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Seek and you will find, share and you will benefit: organising knowledge using groupware systems

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Abstract

Knowledge has been of growing importance in economic life during the last century, and most organisations depend on knowledge for their existence. Knowledge is both external and internal to the organisation, explicit within the organisation or tacit, resting with its employees. There are different forms of knowledge, and knowledge is the intellectual capital of organisations. This valuable capital can be collected, documented, classified and organised, using a new type of computer software, the groupware.

Certain tools must be employed to organise knowledge into the groupware for it to function as a solution for knowledge management. These are the tools which the library and information specialist, trained in records management, has at his disposal. The groupware can produce definite benefits for the management of any organisation and for its knowledge management. However, in order for the groupware to meet expectations, the introduction of it must be planned and it must be correctly implemented, as only correctly implemented can the groupware become the solution for organising and preserving the knowledge base of the organisation.

Keywords: Groupware; Management information systems; Knowledge management; Records management

1. Introduction

Knowledge is an important competitive advantage for any organisation. Increasing competition, continuous changes and mergers in industry have, however, made the risk of losing valuable knowledge, due to transfer or termination of employees, a real problem. Organisations must, therefore, preserve their knowledge base and take steps to utilise effectively both the internal and external knowledge which is of relevance to their operations and make it explicitly available to their employees. One way to manage and share this knowledge is to employ for this

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purpose a computer-based information system, the groupware, which is a collection of computer software and work processes.

The aim of this article is to show how the groupware, especially if it has a good records management solution in the system, can be used in information and knowledge management. Another important aim in using the software is to encourage co-operation and sharing of information within the organisation.

First, we discuss knowledge management and the different types of knowledge and show how important and valuable intellectual capital is for the operation and survival of any organisation. To be of value and accessible to the user, information and knowledge must be placed into the groupware in an organised manner. Here, knowledge of indexing and classification is important and makes the skills of the library and information specialist valuable in organising the knowledge base. Then we introduce the groupwares, what they are, what they can do and what benefits can be derived from their use. These systems are then evaluated on how they meet criteria regarding information methodology and information technology. Finally, we conclude by discussing how the groupwares should be implemented, as only fully implemented and correctly used, are these systems putting the knowledge base of the organisation into full use.

2. Knowledge management

During the last quarter of the 20th century, there has been an increasing focus on the use of knowledge in business. We hear of total quality management, business re-engineering, the learning organisation, and knowledge management. Utilising and organising information and knowledge is central to these developments. But what is the difference between information and knowledge?

Facts without context are called ''data''. However, when these data have been organised, analysed and interpreted to acquire a meaning, we talk of ''information'', but information only becomes ''knowledge'' when it is put into a logical and understandable context which we can verify and recall from our experience. Information only becomes knowledge when it meets a need to finish an assignment or to solve a problem (see also Davenport and Prusak, 1998a, b, pp. 1–12). The truth is that we are drowning in information, but we thirst for knowledge.

In business, as in so many fields, it helps to know what one is doing. Knowledge is an important asset which individuals and organisations can use to their advantage in our competitive world. Many organisations have realised this and have embraced ''knowledge management'' as a way to discover, collect, document and organise a knowledge base which the employees of the organisation can later retrieve, distribute and use in their individual daily work and in their collaborations with their colleagues. This new environment, the system of people, practices, technologies, and values are even acquiring a new name, the information ecology (Yakel, 2000, p. 26).

Knowledge management projects focus on:

- Creating knowledge repositories.
- Facilitating the capture, creation, transfer, use, and sharing of knowledge.

- Managing knowledge as an asset, structuring it, organising it, safeguarding it (Abell & Oxbrow, 2001, p. 37).

The essence of knowledge management is:

- Connecting people with people.
- Connecting people with information.
- Enabling conversion of information into knowledge.
- Encouraging innovation and creativity. (Abell & Oxbrow, 2001, p. 39).

There are many ways to look at knowledge. On the one hand, there is the tacit or implicit knowledge resting in the minds of employees, such as work experience or contacts with customers. This knowledge can easily become lost to the organisation when employees leave, especially if their work is terminated due to a dismissal. On the other hand, there is explicit knowledge which has been documented in some way (Saffady, 1998, p. 4). This knowledge can be both inside and outside the organisation. I prefer to look at knowledge from this angle, whether it is internal or external to the organisation and how it can become internalised and made explicit.

2.1. External knowledge

Examples of external knowledge are seminars, conferences and lectures attended by employees. If employees are required to report on such events, this knowledge can become a part of the knowledge base of the organisation. Organisations can also acquire and distribute to their employees published material from external sources such as books, magazines, and so on, and create access to external databases and the Internet. All this material is used to support the employees in their work. In this way external knowledge becomes internal, but it can be either implicit or explicit depending on the organisation's approach to knowledge management.

2.2. Internal knowledge

The internal knowledge is either documented or not. It is created in the daily operations of the organisation. Basically it is of three types. First, there is the knowledge which rests in the minds of the employees. Second, there is the documented knowledge which we find in the various records of the organisation, not necessarily available or known to the employees in general. Finally, we have a relatively recent phenomenon, the groupware, where the knowledge base of the organisation is organised, managed effectively and is accessible to all authorised employees, provided that the system is properly implemented.

2.2.1. Implicit or tacit knowledge

Every employee has some knowledge which has not been documented but is nevertheless often of great value to the organisation. As an example, there is the work experience of employees, how things are done, knowledge of customers and their needs, various personal contacts and so on. This knowledge is implicit, but it can be written down and it can be documented. This knowledge can become explicit if employees are willing to share their knowledge with others.

The introduction of quality management to industry and the certification of organisations under the ISO 2000:9000 quality standards has been instrumental in forcing organisations to document what they plan to do and then to act in accordance with what they have documented. Product recipes are written down and should agree with the raw materials actually used in the production. Production processes and work procedures are written down. The order process is documented every step of the way to make it possible to trace what took place. Customer relations can also be documented in a similar manner, from the initial contact, the offer, the acceptance and so on.

We can learn from our employees in many ways by documenting their experience. Some organisations have created knowledge maps or directories that chart where particular knowledge is to be found within the organisation. We can ask employees to report when coming back from conferences or customer visits. It is not only meetings which should produce minutes. The Army uses debriefing and has introduced an After Action Review programme (Davenport and Prusak, 1998, p. 8). We can learn from the Army and ask project participants to document upon completion what could have been done better, or should have been done differently.

Many organisations have developed databases of best practices where they have documented the preferred ways of doing things which their employees have discovered through trial and error what works best in a particular situation (Saffady, 1998, p. 11). There is no need to constantly re-invent the wheel. We can compile a trouble shooting guide for the manufacturing department, check lists for repetitive events and tasks like maintenance, a list of frequently asked questions (FAQ) about products or services for the customer service, and so on. 3M, for example, has integrated customer relationship management (CRM) and knowledge management software to respond to customer queries on their more than 60,000 products (Edwards, 2000). From these examples, we can see that there is a great number of ways in making expert and implicit knowledge explicit and available to other employees.

2.2.2. Explicit knowledge

The most common type of documented internal knowledge in most organisations can be found in the records which we find on paper, films, discs and tapes, both in human readable and electronic form. This is explicit knowledge, in the form of incoming and outgoing correspondence—including faxes and electronic mail—internal and external supporting material, minutes from meetings, agreements, internal memos and reports, plans, contracts, and other related matters. Furthermore, these are accounting and business records, production records, service and maintenance records, as well as documents relating to work processes in the quality and environment management systems. All these records may vary according to the type of industry the organisation is in, although they are essentially the same for all practical purposes.

These records are kept in filing cabinets, folders, in the memory of personal computers, on floppy discs, computer discs and in various databases using a variety of information technologies. The problem with this knowledge is that it can quickly become lost, if the information is stored in a manner making it difficult to retrieve, and thereby this knowledge can become implicit. The storing of information on the hard drive of personal computers by individual employees is a classic example of information which can even become totally lost when the employees leave the organisation. The groupware can solve this problem.

2.3. The knowledge quadrants

The authors of the book The Knowledge Creating Company (Nonaka & Takeuchi, 1995, pp. 62–74) claim that new knowledge is created by conversion, for example, when personal knowledge becomes public knowledge. These conversions are of four types:

1. *From explicit to tacit* (*internalisation*): We learn by acquiring public knowledge. This knowledge is internalised. We obtain general knowledge from books, the Internet, and other public sources.
2. *From tacit to tacit* (*socialisation*): We learn by socialising with other people, exchanging ideas and experiences. We observe our elders and they share with us their wisdom.
3. *From tacit to explicit* (*externalisation*): Personal knowledge becomes public or explicit knowledge through documentation. The knowledge of individuals is collected, documented and classified to be available for re-use by others.
4. *From explicit to explicit* (*combination*): Here explicit knowledge from different sources is combined, mixed or connected to create new knowledge, new innovations. Later, we will learn how groupwares are used for this purpose.

We see these transformations at work all around us. As more individuals come together for group work in organisations, using both the explicit and tacit knowledge, the more likelihood there is that new knowledge will be created. The sharing of knowledge is, however, in many ways alien to our Western culture as our upbringing does not foster it. We are raised in a competitive society where knowledge is power and sharing it does not come naturally. In such group work, trust, honesty, the willingness to learn, and to share knowledge and ideas are important qualities.

The research of Amidon and Skyrme has shown that for creating high levels of innovation and learning, it is critical to have a culture of knowledge sharing (Amidon & Skyrme, 1997). ''Free flowing conversation, open dialogue across organisational boundaries, team and network building'' are important for creating such a culture (Skyrme, 1997, p. 26).

As we will see later, the groupwares provide the forum for this new cultural exchange. They provide the technology to facilitate communication and the sharing of information to create and manage knowledge. But sharing and exchanging knowledge will not be fruitful unless it has been put into the groupware in an organised manner. If that is not done, retrieving it, sharing it and building on it may prove difficult, even impossible. Therefore, we must organise the knowledge base. When we look at Fig. 1, we see that we are organising the knowledge base when we move from tacit to explicit. However, when we move between the explicit quadrants we are using the groupware.

Organisations, according to Morten Hansen and his colleagues, should select their knowledge management strategy based on their competitive strategy. Companies which sell relatively standardised products follow a codification strategy, carefully collecting, codifying and storing their knowledge in databases where it can be accessed and re-used, but companies which offer problem solutions which are tailored to individual customers follow a personalisation strategy where knowledge is shared mostly by person-to-person contact and computers are mostly used to help people communicate knowledge, not to store it (Hansen, Nohria, & Tierney, 2001, p. 63).

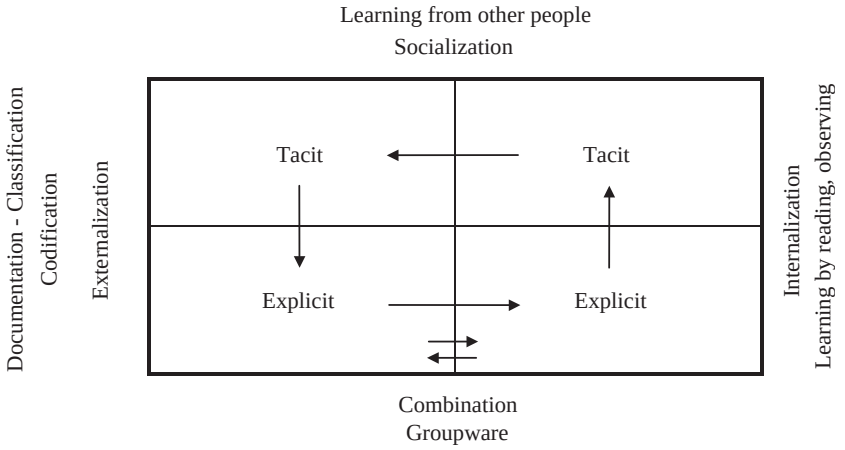

Fig. 1. Organisational knowledge conversion.

Emphasising the wrong strategy or trying to pursue both at the same time can quickly undermine a business, they claim.

I am not refuting the value of creating a network of experts which can be consulted and put on a task force to come up with creative and innovative solutions. But experts come and go. Even the old tradition of passing on the commercial wisdom or craftsmanship to our children is fading as they no longer follow in their parents' footsteps but increasingly enter into careers of their own. It is here that the groupwares come in to bridge the gap, combining the two strategies, creating a platform where people can share codified, systematic knowledge and at the same time co-operate in a creative manner in an organised environment. These systems offer even the opportunity that people participate in discussions, present and challenge ideas, and vote on issues, anonymously, thus creating an environment where the participants can be frank and open without having to worry about the various consequences (Abell & Oxbrow, 2001, p. 52).

2.4. Intellectual capital

Access to financial capital was once a significant competitive advantage. Now, capital is a commodity which can be raised in many places in the world. What has also changed is that it is not necessary to own aeroplanes to operate an airline, as an example, but one must know how to run it. Intellectual capital has become the important asset of our times, and intellectual property now comprises well over half the market value of publicly traded companies (Aston, 2002, p. 58).

As shown in Fig. 2 a distinction is increasingly being made between physical capital and the intellectual capital which a company employs. Intellectual capital is further broken down into human capital, that is individual capabilities, experience and skills, structural capital which is the capacity to meet market requirements by use of systems, processes, plans, etc. and customer capital which is the value of customer relations, what ties customers to the organisation (Stewart, 1997, pp. 75–165). Various measures of the value of intellectual capital have also been made out (Stewart, 1997, pp. 222–246). The best-known book on the subject is perhaps The Balanced

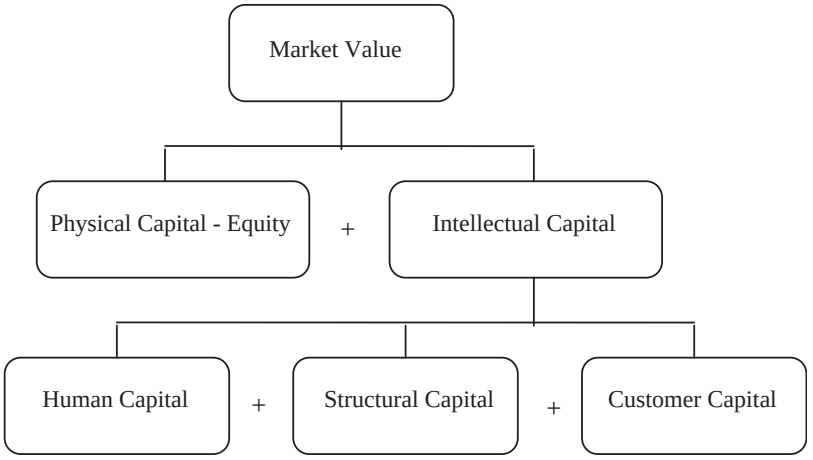

Fig. 2. The valuable organisation.

Scorecard (Kaplan & Norton, 1996) where measures of what drives future performance of the organisation, the intellectual capital factors, are introduced to complement the financial measures.

One measure of intellectual capital is what the market is willing to pay for it. When IBM bought Lotus in 1995 it paid $3.5 billion for the company, 14 times its book value of $250 million. IBM did not pay that money for the revenue which Lotus generated. It was paying for the intellectual capital in the company. The minds that invented Lotus Notes were more valuable than the software itself (Davenport & Prusak, 1998a, b). The value of intellectual capital then really boils down to the difference between companies in the return they are receiving from their physical assets, the difference being how they employ their intellectual capital. A simple measure of the intellectual capital is, therefore, the difference between the market value of the company in the financial market and the book value of the equity in the financial statements (Sveiby, 1997, p. 18), provided that the value of the physical assets is their market value. Although intellectual capital is not accounted for in the balance sheet, it is no less real. Annually, "IBM itemises more than $1 billion in earnings each year from its intellectual property portfolio" in the income statement (Aston, 2002, p. 59).

The groupware is supposed to safeguard this intellectual capital, organise it and make it available and useful. It is obvious that we would want to have a good system to guard the Crown Jewels, but we are trusting the groupware with items of no lesser value. It has to be good.

3. Organising knowledge

Consulting firms have been in the forefront of building knowledge databases or repositories where they have tried to collect throughout the organisation scattered information, knowledge and experience from working with customers in order to convert it into organisational memory: Knowledge Xchange was set up by Andersen Consulting, Knowledge On-Line was developed by

Booz Allen & Hamilton, Center for Business Knowledge was created by Ernst & Young, Knowledge Manage was established by KPMG Peat Marwick, and Knowledge View is at Price Waterhouse (Takeuchi, 1998). Some of these consulting firms no longer go by these names, but it does not change the fact that valuable knowledge can be collected and placed into repositories for use by others. But it has to be done correctly.

In the better days of Arthur Andersen, an Andersen Consulting Knowledge Manager was quoted as saying: "We've got so much knowledge in our Knowledge Xchange repository that our consultants can no longer make sense of it. For many of them it has become data" (Davenport & Prusak, 1998a, b, p. 7). This happens when the knowledge base is not organised. Organisation is, therefore, paramount. Here the contribution and knowledge of the library and information science (LIS) specialist can be of great value.

To be an information science specialist one must, among other things, be able to:

- *Disseminate and deliver information* by abstracting, analysing, editing, writing and designing information and being familiar with the IT applications and intranet/extranet management.
- *Manage information* and here the tools are archives management, bibliometrics, cataloguing, codification, content management, document management, indexing, informatics, information architecture, information/document lifecycle, metadata, records management, taxonomies, text analysis and thesauri (Abell and Oxbrow, 2001, p. 70).

It should not come as a surprise that the knowledge which the LIS professional has acquired through his education and training of bibliographies, cataloguing, indexing, taxonomies and thesauri makes him a candidate for the job. Although these terms are familiar to librarians, some explanation of these tools for organising information and knowledge are in order.

3.1. Organising tools

A bibliography is a list of items, originally books, giving the description and identification of the edition, date of issue, authorship and typography of written material. A catalogue is a list, usually alphabetical, of the materials or items in a library, making it possible to find the library material by author, title or subject. An index is an alphabetically arranged list of pointers guiding the user to entries in a catalogue or bibliography, or to a place in the text of a document. It gives us indications of what the record may be about, but it does not tell us what it means. Taxonomy is the science, laws or principles of classification.

A thesaurus is a collection of a controlled vocabulary giving a semantic relationship between terms. It facilitates search in a free text database by suggesting additional search terms which can be either equivalent or related in some hierarchical or associated way (Rowley & Farrow, 2000, pp. 22–161). Rules on how to construct a thesaurus can be found in the ISO 2788 standard (ISO, 1986).

There are several well-known bibliographic classification systems available, like the Dewey Decimal Classification, Library of Congress Classification and so on. (Rowley & Farrow, 2000, pp. 215–243). These systems are, however, not always well suited for organising knowledge in industry. The LIS professional must, therefore, often depend on his own knowledge of taxonomy to construct a subject classification system for records, information and knowledge in industry.

It is neither possible nor the plan in this article to teach classification or indexing or to discuss these functions in any detail. I can only mention that there are several publications available for filing and classification which can be recommended (ARMA, 1988; ARMA, 1989a, Filing Procedures; ARMA, 1989b, Numeric Filing; Bradley & Dale, 1999; Bennick, 2000; Dale, 1999), and the book Classification Made Simple covers the basics of subject classification in a clear and concise manner (Hunter, 2002). There are some good books available on indexing (Cisco & Dale, 1998; Lancaster, 1998). On writing abstracts (Lancaster, 1998) and making up thesauri (Aitchinson, Chilchrist, & Bawden, 2000) is also a field where good references can be found.

In order to file records, their subject must be determined and a subject name chosen for classification. Guidance on the choice of subject names can be found in an international standard (ISO, 1985). In the guidelines accompanying new a standard on records management (ISO, 2001a, b, ISO/TR 15489, p. 9), there is an example of a classification system. Textbooks on records management, like Information and Records Management, offer also some valuable information on the subject (Robeck, Brown, & Stephens, 1996, pp. 98–130). Therefore, the professional most likely to have the education and training to compose such classification systems and organise the knowledge base into the groupware is the LIS professional trained in records management.

4. Groupware

Organisations introduced specialisation originally to increase efficiency and output. What followed generally was that information was departmentalised and not shared. Knowledge was something that departments and individuals kept to themselves. This was not so much of a problem in small organisations which operated locally when the ability to create documents was limited and they were in paper form. In an organisation of 200–300 people, it is even possible for people to know one another "well enough to have a reliable grasp of collective organisational knowledge" (Davenport & Prusak, 1998a, b, pp. 17–18) but beyond that it becomes impossible.

With the creation of the large organisation which acts globally, access to information, both globally and on an individual basis, became more difficult. The full gravity of the problem was later realised when employees who had been storing records on their personal computers for many years started to leave their jobs, leaving behind their personal computers full of information which no one could retrieve or utilise. Groupwares are aimed at solving this problem.

4.1. What is it?

Groupwares is a collaborative technology which allows people to communicate with each other, co-operate on projects and share information and knowledge. Groupwares are a collection of computer software, employees and work processes within an organisation. The system works if all three parts are operating in harmony. The employees must respect the work processes and use the software for the system to function. If some employees use the system but others do not, then the system does not function. It will be like an orchestra where each member plays his tune.

The most common features of the groupware systems are presented in Fig. 3. The groupware links employees together and connects them with the information and knowledge base of the

- Electronic mail and messaging.
- On-line calendars or diaries of employees.
- A records management solution. This is the part of the system which is also utilised for knowledge management.
- Project management, TQM and environmental management with all their manuals and documents is part of the system, if applicable.
- Mapping of employee knowledge areas and expertise is part of the open system, but most of the other records of the HR department are of course with limited access.
- On-line catalogues of library material, books, journal articles etc. are part of the system, and sometimes portals are made up to create access to specific material on the *Internet* or in internal data bases.
- Desktop video conferencing is a less common feature, but many of these software solutions offer the possibility to hold meetings on-line and even to vote on issues anonymously.

Fig. 3. Common features of groupware solutions.

organisation, offering them the opportunity to use it and expand it. Records are safely stored in an organised, central database where all authorised employees have access to the latest versions of manuals and other documents and records. The system offers also version control, that is how many versions were made and who wrote each version.

Knowledge stored in a groupware in an organised manner continues to be explicit knowledge thanks to the organisation and the classification. It takes the form of records which have been written into the database itself, transferred electronically into the system, scanned into the database, or just registered into the system but kept elsewhere where they can be found. The database contains also references and links to other files and databases like accounting records, production records, and records in other internal and external databases which can be searched for information which then can be transferred into the groupware, if so desired.

Groupwares provide access to information. They do also eliminate duplication of effort and provide for the sharing of information which many employees were previously collecting and entering onto their personal computers for their private use. The groupwares offer effective collection, storing, organisation, retrieval and distribution of information. Any good groupware has also a records management solution equipped with an internal classification system. That makes it possible for users to classify and organise information. The systems also offer the user the possibility to analyse the database in many ways and form connections between events and ideas which otherwise would not be for everyone to realise.

To summarise, the knowledge or records management part of the groupware must have the following five basic functional components:

- *Gather*: The system must provide a means to gather or capture information.
- *Organise*: To be accessible, information must be organised and classified in meaningful ways.
- *Distribute/deliver*: The system should do both deliver information to users and allow users to search for information.
- *Collaborate*: Users need to be able to send messages, participate in work-flows, route information, contribute to discussions and schedule meetings with each other.
- *Refine*: The system should employ the principles of classification—taxonomy—and allow users to refine or analyse the content of the knowledge base in different ways (Choksy, 1999, pp. 33–34).

In order for the system to function, all relevant information must be entered into it timely and correctly, and in an organised manner. Every employee must be able to count on the necessary information being in the system. If it happens that employees are not using the system or cannot trust the information in it, then it breaks down.

When a groupware is bought from a vendor, it is like a house under construction, lacking all fixtures and plumbing. Each organisation has to adapt it to its needs, organise the information and put in the communication pipelines (Fjarmalaraduneytid, 1998). The organisation must decide and then collect and record the information which it wants to store. The system does not do it automatically. The information must also be organised into the system to be accessible and of value. Information which cannot be retrieved, distributed and utilised is of little value. The groupware is a tool. Only if it is used, does it produce value.

4.2. The benefits

Starting to use a groupware can produce at least eight distinct benefits:

1. Internal and external communication is facilitated with the inclusion of electronic mail, messaging and fax capabilities. Urgent messages can be highlighted. Connections to the Internet offer links to external databases and various sources of information. The intranet can be used to post announcements and news to all employees or particular groups at the push of a button.
2. Group calendaring and scheduling makes it easy to schedule meetings and see when people are available or where they are.
3. Team members around the world can collaborate and hold meetings sitting in their own offices by use of desktop video conferencing.
4. The records management solution in the system facilitates the creation, capture, storing and retrieval of documents. It offers various ways to search for records and trace and track the status of inquiries. The format of documents is standardised and templates are provided to respond to frequent queries and issues. All contracts are tracked and can be renewed before expiry dates.
5. The TQM manuals and similar documents of the organisation are updated on-line securing that all employees are using the same and the latest version of the document.
6. Information and knowledge is organised, indexed and can be shared, avoiding information overload, redundancy and re-invention.
7. Experience and knowledge gained on past assignments or projects is available to those starting on a new one. Ideas for new products or services can similarly be stored in an idea bank.
8. Customer service can be improved. The CRM part contains information on customers, customer contacts, customer complaints and how things stand. Tenders are alive in the system with notices to act until they are accepted or turned down. Lists of other deadlines can be monitored. A compilation of FAQ and their replies helps service reps to provide customers with the same ''best'' answer to the same question.

The groupware does not guarantee that group members or employees in general will work together and share their knowledge. It solves the technical issues regarding communication

and collaboration. Creating the knowledge sharing culture is up to the leadership of the organisation.

5. Planning, analysis, evaluation and implementation

The management literature is rich in books (Hayes, 2002; Pugh, 2000) and articles (Orna, 1999) on the management of change, and how new projects which change the way we work can be planned, analysed, designed and implemented. The same is true of professional records management (Gold, 1995). The new international standard on records management has likewise good work rules and procedures on designing and implementing a records system which are, for that matter, valid for any project (ISO, 2001a, b, ISO 15489, pp. 10–11). Developing a system starts with planning and ends with the post implementation review as shown in Fig. 4.

5.1. Planning and analysis

Some people rush into action. They do not plan to fail, but it happens because they fail to plan. Planning focuses attention on objectives and reduces the uncertainty which may lead to failure. Plans thus provide a rational approach to agreed objectives. The first steps in planning are the initial assessment and the feasibility study. Planning involves detailing the steps to be taken, what is to be done, who is to do what, putting down the time frame for the project, estimating the resources needed, and mapping who are the stakeholders. With an approved plan, we can go ahead to the next phase.

The second phase is the analysis where we identify user requirements, what are our needs and what demands will there be made on the system. It is useful to evaluate the existing system as well to see if parts fit into the new system. In the end we should have a written specification for the new system, a detailed system design, where user requirements have been spelled out as software specifications (IEEE, 1998).

5.2. System design and evaluation

Although groupwares can be bought off-the-shelf, they are not fully made. They are not the solution. The solution lies in what we make of the system. We must be able to fit our specifications into the system as they are defined in the need analysis or user requirements. The vendor should

- **Planning** – initial assessment, preliminary investigation – feasibility study.
- **Analysis** – identification of user requirements – existing system evaluation – system specification.
- **Detailed system design** – design (or purchase) according to specification – evaluation of system solutions.
- **Implementation** – secure top management support – presentation, training, involvement – manuals and training handouts.
- **Post-implementation review** – evaluation and review – maintenance – enhancement (Rob & Coronel, 2002 p.323).

Fig. 4. The system development life cycle.

have a good reputation for service and for providing solutions. The vendor must also be able to meet our needs for service. Finally, the vendor should be experienced in implementing systems and use implementation programmes or standards for that purpose.

The buyer must, therefore, be ready to invest time, money and effort in filling in the functions which the system is supposed to perform and define what he wants to purchase. Various guides are available which assist buyers in the purchase decision when buying computer hardware or software (Fjarmalaraduneytid, 1998). The Central Computer and Telecommunications Agency (CCTA) in the UK has also developed a standard for IT projects management, called PRINCE2 which can be recommended for managing the project implementation as it has now become the de facto standard for project management in the UK (CCTA, 1989).

Although each system has to be evaluated according to its particular system specification, some general guidelines can be given regarding the evaluation. We can group these evaluation issues into four groups: information methodology and information technology, operational issues, legal issues and security and technological issues.

5.2.1. Information methodology and information technology

The groupware should be based on two disciplines. On the one hand, the system should be based on library and information methodology which has been designed to organise information in any form in a structured and standardised manner. These are subject classification systems and various solutions where the methodology of indexing, registration and cataloguing of information is utilised.

On the other hand, the groupwares should be based on information technology which has been used by organisations to handle information. Among these are demands for being user friendly and efficient when the user is working in the system, writing, registering, searching for, retrieving or distributing information. Some information in each document should be automatically registered such as the date, the name of the receiver and the sender, and the subject line. The appearance of documents should be standardised. The system should provide ways to track the status of an inquiry within the organisation, that is who is to answer the inquiry, has it been responded to and when?

The system should also provide for the registry of various works and communication processes, such as communications with customers or clients. A good subject classification system and an index should be incorporated into the system and it should offer ways to perform a free text search which can be limited with the use of Boolean algebra (|, /, — versus AND, OR, NOT). Further, a thesaurus designed according to the needs of the organisation, should be part of the system. Also, the system must provide linkages to other systems, both within and outside the organisation. Examples of such internal systems are accounting, production and customer records, and the database containing the employee skills inventory, but examples of outside systems or databases are the national registers of organisations and individuals in the country. These linkages are necessary to reduce or prevent the repeated typing of data, but in addition they supplement the system with a wealth of information.

5.2.2. Operational issues

In order to evaluate a groupware and to find out how it performs and whether it meets user demands, we need to consider a number of operational questions. Examples of such questions are

shown in Fig. 5. We must also raise questions regarding legal issues, security issues and technological issues.

5.2.3. Legal issues

Certain legal demands are usually made regarding records management in most countries. These are provisions for the protection of confidential information, public access to information, demands for the protection of privacy and permanent preservation of historical records. Here it makes a difference whether the organisation is in the private or the public sector. Different rules apply relating to access to information, as well as regarding privacy.

Individuals have the right to private access to confidential information regarding themselves which is kept by public institutions, and furthermore, there are laws which provide for public

- Does the software offer many ways to search for information and retrieve it, for example:
  - by providing the date, will documents, created or received on that date, be listed?
  - by providing the name of a certain individual/organisation – the sender or the receiver of a document – will documents relating to that party appear?
  - according to subject matter?
  - according to a record form which can be a paper document, an e-mail, an attachment, another electronic form, a fax, a film or a picture.
  - according to record type which can be a letter, minutes, a report, a plan, a contract or a memo.
  - by matching a given text from a document?
  - by providing the number or the name of a subject or class in a subject classification system?
- Does the software offer easy access to information?
- How long a time does it take to find the information?
- Can the status of an inquiry/case in the system be checked or monitored?
- Is it secure that originals of documents cannot be changed without authorisation and documentation?
- Does the system furnish a history of the various versions of a document?
- Does the system have a connection to the organisation´s records retention and disposition schedule?
- Is it possible to search for inactive records, that is records which have been put away in storage?
- Is there a controlled access to the information data base or can anyone enter?
- Is the information securely stored in a central data base?
- Is the system linked to outside data bases, such as the national register?
- Is the system linked to internal data bases or systems, such as employee records, accounting records, customer files, the quality or the environment management system, the filing classification system and library records?
- Is the system linked to the various formats or templates which are used for documents and records?
- How many employees can work in the system at the same time?
- Does the system only provide for local access or is it global, allowing access to employees in different countries around the globe?
- Is the system connected to the *Internet*, and does it offer e-mail and fax capabilities?
- Can documents be scanned into the system and does it offer OCR (Optical Character Recognition)?
- Is it possible to print out information from the system in various forms, such as:
  - on paper ?
  - on microfilm – COM (Computer Output Micro-form)?
  - on optical discs – COLD (Computer Output Laser Disc)?

Fig. 5. Sample operational questions.

access to most documents kept by government departments and public agencies. These systems must be operationally safe and protected so that information can be accessed whenever needed, but unauthorised parties should be unable to enter the system. This is accomplished with safety and recovery plans and by use of work rules and accepted standards for electronic media (BSI (British Standard Institute), 1999; ISO, 2000a, b, ISO/IEC 17799).

5.2.4. Security and technological issues

We do also have to find out whether the system has been adapted to recognised rules and standards such as relevant international and individual country standards, XML (eXtensible Markup Language), metadata, DoD 5015.2STD (DoD, 1997) and so on. Electronic records are always increasing and the system must of course meet the standards which have been set for the format of these records.

5.3. Implementation and review

Is the groupware effective and improving the productivity in the organisation? This can only be found out by studying the situation in the organisation before and after the introduction of the system. What makes the difference in this connection is how effectively the system has been implemented.

In my country, Iceland, there are many organisations that have invested in groupwares, such as Lotus Notes from IBM and Outlook/Exchange from Microsoft. Included in the groupwares are various solutions, for example in records management. The investment is large, but unfortunately not always giving the return expected because the employees are sometimes either not using the system at all or are using it in the wrong way due to failures in the implementation. This has been my experience as a consultant to many organisations and it agrees with the experience of the vendors of the software and the top management of several of the organisations buying the solutions.

There are seven ground rules which must be respected if a groupware is to be successfully implemented:

1. Secure top management support. The higher up in the organisation, and the sooner, the better.
2. Select a well-defined and confined division/department in the organisation which is visible and an important part of the organisation for starting the programme. Do not take on an entire, huge organisation in one go.
3. Measure output/productivity before and after the introduction of the groupware system.
4. Groupware changes how people work. It is not only software but also a way of collaborating. The aims of the project and the reasons for the change must be explained clearly, both to the employees in general and in smaller group meetings. Considerable support is needed to help people adapt to the new work environment.
5. The reasons and the need for the new system must be explained to all concerned. Training and support is of vital importance. Employees must understand the reason for introducing the system, know how to operate it and how to work in the system, and understand the benefits which the system will provide for them and the organisation. For this purpose, proper

documentation must be provided in the form of system manuals, reference guides and training handouts (Davis, 2000, pp. 86–89).
6. Control is needed to make sure that people work the new system and do not continue operating the old one. Formal dates should be set when the old system is to be closed and the new one begun (Bean, 2000, p. 45).
7. Get people involved. Listen to suggestions. It takes courage to change. Reward those willing to make the effort. There will be resistance to change, but it can be overcome (Coleman, 1997).

What we want to discover after the implementation is greater effectiveness and productivity. Do managers have a better overview, are employees turning out more output with fewer errors, is it easier to find information and is information less likely to get lost? The post-implementation review is done to make sure that "all of the project's objectives have been met" (Bean, 2000, p. 45). We want to make sure that the system serves our needs, and that it is secure that both old and new knowledge is accessible to the managers and other employees. Another important reason for the review is that it enables adjustments, corrective action and provides for enhancements. All systems can be improved. Continuous improvement should, therefore, be introduced by monitoring the system in use.

6. Conclusions

In this article we have discussed the various types of knowledge and shown how the knowledge base of the organisation can be managed using the groupware. If information and knowledge is systematically organised and classified into the database, it continues to be a repository of explicit knowledge. The LIS professionals have a key role to play in this process which will only be a success if the system is properly implemented and used by the employees in general.

My studies of groupwares indicate that even though the systems may vary in design and structure, those factors which relate to information technology are usually well thought out whereas those relating to information science may be lacking. A good groupware is only a tool. If the informational input into the system is not well organised and planned, and all employees who are supposed to use the system are not doing so, then it will be of little value to the organisation. Under those circumstances, even the best system will be like a Stradivarius violin lying on a shelf, not turning out any music.

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