more biased towards technology, while information and business fit have been given a larger proportion in recent years. Another factor may be that young children now grow up with mobile phones and social media on the internet, and that communication is more aligned to girls’ interests, while boys are competing in computer games. The recent studies showing female superiority were carried out amongst children, while former studies have addressed all age groups.

Socio-economic factors are generally influencing competence levels, and this is also the case for IT related competences (OECD, 2011). Having a computer at home has a positive effect on children’s IT literacy.

**13.4. Summary**

In high income countries, children play with digital devices from an early age and become skilled at manipulating computers. People in low income countries may meet the digital age through a mobile phone and few acquire computer skills. Regardless of skill levels, standardized tests show that people may struggle with understanding and problem solving.

Having a certificate of IT user competence may help getting a job, and millions of users have passed such formal tests. Many tests address skills to a larger extent than higher order IT use competence. Users who perceive themselves as skilled often fail tests which require more understanding.

While girls in high income countries score higher than boys on competence tests in the information subject matter area, the reverse is true for the IT subject matter. Interestingly, these differences were not found in China.
Part III - Managing development of digital competence in organisations

The previous parts have considered the individual’s competence and learning. In order to consider organisational aspects of IT competence, we shift focus from individuals to groups. We will base the identification of a group on people who share a set of activities, called a practice. Such groups constitute the units in a theory of learning at work within the class of situated learning theories. Situated learning refers to learning that takes place within the practice where the learning is applied.

Pedagogical theory – Situated learning – Communities of Practice

According to (Wenger, 1998) a community of practice (CoP) has three crucial elements; domain, community and practice. The identity of a CoP is defined by a shared domain of interest with shared competence for dealing with that domain. Members in a CoP value their collective competence and learn from each other. Second, members in a CoP create a community through engagement in joint interactions and discussions, by helping each other, and also by sharing information. They also build relationships that enable them to learn from each other. However, members of a CoP do not necessarily work together on a daily basis. The third characteristic element of a CoP is the practice; the doing which provides meaning and structure to the activities. The shared practice is created by practitioners who develop a shared collection of resources such as tools, experiences, and ways of addressing recurring problems. For example, a group of supermarket workers would constitute a CoP when they share the concern for the goods and customers, they interact, discuss and help each other, and they use common tools for sales and pricing of goods.

CoPs often differ from the formal organisational units, appearing neither on an organization chart nor on a balance sheet. In a small shop with a handful of staff, managers may be part of the cashiers’ CoP, and in a large organisation, the accountants spread around in different departments may interact sufficiently to constitute a CoP.

Newcomers get socialised into a CoP by imitating its members, and also by getting punished or neglected if behaving in ways which are not acceptable in the community. The members may also tell newcomers explicitly how to behave, and the novices may have attended formal education which has prepared them for the introduction. When a community of practice receives a new member, it is mainly the newcomer who will have to adapt, while the community is less receptive for changing their practice.
In line with (Wenger, 2000) and (Cobb et al., 2003), we consider three aspects of interaction between CoPs: boundary interactions, brokers, and boundary objects. In *boundary interactions*, members from different communities take part in common activities. This might be short encounters, like when a manager calls the computer support for getting help in connecting to the network, or longer practices, for example when health managers participate in a course conducted by health information specialists.

A *boundary object* is a material thing which makes sense in more than one CoP, and which also has a structure that is common enough to be recognized in both CoPs (Star and Griesemer, 1989). Boundary objects are used for communication between CoPs, and they may provide a common understanding of a phenomenon as well as give rise to misunderstandings. A database could be a boundary object for accountants and computer scientists, where both parties would recognize its ability to store and retrieve financial data. However, the accountants would emphasize its role of representing the financial affairs of their company, while the computer specialists could regard it as an instantiation of a relational database management system.

*Brokers* are at least peripheral members of two CoPs and can introduce parts of practice from one CoP to the other. A headmaster could be a broker between the community of teaching practice and the community of school management practice in the town. Construction engineers could be members of engineering, architectural and construction work practices, providing some joint understanding between the three partners.
Chapter 14. Superusers

The learning aim of this chapter is to be able to identify groups with different roles as learners and supporters and to specify conditions for these groups developing into communities of practice.

14.1. Roles

The areas of IT use competence were identified as information, IT, and business fit. Each of these has its specialists, while users in general will be specialists in their business and the domain of the system. In addition, teachers are specialists on metacognition, being a central ingredient in problem solving competence. The areas of practice of these four types of specialists are summarised in Table 15.

Table 15. Areas of practice and corresponding communities.

<table>
<thead>
<tr>
<th>Role</th>
<th>Area of main practice</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT personnel</td>
<td>IT</td>
<td>IT support staff. Software developer.</td>
</tr>
<tr>
<td>Teachers</td>
<td>Metacognition</td>
<td>School teacher. Business instructor.</td>
</tr>
<tr>
<td>Superusers</td>
<td>IT + at least one of the other</td>
<td></td>
</tr>
</tbody>
</table>

*Users* are characterised by having the domain of the information system as their primary domain of work. Second, people having information as the main domain of their practice, like accountants and archivists will be called *information officers*. Third, *IT personnel* have IT as their main domain of work, so these are in the IT practice.Fourth, *teachers* enable learning and have metacognition in their competence base. People working in each of these four roles can constitute communities of practice, since they share a main practice.

Finally, some users, information officers or teachers develop specific skills in using computers, so they provide computer support to their colleagues, and this group will be called *superusers*. A superuser can also come from the IT side and adopt competence from one of the other areas. Superusers will be members of at least two communities of practice, hence become brokers between these communities. They can also develop into a community of superuser practice. Each of these five roles will be described in more detail below.

*Users*

For the majority of IT users, the technology is a means to get work done, and not an aim in itself. Users find IT problems annoying and prefer to spend their time on their primary business. Their shared domains of interests are therefore not IT or data, but any other work area; hence they may constitute communities of non-IT practice. Correspondingly, the eventual learning of IT use taking place in these communities will be of secondary importance to the learning of the main business.
**Information officers**

Information officers are normally people of other professions than IT, having data management as their main responsibility. This could be accountants keeping the books, clerks doing data entry, statisticians producing reports, epidemiologists analysing data, surveyors measuring locations, or archivists storing and retrieving files. Information officers are the experts on information in the IT use competence model. Having IT as their main tool for work, they often develop into superusers, thereby achieving double expertise in relation to the information system.

In larger organisations, there may be an accounting department, a central archive, or a management information systems group, each having a number of staff working closely together. They could constitute *communities of information practice* within their application area. However, such specialists can also be scattered around in an organization, leaving them few opportunities for developing into a community. In these cases, user forum meetings, e-mail groups, professional societies or the odd phone call may provide sufficient contact for their expertise to be shared and thrive. If they work in a place where there is also a community of information practice in the same domain, like the accountancy department or the central archive, these communities could provide the support for the scattered individuals.

**IT personnel**

Larger companies or agencies would have IT personnel involved in a mix of activities. Network administration and user support would normally constitute two time consuming ones, while procurement and application tailoring could be other tasks.

The idea of a community of practice is that people share a domain of interest, and we could say that the IT systems and their users in the organization is the domain of the IT personnel. They would normally share information about the technology and its users through lunch conversations, meetings, e-mail, documentation and random encounters in the corridors. Larger organisations could also have a database for storing user requests and responses, where the IT personnel can search for topics with which they are unfamiliar. In these ways they may develop a shared repertoire of cases, problems, software and users, so that they constitute *communities of IT practice*. IT specialists meet users in boundary encounters on the phone and face to face, helping out those who need more IT competence, and they learn about users’ business and information through interacting with them. They also have boundary interaction with other communities of IT practice, e.g. at computer vendors, thus keeping updated in the IT field.

Software companies and IT vendors can also have departments for support. For these organisations, their customers will constitute their users. A newly established, small company might just have a flat structure, where all members carry out development and support. These would constitute a community of practice, where the software product constitutes the shared domain of interest. A big vendor, on the other hand, might have a call centre in India with several hundred staff members who serve customers worldwide. If they have the opportunity to communicate and exchange experience, they may also become a community of practice, where the users’ requests and the corresponding responses constitute the shared domain. In
between these extremes, there are many medium sized IT companies, where the user support is located in a department of a smaller size, such that the formation of the community is simpler than in the huge call centre case.

An IT department in a non-IT company would use the software and hardware vendors as their lifeline for support. They would engage in boundary interactions with the vendors, and the software and documentation would constitute the boundary objects of these practices.

**Teachers**

Larger organisations have human resource departments where educationalists are hired for organising and planning training, and who may also act as instructors themselves. Schools are obviously special in this respect, as their main staffs have formal pedagogical qualifications. They would normally constitute one or more *community of teaching practice* in each school.

School teachers and business instructors sometimes also do IT training. In schools, IT competence could be an end in itself or a means for the students to learn other topics. In the latter case, the teacher may be fluent on business fit and information but short on the technological competence. Professional teachers bring training methodology and learning competence, including knowledge of metacognition, into the realm of user support and training. This pedagogical competence is hardly found amongst IT personnel or information officers.

**Superusers**

Super-users are users, information officers or trainers who have specific IT competence and have taken on the role of supporting their peers in an organization (Boudreau and Robey, 2005, Olfman, et al., 2003). ‘lead users’ (Lee, 1986), ‘key users’ (Fitzgerald and Cater-Steel, 1995), ‘business coaches,’ ‘subject matter experts’ (Olfman, et al., 2003)(Gallagher and Gallagher, 2012), ‘power users’ (McNeive, 2009), ‘computer gurus’ (McNeive, 2009), ‘peer-coaches’ (Poe et al., 2011), ‘local experts’ (Orlikowski et al., 1995), ‘translators’ (Mackay, 1990, Mørch, 2011), ‘boundary spanners’ (Mørch, 2011) and even ‘super power users’ (Volkoff et al., 2004) are other terms for this role. They have also been grouped into ‘recognised experts,’ who have an extended reputation in the company, and ‘local experts,’ who are consulted by their close peers (Spitler, 2005). Beware that in computer science, the term ‘superuser’ is often denoting someone with administrative privileges for a computer or software system, who can grant access rights to others (2014b). In this book, superusers are characterised according to their role of helping others and not their software privileges. However, some superusers might also have extended access rights in the computer system for providing more effective help or for creating accounts for other users.

Superusers could have a primary domain of work completely remote from information or IT, for example nursing, sales or farming. They would therefore belong to two communities of practice; one on the IT side, and another on their primary domain, and they would also be brokers between these communities, see Figure 90. They could influence the communities of IT practice with their main competence, and introduce IT competence amongst others.
The text boxes present three superusers. Mozhdeh had some experience as an information officer when she did archiving. She became a superuser of an archiving system after her job was changed, but she still draws upon her knowledge of archives in her superuser role. Oksana is a superuser of a system which she uses frequently in her accounting job. She knows the information in the system, how to operate the IT, and how it supports the business. Sigrun has a computing background and was selected superuser for a web publication system. She is familiar with how it can be used for creating structured web pages.

While these three superusers had been appointed, superusers also emerge spontaneously when no formal appointments are made. In a purchase department of around 100 staff in a Finish company, all staff were provided training when a new information system was installed, but no system of superusers was

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established (Sykes et al., 2009). During a period of three months after training, all staff had either given or received help from others. On the average, a user helped five others, but some became more central, helping out more than ten, thus informally becoming superusers. A summary of studies on organisational learning shows that people learn more from others whom are trustworthy (van Wijk et al., 2008), and superusers can gain trust in their role by proving their abilities. An early study of superusers found that they not only regarded themselves as having better IT skills than others, they also used a larger number of software tools in their work (Eveland et al., 1994).

14.2. Community of superuser practice

A group of superusers could develop into a community of superuser practice if they engage in activities where they meet and exchange experience specifically on their superuser activities and role. The emergence of a community of superuser practice was deemed necessary for an enterprise information system to be adopted by its users, due to the distance in practices and purposes between the IT and the user communities (Volkoff et al., 2004). Almnes (2001) conducted a study of superusers amongst nursing home personnel, and McNeive (2009) reports from nurse superusers in a hospital. Both emphasize that belonging to a group is important for superusers, since their role is the only one of its kind amongst those whom they meet daily. In addition to group meetings, e-mail lists, newsgroups and lists of frequently asked questions may be advantageous. The organised group should also provide the necessary opportunities for the superusers to update their skills, whether new software or other upgrades necessitates it. An accounting company formalised their superusers into a group with a coordinator in charge (Åsand and Mørch, 2006). Mozhdeh and Sigrun belong to such groups.

Selected superusers who were going to help out during implementation of a clinical information system, spent on the average 13 hours per week for preparing themselves...
(Halbesleben et al., 2009). The longer time the superusers spent on learning the computer system, the more positive attitude did the users develop towards the system (Halbesleben et al., 2009).

An organised group has to cross the organisational units. In the Finnish company, the department was divided into three product lines, which again was split into a total of 11 groups (Sykes et al., 2009). A lot of the help was given across groups and also across the product lines.

The superuser is the first person in the support chain. She should handle most of the normal requests dealing with use of the computer system, for which she has received special training. In addition, the superuser should be able to take care of user requests concerning the operating system and standard tools. Both Mozhdeh and Oksana help out on information issues like getting the information into the right field and on IT issues like updating software.

Communicating frequently with users, the superusers receive requests for changes of computer systems. They are in a good position to communicate these requests to the computer department or those in charge of the software and hardware. This aspect of their role should be exploited, such that the requests from the users are taken into account. The meeting of superusers could also be an agenda for discussing and distilling such requests. This is a regular item on the agenda in Mozhdeh’s group.

The superusers could also act as communication links in the opposite direction. When system updates occur or tools are replaced, the users need to be informed and trained in the altered functionality. The superusers could naturally take on this obligation, and provide small training sessions locally if needed.

The superuser should be given responsibility of the resources necessary for carrying out the role (Almnes, 2001, McNeive, 2009). A dedicated amount of time for the superuser activities is recommended (Almnes, 2001, Åsand and Mørch, 2006). The resources for sending users for training, is a responsibility that should be attributed to the superuser.

The selection of people for the superuser role is an important issue for creating a decent support system. Superusers’ ability to connect socially with other people is in general improving the chances that others will learn from them (van Wijk et al., 2008). People with poor social skills should therefore be avoided. They could preferably be amongst those whom
people often calls for assistance, which would guarantee a caring person. In a survey of users and superusers, Boffa and Pawola (2006) warn against selecting users who are indifferent about or have negative attitudes towards the information system as superusers. Helbesleben et.al. (2009) confirm that a positive attitude amongst superusers spill over to the users.

McNeive (2009) and Poe et.al. (2011) emphasize that they should be champions for the changes that the computer system should support. Almnes (2001) warns against local managers, since they are often too busy and not always available. In addition, many people do not like to expose their misunderstandings to their superior. Sigrun is such a boss-and-superuser which is not recommended, but she mainly helps out people outside her subordinates.

People who are unwilling to take on the role should also be avoided. They may behave hostile or less caring towards their peers, and if so, the users will soon stop consulting them.

Since superusers help others solving IT problems and also guide them in problem solving, problem solving competence is important for superusers, as stated for the selection of superusers during implementation of a clinical information system (Halbesleben et al., 2009). In addition to computer skills, the superuser also ought to have skills in guiding others, something which the trainer need in particular. Poe et.al. (2011) emphasized that the superusers also should have some teaching competence, placing them also as peripheral member of a community of teaching practice.

Some IT personnel like Sigrun change their career into other occupations, and they will naturally be more skilled in IT than their peers. If they have the necessary inter-personal skills, they would become very good at supporting colleagues as well as communicating with the IT specialists. People having at least one formal computer course were more likely to become super-users (Eveland et al., 1994).

14.3. Superusers’ roles

Superusers may provide a variety of tasks, as recognised in guidelines for user support (ITIL-Axelos, 2011).

**Chauffeur**

Some people interested in output from information systems do not search themselves, but get others to do it, and this role has been termed ‘chauffeur’ (Culnan, 1983). When Oksana generates a financial report to employees who do not have access to the accounting system, she is their chauffeur.

While Oksana will continue generating the report for other staff due to her access rights, the chauffeur role also appears for other reasons. In a study of implementation of a companywide information system, adoption was slow (Boudreau and Robey, 2005). It was found that most user groups did not attend the initial training programme, and when the software was implemented, the users found ways of avoiding using it. Rather than entering data, they got some groups of information officers to be their chauffeurs by carrying out their data entry.
**Problem solvers**

Later in the implementation reported in (Boudreau and Robey, 2005), some self-initiated superusers found out how to operate the new software, and this competence was spread in the organisation as folk wisdom. In the end, most people used the system, after the user communities had found *workarounds* (see Section 8.4) in order to get the system performing as needed. This competence was also spread throughout the relevant user communities. Being a broker between business and technology, superusers would be in the perfect position for fitting the two through problem solving.

An e-mail support system had been set up in a global company years before the www was introduced. It was found that users’ problems were solved if the helper was either from the IT department or from users who considered themselves more competent on the problem than average, who came from another country and who was not a manager (Constant et al., 1996). There is no obvious reason why an international response is better than a domestic one. Diversity in responses in general seems to help, and the global community may contribute in that respect.

In a management consultancy company (Spitler, 2005), Goran was a superuser on most IT, but he did not know a statistical software package needed for some analysis. He contacted a superuser on the package, who had already set up an analysis model. Goran then acquired the problem solving competence of *customizing* (see p.109) for this package through learning how to write scripts. He thereafter customized the analysis to the particular user’s needs.

**Broker**

Being a peripheral member of a community of IT practice and also another community of practice makes the superuser a broker between the communities, enabling communication between the two communities. Mozhdeh participated in a group which requested changes to the IT department every quarter.

In a study of distribution of software set ups in a computer company, Mackay (1990) observed that for each group in the organisation, one person took the role of a broker between IT and other staff. This person was not an IT professional and also not amongst those with low IT competence. Those who played this broker role of superusers volunteered, such that there was no need for formal organisation, which was established in Mozhdeh’s case.

**Trainer**

In a community of practice, the practice would constitute the tasks of the majority, while the minority would be peripheral people who could learn the tasks through interacting with the majority. A training session is of an opposite kind, where the majority of learners is supposed to adapt to the minority of trainers. Unless all trainers are superusers, it is highly unlikely that the trainers and the trainees develop a common knowledge base during a two weeks in-service training session; hence such activities constitute boundary interactions rather than CoPs.

In-service training is acknowledged by Wenger (1998) as useful when providing a place for reflection on the practice, and as an opportunity for getting to know people whom one would
otherwise not meet. However, Wenger remarks that often in-service training or education are too detached from practice to foster learning which strengthens the individuals’ participation in the communities, an issue which was considered under ‘transfer’ in Chapter 10. This could easily happen when the business fit and information are not included in IT user training, or when business and information included do not match the learners’ experience. Including superusers amongst the trainers could bring training closer to practice. Super-users who are also ordinary users could bring business fit into training. Information officers could include relevant data which users recognise. Super-users who also belong to the community of teaching practice could teach ways for further learning, like problem solving competence.

Leaving the training to IT personnel only creates the risk of restricted interaction between users and trainers in the classroom. Including also a superuser improves the relevance of the training and creates variety amongst the trainers. The latter is in general an advantage for learning. Both Almnes (2001) and McNeive (2009) recommend that superusers should be involved in planning and conducting IT user courses, in order to include user activities in the training contents. Also, users feel more comfortable by being taught by one from their own profession than by a computer specialist.

Oksana lectured and guided other users on the human resource system. Her experience enabled her to convey how the system should be used to support the accounting tasks. She could also bring her inventions to the larger audience.

**Champion**

The extent of people’s use has been employed as a measure of success of introducing an IT system in an organisation (Davis, 1989, Venkatesh et al., 2003). Perceived usefulness, perceived ease of use, social pressure and facilitating conditions have been found to influence the amount of use (Venkatesh et al., 2003), see Section 8.1. Documentation (Chapter 2 and 4-6), training (Chapter 10) and IT support (Chapter 15) constitute aspects of the facilitating conditions, while superusers are members of the community of user practice, hence they can exert pressure on system use amongst its members. In order to know whether to put the effort into training, IT-support or superusers, knowing the relative influence of each of these factors would be needed. No comprehensive studies of all these factors have been carried out, but a comparison or coworkers’ influence versus training provides some insight.

In a non-profit organisation in the US, half of the 200 employees responded to a survey on IT use, perceived usefulness, perceived quality of user training, amount of user training, and coworkers’ IT use (Gallivan et al., 2005). 80% of the respondents were female, and the large majority had a university degree. The extent of coworkers’ IT use had the strongest impact on an individual’s use. Coworkers’ perception of the training quality and to a smaller degree also the individual’s perception of training quality also influenced the extent of the individual’s use. The amount of user training and the perceived usefulness had no influence. The latter contradicts the technology acceptance model (Venkatesh et al., 2003), and there is no obvious explanation for this finding.
This study points to the importance of what happens in the local work group and the possible futility of putting many recourses into training (Gallivan et al., 2005). Given that people follow their colleagues in their computer use, and that a new system is to be introduced, people will only use it if their coworkers do. For an innovation to be taken up, some have to lead, such that the rest of the community can follow suit. Super-users are in a favourable position to be the leaders, since they are well versed in IT in addition to being a coworker of the others. In order to become a strong leader, super-users would need to be well trained and preferably a member of a community of superusers, such that they also can learn from each other. Consequentially, providing thorough training for superusers would be more efficient than training the whole group of users.

The study also points to that the quality of the training is more important than the quantity (Gallivan et al., 2005). Since being able to help others would probably ease the leadership role of the superusers, their training should particularly emphasize understanding and problem solving skills.

IT innovations in organisations are often driven by champions, being people who persistently and convincingly argue for changes (Beath, 1991). Similarly, superusers could take a corresponding role in their department, convincing others to employ new solutions. Champions who get support from the IT department are more likely to succeed, and similarly, they need support from the IT specialists.

Innovation champions in general have a breadth of interest, view their role flexibly and believe that they can influence events (Howell, 2005). They employ official and informal channels to persuade colleagues and are able to frame new ideas as opportunities specifically targeted at potential users. For instance, a successful champion will demonstrate a prototype of a system to the information officers, pinpointing how the new system could ease organisation and access to their data. The champion would show the manager how the same system would improve the overview of the company’s performance, and the IT department would be told how the system could relieve the staff from previous maintenance trouble. Selling an innovation means making people understand how the system fit and improves their business and provides a useful tool for their work. Managers can help out by letting users with particular interests volunteer to champion them and by recognising achievements by the champion (Howell, 2005). Recognition could entail assigning the champion to a new, exciting project, to make them cooperate with leaders who appreciate their style of working or with other champions, or offer them educational opportunities.

A study of Canadian managers’ intentions to champion IT found that their knowledge of the technology and applications and their access to other people with IT competence were particularly favourable for their championing role (Bassellier et al., 2003). In a study in New Zealand, school managers’ IT competence, primarily developed through use, was the most important factor for their intention to champion IT in their school (Stuart et al., 2009). The same conclusion was drawn from a similar study of school managers in Iran (Afshari et al., 2012). If the same holds for superusers, those with higher level of IT and business fit
competence gained through IT use and those with stronger connections to IT personnel will be better champions.

Users who hear negative (positive) remarks from peers about a system develop negative (positive) attitudes towards it, and subsequently negative (positive) motivation to use it (Galletta et al., 1995). Superusers should therefore distribute positive remarks about a system to be championed. Unfortunately, negative remarks in general have stronger effects towards people not adopting an innovation compared to the effect that positive remarks have in the other direction. To champion a system, superusers therefore have to try to silence those against it and be prepared to counter their remarks and arguments.

14.4. Organising for competence development

The accounting company mentioned above appointed one superuser per 10 employees, and gave the superusers the obligation of training the others (Åsand and Mørch, 2006). Being organised in a community of superusers helped them becoming capable of carrying out this task. The same proportion was also utilized when introducing a patient record system for nurses (McIntire and Clark, 2009), while in another hospital, there was one superuser per 15 nurses (Poe et al., 2011). Oksana and Sigrun have similar roles, and they support 250 users. However, the information systems for which they are superusers are only used now and then by most of the staff.

The Finish company trained all 100 users simultaneously (Sykes et al., 2009). The study revealed that there was a positive correlation between how often a user gave or received help and how much she or he used the system. If the goal is high system use, helping each other after training is therefore effective. Seen from the individual user point of view, it would constitute a facilitating condition in the technology acceptance model (Venkatesh et al., 2003), see Figure 59, p.98.

When a new system has a large number of users, training is costly and it leads to disruption of the organisational performance. The latter is unacceptable when clients have to be cared for, like in a hospital, or when processes cannot be halted, like the power plant. To reduce costs and avoid disruptions, training is often provided only to a group of superusers, who are selected from each organisational unit. All staff is given access to user documentation, and the superusers are thereafter supposed to help out the rest of the staff when needed.

14.5. Summary

Users who help out colleagues on IT related issues are called superusers. People may develop informally into superusers because others seek their assistance, or they may be appointed by the organisation and given advanced training. Their background as regular staff and their additional IT competence make them experts on the fit of IT in their part of the business.

Appointing superusers has become a common strategy for introducing information systems in large organisations. Selected users from each department are appointed superusers with the responsibility of assisting the other users and functioning as a liaison between their users and the IT services.
Superusers need time and authorities to carry out their tasks. They learn more about the IT through regular discussions with each other. Engaged superusers can convince people to start using a system and keep them afloat by encouragement and support.

7. Identify, organise, authorise and cultivate super-users.

8. Include IT, information and use competence in support and training.
Chapter 15. IT support

The learning aim of this chapter is to be able to support users such that they increase their IT user competence.

Learning can take place anywhere and anytime, but some activities are carried out with learning as their main purpose. In addition to training, supporting users also constitutes an activity where learning may be the main objective.

15.1. Support as boundary interaction

Support is normally a boundary interaction between an IT specialist or a superuser on the supporting side and a user at the receiving end. The IT is a boundary object in the interaction, and documentation and data may constitute other boundary objects.

Support interactions are normally of limited size, being a few minutes conversation or a couple of written messages. Contrary to training sessions, the topic of the support sessions are initiated by the users and the support is targeting the user’s current problem. Support personnel would normally not prepare specifically for an encounter, but they may subsequently note down information about it.

While superusers have the advantage of knowing the business and the information, IT personnel would be the support expertise for IT problems. Also, staff in an IT department in a larger organisation would normally have user support as a main part of their job, while helping others constitutes an additional role for superusers.

When users and IT personnel meet, they talk about the same phenomena in different ways. For example, when a user says

we have a group of students who cannot synchronize

the technician talks about

IP-errors or server-errors (Kanstrup and Bertelsen, 2006)

We see the terminology problem from search in documentation (Section 2.1) reappearing. When the user and supporter are co-located, they also have boundary objects like software and documentation which they can look at, point to and interact with, and they can observe each other’s actions. When helping out on the phone, the oral interaction is the only communication channel. The following conversation took place when a user of a printer/copier called the vendor’s support centre for help. The support person searches a knowledge base for finding possible solutions (Crabtree et al., 2006):

Troubleshooter: OK, and what’s the problem you’re having with the machine?
Customer: I’m getting poor quality prints – sort of smudges on them.
Troubleshooter accesses knowledge base and selects ‘image quality’.
Troubleshooter: When it’s printing?

Customer: Yes.

Troubleshooter: OK, do you get this when it’s copying?

Troubleshooter: So you get it printing and copying and they’re like smudges?

Troubleshooter selects ‘smears and smudges’ in knowledge base.

The troubleshooter has to translate the vernacular of the customer to the specialist terminology. Likewise, the customer has to grasp the technical terms ‘image counts,’ ‘xerographic’ and ‘fuser module’ (Crabtree et al., 2006):

Troubleshooter: You know your image counts, which is the amount in thousands of copies that the xerographic and fuser module have done, check them just to see if they’re running over their copy limit and causing that problem for you.

Troubleshooter: Of course, yeah, take your time, that’s fine.

48 second pause.

Customer: Where do I find them?

Troubleshooter describes how to use the menus to find the counts and customer goes to find them.

70 second pause.

Customer: 43

Troubleshooter: Hi, that’s from your fuser module

(writes down count).

Troubleshooter: OK could you - do you know where the xerographic module is in the machine?

Troubleshooter: OK, I’ll tell you exactly where it is as there’s something I want you to try, just to see if this will rectify the problem for you – if you open the front door of the machine ...

After having negotiated a common understanding of the terms, the support person instructs the customer to carry out an operation, which will lead them through the first cycle of troubleshooting. If the customer remembers the steps such that he can do them without support the next time the problem occurs, he has learnt this particular way of troubleshooting the machine. Since the troubleshooter has this as her main job, she is likely to pick up users’ terminology and the technical trouble.

Support persons are often technical experts, and experts in general overestimate the competence of those whom they support (Hinds, 1999, Nathan and Koedinger, 2000). The troubleshooter in the case above communicated interactively with the user, enabling the troubleshooter to find out about the users’ competence level. This is more difficult if the support person only reads a short, written message. Supporters who know the competence
level of the user will adapt their responses by translating the jargon into less technical terms, like the troubleshooter did, and include only explanations which the supporter thinks are at the appropriate level for the user to understand (Nückles et al., 2006). Efficient supporters interact with a variety of users and experience a multitude of user problems and terminology, and they are 2-10 times as efficient as supporters with more homogenous interactions (Chi and Deng, 2011).

The interaction between 11 IT supporters and 61 users was observed during implementation of a work flow system in a US bank (Santhanam et al., 2007). In addition to support, several meetings were organised for the users and IT personnel to discuss issues. It was found that users mainly learnt IT skills during interaction. The IT personnel gained know-why, i.e., they understood how the IT was fitted in users’ business during the same encounters. Also understanding of the technology was shared. User competence, particularly on how the IT is used in business, is hence introduced into the community of IT practice and shared amongst the IT personnel (Santhanam et al., 2007).

15.2. Support quality

In a qualitative study, 39 users in the Finnish public and private sectors were interviewed about their learning preferences (Korpelainen and Kira, 2010). In general, they prefer learning IT use on the spot. Formal training courses take too long. Said one of the interviewees:

*There are so many [user training] courses and other rubbish that I can’t be bothered to do an extra thing. I haven’t left a single task uncompleted, so why would I bother. [ . . . ]. I don’t need the extra information, and I am not interested. I am only interested in being able to do my tasks; I just want to find the information and complete my tasks. That is all I need the system for.* (Korpelainen and Kira, 2010)

Also, users hardly read documentation (Novick et al., 2007), they rather ask others, unless they try and err or succeed. Getting support is therefore essential for most users both for learning and for solving IT problems without learning how to do it themselves the next time.

A survey of 484 users in a US university examined the correlation between support factors and user satisfaction (Shaw et al., 2002). The factors which influenced satisfaction the most are listed in Table 16. Factor 1, 5 and 6 are all qualities of IT support. Factor 3, user understanding, is partly influenced by previous training and support. Factor 4, software upgrades, is also a product of decisions in IT departments. Many users get annoyed when new upgrades appear, since they have to relearn the software, however, others push for new versions.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Factor</th>
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<tr>
<td>1</td>
<td>Fast response time from system support staff to remedy problems</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Data security and privacy</td>
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<tr>
<td>3</td>
<td>User’s understanding of the system</td>
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<tr>
<td>4</td>
<td>New software upgrades</td>
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<tr>
<td>5</td>
<td>Positive attitude of information systems staff to users</td>
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A high degree of technical competence of systems support staff

In general, the findings point to the central position of user support and to learning issues for user satisfaction with IT. Software upgrades and response time were the only factors found to correspond with studies from the beginning of the 90’s.

When broken down into three distinct user groups, administration, academics and students, there was a great variation in the factors. This corresponds with a previous study, concluding that the specific business of a user department influences its perception of IT support (Speier and Brown, 1997).

Users’ opinion of the performance of the IT support gave the lowest score to documentation which supports training (Shaw et al., 2002). This issue is not amongst the general top factors influencing satisfaction, since users regarded it as less important. However, non-academic users had this item in their top factors of dissatisfaction (Shaw et al., 2002). Low quality of training material is particularly bad since instruction sheets and models for understanding used during training are twice as effective for problem solving compared to material found elsewhere (Novick et al., 2009).

The physical place where users find IT support personnel has been called a helpdesk, while the phone call support is called a helpline. A survey of user satisfaction with helpdesks and helplines in the Netherlands compared user preferences (van Velsen et al., 2007). There were 64 responses concerning the helpdesk and 242 for the helpline (11% response rate).

Concerning the helpline, user satisfaction depended to a high degree on the quality of the solution which the support personnel came up with. Surprisingly, the users who contacted the helpdesk were more satisfied when having a good time at the helpdesk, while the solution was of secondary importance. Thus, the helpdesk should have friendly staff, while the knowledgeable ones should be working on the helpline.

15.3. Improving IT support

An IT department will normally be responsible for parts of the IT support for the whole organisation. IT departments previously often conceived their tasks as management of the technical installations and organised their activities according to the hardware and software packages. Consequently, there was one support service for each software package; hence a user who did not know whether his problem was connectivity, web-browser or credentials might have to approach three support people to get a useful response.

Lately, a view of themselves as providing service under the heading IT Service Management has become more common amongst the IT departments (Iden and Eikebrokk, 2013). This transition has been influenced by a set of guidelines for IT service operations called ITIL – Information Technology Infrastructure Library. ITIL has been developed by the British Office of Government Commerce, including strategy, design and operation of services. ITIL Service Operation (ITIL - Axelos, 2011) concerns user support and handling of incidents. It suggests organising one service desk as a single point of contact to handle all user contact, including troubleshooting, requests for software changes and warnings concerning threats to data security. Organisations which have implemented ITIL or similar guidelines have improved
their user satisfaction and service quality, including reduced response time (Iden and Eikebrokk, 2013).

ITIL succeeded more in larger than smaller firms in a study in Malaysia (Kanapathy and Khan, 2012). In an international survey of IT managers, the benefits to the operation of the IT support increased as the maturity of adoption of ITIL grew (Marrone and Kolbe, 2010).

The organisation of user support at Digibank is a common way of splitting up the services. Hayley talks about the Ticket system, which is an issue tracking system, where each user request is registered. This system enables communication between the support sections. If the first line of support cannot handle the request, the issue tracking system sends a message to the second line for them to pick it up.

An issue tracking system also allows statistical analysis of the tickets, such that Hayley can see the common issues. She would then bring the common issues to the attention of IT personnel dealing with software modification, such that they might prevent the trouble from reappearing through altering the systems.

Support personnel should have a wide range of capabilities. An experienced support manager summarised the ideal support person like this (Bruton, 2002):

- Patience
- Assertiveness
- Thoroughness
- Enthusiasm
- Responsibility
- Technical knowledge
- Empathy
- Communicative ability
- Works well under pressure

Digibank – user support manager Hayley – 1:

*We have organised user support in three sections. The Customer Desk is the service point for all of our hundred thousands customers. Therefore, customers can call and e-mail us 24/7, and our average phone response time is 30 seconds.*

*For our staff, we run the Front Desk within working hours. After we installed the Ticket system there also, user satisfaction has improved. Previously, some requests got lost and remained unanswered.*

*Back Office is our second line of support. If Customer or Front desk cannot solve the problem, it is referred to the Back office through the Ticket system. If they can’t deal with it, they may call our IT vendors.*
This list summarises a mix of technical and personal qualities which is hard to find, and those who possess all of these are unlikely to be satisfied with a technical support job, which is often low paid. Hayley is well aware of this issue and has a solution. A large company like hers can take advantage of people’s strong and weak sides by assigning them to a job where their competence is most needed.

Novice support persons would benefit from training up to the problem solving level for the most frequently occurring problems. ITIL suggests that they thereafter listen in to experienced staff before they start responding to calls and messages themselves under supervision of a mentor (ITIL - Axelos, 2011). Having a career path into technical, training or managerial positions may keep valuable service staff in the organisation.

15.4. IT support versus superusers

In contrast to the single point of all support by a service desk, a superuser may provide support for specific software (ITIL - Axelos, 2011). There have been several studies on the type of support which users prefer, and the results seem to depend on many factors.

Interviews of 40 users with education above high school in the US, showed that users preferred asking IT-personnel and colleagues at roughly the same rate (Novick et al., 2007).

In a survey amongst university staff in Norway, 49% preferred support from the IT services, while 31% chose colleagues (Nilsen and Sein, 2004). There were 222 responses to the questionnaire (37% response rate).

A survey of US middle level managers’ opinion on support gave the opposite result. 38% preferred superuser support, 26% other colleagues and 19% an IT centre (Govindarajulu et al., 2000). These results are based on 98 informants (response rate 11%).

These three studies agree that users prefer support from both IT personnel and superusers, but there is no consensus on which one is superior. A survey in Norwegian organisations investigated some possible causes for choice of support (Munkvold, 2003). Responses came from 277 informants, yielding a response rate of 41%. Short distance to the IT support personnel made users go there, while when the distance was longer, users preferred colleagues. Higher skilled users consulted the IT support to a lesser degree, while they solved problems more often themselves than did less skilled users (Munkvold, 2003).

Convenience and the users’ competence level may therefore be reasons for choosing one source of support to the other.

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15.5. Summary

IT support is an organised service for users who need help for solving their problems. Users may learn IT during support encounters and IT support personnel may learn business fit from the users. Support personnel learn about users’ IT competence through a diversity of interactions, thus becoming able to adjust their technical explanations to the user’s level. Support staff complements superusers, who are the business fit experts.

While users want support to help them understanding more, quick response time is the most important quality of support. Large organisations have improved their user support through a service desk, which is a single point of contact for all users. The service desk is staffed with service minded people, who forward more tricky questions to computer scientists in the back office.

9. Provide a variety of support channels and frequency.

10. Train local groups of users, not only individuals.
Chapter 16. Mutual learning during business fit

There have been numerous cases where IT designers have developed systems which do not fit users’ business and which therefore have not been used. When developing an information system or any digital device, the IT personnel involved in the design hence need to know the business into which the software and hardware are going to fit. While IT personnel have the IT competence, users would know the business fit, and information officers know the information to be included. In order to bring all competence areas into development, users and IT personnel are often cooperating in what has been termed participatory design.

While IT personnel’s need for understanding users’ business was recognised early, it was also noted that for participatory design to become effective, users also needed to learn about IT, so the term mutual learning was adopted (Bjerknes and Bratteteig, 1987).

Based on the identification of roles of users, IT personnel, etc., this chapter will characterize the competence of these roles during development of IT applications in organisations.

The competence needed for a development group consisting of both users and IT personnel was suggested by Kensing and Munk-Madsen (1993) to consist of six categories as shown in Table 17. “Abstract knowledge” corresponds to understanding, while “concrete experience” leads to skills. According to Kensing and Munk-Madsen (1993), before starting cooperation, users would have the concrete experience with their own work and not necessarily more. This implies that if they used computers, they would have the skills, but not necessarily understanding of the technology or the business fit. IT personnel would start out with the technological skills and understanding.

Table 17. Areas of knowledge in user-developer communication (Kensing and Munk-Madsen, 1993).

<table>
<thead>
<tr>
<th></th>
<th>Users’ present work</th>
<th>New system</th>
<th>Technological options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract knowledge</td>
<td>Relevant structures on users’ present work</td>
<td>Visions and design proposals</td>
<td>Overview of technological options</td>
</tr>
<tr>
<td>Concrete experience</td>
<td>Concrete experience with users’ present work</td>
<td>Concrete experience with the new system</td>
<td>Concrete experience with technological options</td>
</tr>
</tbody>
</table>

The IT personnel have the responsibility of creating conditions for users to understand their current work structures, particularly data flows and data structures. Also, the IT personnel in a project should enable both partners creating the vision and design proposals and provide experience with a new system (Kensing and Munk-Madsen, 1993). This categorisation of competence in mutual learning has been repeated until lately (Bødker et al., 2004a, Bratteteig et al., 2013).

This book emphasizes information as a separate area of competence for IT users. While changes in technology often lead to altered processing or transfer of the same information, other projects are driven by changes in the information. In a case of health management...
information system, health managers had noticed that most of the collected data remained unprocessed or unused (Braa and Sahay, 2012). While the unused data might have been part of the “relevant structures on users’ present work” for those who collected and entered it, it was of no relevance for the managers. The major work in developing the information system was to reduce the amount of data with 95% and agree on definitions of the remaining data and on rules for calculating indicators. Since information seems to constitute a separate area of competence also during development, information officers will be considered a relevant group also for mutual learning.

Figure 91. Developing joint understanding amongst users and IT personnel through mutual learning.

Based on users’ and information officers’ skills and IT personnel’s understanding of IT, mutual learning aims at developing a joint competence for both groups, consisting of structural understanding in all three areas of a new system, see Figure 91. Competence for envisioning new business fit belongs to the problem solving level of business fit competence, see Section 8.1.

In order to reach joint understanding of a new system, the two partners first need to understand parts of the current situation. Mutual learning can be considered as consisting of three processes.

1. Users and information officers learning about IT
2. IT personnel learning about the information and business fit.

3. Based on such a mutual understanding of each other’s competence areas, they jointly create understanding and skills of the new information, IT and business fit.

Users normally do not constitute one homogenous group. Rather, they do a variety of jobs in different departments and levels in the organisation. When building new systems for larger parts of an organisation, a diverse group of users and information officers would be needed to bring in all the organisation’s skills in information and using IT for the different activities (Markus and Mao, 2004). Including some existing superusers would have the advantage of bringing competence of the relation between IT and business into the project team.

16.1. Users and information officers learning about IT

This is what the two first parts of this book is about. The special requirement here is that users and information officers need to learn about technological options which can be utilized in their organisation, but which currently are not in place. Implementations of these options in other applications can be used for practical training, and functional and structural models can create some understanding.

The two other learning processes differ from those having been presented previously in this book, so they will be elaborated in the sequel.

16.2. IT personnel learning about information and business fit

As seen in the previous chapter, IT personnel learn about business fit during encounters with users (Santhanam et al., 2007). This can be done in more systematic ways, including interviews and observations. Interviews can provide an understanding of how information and IT fit in the organisation in a broader sense than for one user, thereby contributing to understanding the current situation. Observations can complement interviews through providing understanding of how individuals use IT and information for their business.

Interviews may give a skewed understanding for several reasons, one being that the user have skills, but lacks the understanding for expressing the business. This can be mitigated through making the interviews as concrete as possible, making the user telling what she actually does. Carrying out the interview at the workplace enables talking about the information and the IT being present, thus details of work can be included.

Other users may have more elaborate understanding of their work than anticipated. In a study of information officers in a lawyers’ office, the interviewer noticed that they frequently discussed the meaning of codes (semantic understanding) and that they

... were continuously experimenting with alternative strategies for coding documents. One lesson we (re)learned was the degree to which workers themselves are engaged in reflecting on and redesigning their own practice. (Blomberg et al., 1996)

They concluded that for learning about users’ business, the investigator should search for the knowledge work in what is called routines, and the routines in what is called highly qualified work.
Interviews and observations need to be thorough enough to avoid generalisation based on single cases. Anthropologists experienced in studying work in organisations emphasize that investigations should include

- comparing observations of the same individual over time and in different settings;
- comparing interview and observational data from the same individual, investigating apparent disparities between them; and comparing what people say about each other with what they can be seen to do, again using apparent disparities to guide further investigation. (Forsythe, 1999)

Aiming at learning the diversity of users’ business, investigations should ideally continue as long as one learns something new. In reality, there will be budget and deadlines which limit the amount of interviews and observations which IT personnel can carry out.

16.3. Joint creation of understanding and skills of new system

After users, information officers and IT personnel have learnt about each other’s area of competence, they would have a platform for joint creation of new systems.

User participation during development of information systems has in general been found to contribute to better solutions and less user resistance during implementation, although that is no automatic consequence (Bano and Zowghi, 2013). One way of obtaining the positive outputs has been identified as engagement or involvement, meaning the importance and personal relevance of a system to a user (Hartwick and Barki, 1994). Involvement in participation can be strengthened by allocating responsibilities for some tasks to users. It has been noticed that one reason why users do not involve themselves properly during development is scarcity of time. Rather, they become engaged after implementation, when changes are more costly (Wagner and Piccoli, 2007). Either, management can allocate sufficient time and promote engagement during development, or more of the mutual learning can take place during support, as illustrated in the previous chapter.

Many ways of mutually creating new visions and plans have been proposed, and comprehensive methods are found in the literature on user participation (Bødker et al., 2004b, Simonsen and Robertson, 2013, Greenbaum and Kyng, 1991). We will point to three techniques with learning outcomes in different areas, and these techniques can strengthen engagement.

Visiting other installations

Users, information officers and IT personnel jointly visit another organisation which has implemented a similar system. When representatives from the other organisation demonstrates and explains the function and structure of the system, the visitors can acquire an understanding of its information, technology and business fit. When trying the system themselves, they can obtain some skills.

Prospective users and information officers discussing with people in corresponding positions in other organisation enables identification with these people, which can trigger engagement.
Another way of strengthening involvement can be to make every visitor responsible for reporting the experience concerning their speciality to the whole group when returning home.

**Future workshops**

The aim is primarily to create an understanding of current business fit and of future IT, information and business fit. Users, information officers and IT personnel participate through three phases:

1. Critique session
2. Fantasy phase
3. Realisation phase

During the critique session, the participants create a joint understanding about problems in the current situation. The result of the critique phase could include statements like

*We have to log into three different systems. This is annoying, especially since you are logged out if inactive for a while. And I always mix up the passwords.*

The fantasy phase is intended for developing ideas and visions for a different future situation through brainstorming technological solutions and work processes. The participants can come up with a list like

*The computer will see who I am, such that there is no need for login.*
*All customers will enter their invoice directly into our accounting system. All we will have to do is controlling.*
*I wish we had an overview of all heavy-duty stuff on an app, such that we could easily see the closest site when allocating staff to customer visits.*

In the realisation phase, plans for implementing proposals that can be realised are worked out. The realisation also contributes to enrich the understanding of new systems such that users and information officers can learn the technological options and the IT personnel can obtain insight into the business fit.

Future workshops do not require any specific professional background. This means that anyone can be allocated responsibility for any of the phases, thus strengthening their engagement.

More comprehensive introductions to future workshops can be found in (Greenbaum and Kyng, 1991) and (Bødker et al., 2004b).

**Prototypes**

While future workshops provide some understanding about possible designs, prototypes provide the concrete experience. A prototype is a technological implementation of aspects of an IT system. It may provide some functionality, show parts of the user interface, demonstrate a new technological option, etc. When working with prototypes, the IT personnel will have the specific role of developing the IT solutions.
When trying out a prototype, experimentation will be a main way of learning for users and information officers. They will see whether it can do what they expect. They may also explore other aspects of the system. Experimentation and exploration contribute to both skills and understanding of the IT.

A functional prototype may also contribute to information competence, while a prototype of user interface will have less chances of triggering learning about the information in the system.

In order to learn about business fit, the prototype should be tested in the business where it is going to be used or in similar conditions.

Development and testing of prototypes take place in an iterative fashion. IT personnel learn about the same topics as the users and information officers when observing their operation of the prototype and discussing their experience.

Responsibilities can also be distributed during prototyping. Information officers could for instance be required to find their most complicated data structures to see whether the prototype can handle them. Correspondingly, users can find typical and exceptional cases to be used for testing functionality.

16.4. User representatives as superusers

Users and information officers having participated in mutual learning during development will be well suited for joining the training team of a new system and act as superusers (Volkoff et al., 2004).

A study of post-implementation of enterprise resource planning systems, mainly in the US, showed that the companies had included user representatives in their development and implementation projects. After implementation, the majority returned to their original departments and functioned as superusers there (Gallagher and Gallagher, 2012). While the goals of the projects had been business process improvements before the implementation, the success criteria afterwards had shifted to timely response to user needs and user satisfaction. Whether success depended on the transformation of user representatives into superusers was not investigated.

16.5. Summary

User participation in development of information systems is considered advantageous. To achieve fruitful participation, users need to learn about new IT options, and IT personnel need to learn about information and activity fit. In order to design new solutions, users, information officers and IT personnel need to develop joint understanding and concrete experience of information, IT and business fit for future use of new technology. This mutual learning can be enhanced if users and information officers become personally engaged, something which requires sufficient time and responsibilities during development.
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