

Leveraging Knowledge Within Business Processes



White Paper



Introduction

Knowledge is boundless as we can create it, retain it, distribute it and share it indefinitely, supported by various enabling technologies. These technologies range from text books in libraries to global virtual knowledge centers. Knowledge is limitless because it is an infinite resource. It is not a rare resource like land, oil, buildings, plant and machinery, money etc. So, we have been conditioned in our thinking to have a reasoning based on scarcity, our challenge is to now develop an approach leveraging knowledge within an organization's core business and support processes.

In the near past, Business Process Reengineering (BPR) appeared to be the 'solution of choice' for growing the corporate competitiveness. A large amount of Fortune 100 companies found that the way they were carrying out their business processes, such as customer-facing activities, were often ineffective, expensive, slow and inefficient. This resulted from too many business activities being involved in a single process, excessively high a percentage of non-value adding activities, inadequate technology support, etc. BPR, at that time, aimed to radically redesign the process structures in order to achieve spectacular cost and time improvements.

In recent years, the Knowledge Management (KM) concept has taken center stage. An organization's and its employees' knowledge is considered the most important mission-critical asset in the current economy. KM's key goal is improving a company's ability to obtain, develop, safeguard, distribute and employ knowledge assets. The dissimilar approaches draw together under the KM banner range from creativity supporting techniques and improved qualification concepts to the implementation of groupware or artificial intelligence systems.

Although KM, and BPR speak to essential corporate problems and opportunities, and both affect the method organizations are conducting their business, it can be asked whether these concepts are either independent of each other, or even incompatible, or if they complement each other. In this document, the two approaches are compared, and it is shown that the elements which are described, analysed, and changed by each approach are distantly related. A key prerequisite for a successful KM initiative is the mapping and detailed analysis of the business processes.

The Work and Process Environment

BPR generally focuses on the business activities, their arrangement within the corporate process structure and the triggering events. Additional aspects embrace the employees and business activities within the process along with the mission-critical and operational data and information flow.

These types of information about business processes can be used for identifying organizational breaks, redundant or non-value adding functions, missing systems integration, etc., thus enabling the definition of improved processes and the development of an integrated information system support.

With the attention on structured data and information less importance is typically placed with unstructured types, as contained in documents, files, books, drawings, web pages, etc. Human knowledge and the experience of the staff are typically not modelled at all. Most KM approaches, on the other hand, do not address the control flow or database structures.

Due to these differences, BPR and KM are typically applied to different types of business processes. BPR mostly concentrates on the analysis and improvement of well-structured processes, such as order processing in a mail-order company or processing of credit applications in a bank. The control flow (i.e. the sequence of activities) of such processes can be defined in advance, and they are repeated many times without any changes. Typical information systems for supporting well-structured processes are databases and workflow systems.

KM, alternatively, provides important insights for improving processes which are not very well structured and which rely heavily on human expert knowledge, as well as on different kinds of information which may be contained in files, documents, drawings etc. Examples for such weakly structured processes can be found in research and development, in engineering, or in consulting. As a rule it is not possible to define the exact sequence of activities in advance, and every time a specific task has to be performed, the resulting process will be different. Groupware systems and intranets are typical technologies for supporting knowledge-intensive processes.

In most companies, both types of processes can be found, e.g. order processing may be rather well-structured, while product development is more knowledge intensive. Therefore, for improving the overall business performance, both BPR and KM need to be evaluated, particularly since there are many dependencies between well-structured and knowledge-demanding processes. For instance, expert knowledge and ad hoc-processes may be required for handling exceptions within otherwise well-structured processes. Data created in structured processes may become important information for knowledge intensive processes, e.g. by aggregating and restructuring them in an executive information system.

There is no clear division between the two different process types, but real processes are somewhere between the two extremes, showing characteristics of both process types.

For example, the procurement of complex custom-made parts may include well structured sub-processes, such as comparing supplier quotes and producing order documents, as well as knowledge-intensive sub-processes, such as defining the requirements and discussing possible solutions with the supplier.

It also needs to be considered that many previously standardized processes are becoming more and more flexible and therefore more knowledge-centric, since standard tasks are usually automated to a high degree. With the movement towards more customer-focused, individualized products and services, the standardized order fulfilment process will sooner or later become obsolete, while consulting the customer and assembling customer-specific solutions from the company's range of services and products will become increasingly important.

For these reason, an integrated approach is required combining the advantages of KM and BPR. Such an approach should include a set of methods, procedures and tools which enables companies to analyse and improve all aspects of their processes in a homogeneous way, taking into account the dependencies between business processes and knowledge management.

A difficulty with such an integrated approach is that to some extent the objectives of BPR and KM contradict each other. BPR is very much focused on cost, while KM may produce additional costs in order to increase the company's competitiveness. BPR endeavors to eliminate redundancies, while from a KM perspective it may be useful to have some redundancies, because they make it easier to exchange or create knowledge. On the other hand, these contradictions disappear when the strategic objectives for a process improvement project are clearly defined, because then it is possible to compare the benefits of different solutions and to decide according to the company's objectives. This method helps avoiding one-dimensional strategies, such as only reducing costs without taking into account other important objectives.

Managing the Process

Knowledge may be described as information in a specific context, which provides value and enables the owner to do something. Making good use of knowledge has always been an important prerequisite for successful business. Every company procures, creates, stores, distributes and uses knowledge, although these "knowledge processing" activities are not necessarily managed explicitly.

Knowledge processing activities includes:

- **Knowledge Gathering:** Knowledge can be gathered externally, e.g. from research institutes or by hiring experts, and it can be created and developed internally, for example in research and development or by gaining experience from the operation of a process. Since knowledge can become obsolete very quickly, it always needs to be improved and updated.
- **Knowledge Presentation:** To be helpful for end users, knowledge needs to be documented, structured and related to other knowledge and information. It is also essential to document the knowledge meta-structure, i.e. what kind of knowledge is available, how it is structured, and who can be contacted for advice on a certain subject.
- **Knowledge Transport:** Before it can be applied, knowledge needs to be moved to the people who need it. Documented knowledge can be transmitted by e-mail, file transfer, or the distribution of paper documents. Another option is the provision of knowledge in a way that the users of this knowledge can actively access it, e.g. in a library or in an Intranet. In this situation, the knowledge movement is accomplished when the end user searches and accesses the required knowledge. For accessing tacit knowledge which is not documented, the respective knowledge owners need to be found and contacted.
- **Knowledge Employment:** This is the purpose of knowledge processing - to use the knowledge for carrying out, supporting and improving value-adding business and support activities.
- **Knowledge Archive:** Knowledge which is outdated or has become irrelevant needs to be identified, removed from the active corporate memory, and archived.

These knowledge processing activities are usually not discrete, but most of them are - or should be - integral parts of the existing corporate process framework.

KM's goal is to improve and support knowledge processing in the company. It is therefore concerned with developing, supporting, controlling and improving of strategies, processes, organization, and technologies for knowledge processing.

The Knowledge Management framework for the definition, management and operation of knowledge processes. This framework has It consists of the following levels:

- **Knowledge Process Blueprint:** On the first level, the company's knowledge processes are defined and blueprinted. Since knowledge processing usually takes place within the company's normal business processes, it is necessary to analyse the business processes in respect to knowledge processing, and to re-design them in order to improve the way knowledge is created, presented, transferred, and used within the business processes.

In addition to this, it may also be necessary to define specific knowledge management processes, such as a process for screening certain publications, summarising the relevant information and distributing it to those who need it.

The term knowledge process is used here for referring both to such specific knowledge management processes and to normal, knowledge-intensive business processes, when they are looked at in respect to their knowledge processing.

Knowledge process design requires methods for mapping and analysing knowledge processing. The term Knowledge Process Redesign refers to comprehensive projects for fundamentally changing the way knowledge is processed. These topics are discussed later on.

The design created on level one defines the processes, structures and tasks for the following levels:

- **Knowledge Process Management:** The tasks of managing the implemented knowledge processes can be found on this level. These tasks include the operation of the specific knowledge processes defined on level one, as well as controlling and monitoring of knowledge processing. The variables to be monitored are defined during the design of the knowledge processes (level one). For example, it could be useful to record the number of unsuccessful information searches and to analyse the reasons for not finding the desired pieces of information. When such problems are identified, an improvement cycle is triggered, in which the knowledge process design on level one is changed.
- **Knowledge Process Control:** this level comprises those activities that are not related to the actual knowledge contents, but rather to meta-information about the knowledge, such as topics, keywords, or areas of expertise. This meta-information is required for distributing, exchanging, searching, and accessing knowledge.
- **Knowledge Process Application:** The activities on this level are concerned with the actual knowledge contents. They include the creation of new knowledge, the documentation of knowledge, its application etc.

Knowledge Process Models

A principal requirement for successful KM projects is the documentation of the organization's knowledge, its distribution, and how it is processed. Such documentation is required for analysing the current knowledge processing practices and for developing process improvements.

Those companies who have analysed and modelled their business processes already have documented a large portion of the information required for documenting knowledge processing, e.g. the company's organisational structure, its activities, information systems, documents, etc.

It has already been pointed out that BPR and KM provide different views on the company's processes rather than being entirely distinct. It is therefore desirable to integrate methods and tools for knowledge mapping with those for business process modelling, e.g. by linking required knowledge to activities in a business process.

The following types of diagrams are useful for mapping knowledge processing:

- Knowledge Structure Diagrams
- Knowledge Maps
- Business Process Models with Knowledge Requirements and Knowledge Creation

A knowledge structure diagram can be used for defining the relevant knowledge and for structuring it according to different kinds of subjects which are important for the company, and therefore need to be covered by human knowledge and by documented information.

A significant part of relevant project management knowledge, however, may consist of project experience which cannot be entirely documented. It is therefore denoted as a generic knowledge item in. While such generic knowledge items can be assigned to people and organisational units, documented knowledge can be assigned to files, drawings, web pages etc.

In a tool-based representation of a knowledge structure diagram, such documented knowledge can be complemented with direct links (e.g. using OLE technology or www hyperlinks) to files or web pages which contain the respective information, so that this information can be reached directly from the model.

Models can therefore not only be used for describing and analysing knowledge processing, but also as a structured means for accessing knowledge when it is needed during the execution of a business process.

For each employee-knowledge pair, a degree can be shown, indicating whether the employee has only little, some, or much knowledge of the respective subject. Such a knowledge map can be used for getting an overview of the staff's knowledge and its distribution. This helps finding the right person for a job which requires certain kinds of knowledge. The map can also be used as a kind of electronic yellow pages, i.e. for finding experts who can be contacted about questions in their fields of expertise.

With knowledge maps, a company's knowledge profile can be documented and assessed. It can be found out which relevant knowledge areas are currently not sufficiently covered. Sometimes there are important fields of knowledge which are covered only by a single person. If this person leaves the company, the knowledge is lost. Such problems can be detected by analysing the knowledge map. The map helps to define desired employees' knowledge profiles and to develop this knowledge by training or by using these profiles as selection criteria when hiring new people.

It is also possible to aggregate the information about each employee's knowledge profile into knowledge maps indicating the fields of knowledge covered by working groups or departments.

For documenting how knowledge is processed in the company, it is necessary to define what kinds of knowledge are required for a certain activity, as well as which knowledge is documented and provided by an activity. This information can be included in business process models.

While a typical BPR-type of model would include only structured kinds of data, such as "customer data" or "product data" (indicated by a file card box in the figure); a KM-type of business process model also includes required and produced knowledge. The function "select customer" not only requires structured customer data (such as name, address, type of industry, and number of employees) but also background knowledge about the marketing strategy, the market structure and customer specifics and requirements.

Only with this kind of knowledge and experience it is possible to select those customers which are likely to be interested in a certain product or service.

The model also contains information about created and documented knowledge. In the function "document meeting", the experiences from the acquisition meeting are captured in a "lessons learned" document, and newly gained knowledge about a customer is included into the documented knowledge about this customer. This type of documented knowledge is used in the function meet customer, i.e. in future acquisition meetings with the same customer it can be referred to.

From a cost-savings standpoint, the function document meeting could be regarded as superfluous, since the objective of the process is to win new orders, and the documenting function does not directly support this objective. It does not even influence the result of the process execution, because it takes place after any orders have been received. However, from a long-term KM perspective, this function may be very useful, since it secures knowledge about the customer and makes it available to the organisation, so that it is easier to focus future marketing activities on the specific customer requirements. The inclusion of this function in the process may therefore be a result of a knowledge process re-design project.

With the documentation where and how documented knowledge is produced and where it is used, it is possible to analyse whether information supply and demand are adjusted to each other, or whether there are information requirements which are not met while there may be other information which is produced but not needed anywhere.

Knowledge Enabled Process Redesign

An important objective of Knowledge Management is the improvement of the company's knowledge processing. A KM implementation should therefore start with a project for re-designing the knowledge processes.

It consists of the following steps:

- **Strategic Knowledge Planning:** This step includes capturing the company's strategy, the objectives, and the critical success factors, and an analysis of the company environment. Based on this information, strategically important fields of knowledge can be defined, and important knowledge-intensive business processes and activities can be determined. Specific KM objectives are derived from the company's overall objectives.
- **Mapping Current Status of Knowledge Processing:** In this step, the knowledge existing in the company is captured, as well as the knowledge requirements, and the activities concerned with knowledge processing. The current information systems use for knowledge processing also needs to be described.
- **Analysing Current Status of Knowledge Processing:** After capturing and modelling the current status, it needs to be analysed in order to find weaknesses and areas for improvements. This analysis is based on a set of criteria. For example, it may be investigated whether there are strategically important fields of knowledge which are not covered by the existing knowledge, or whether the same piece of information is produced more than once, due to a lack of communication.

- **Development of Changes in Knowledge Processing:** Based on the analysis results, improvements can be developed. This includes changes in the existing business processes in respect to the documentation, provision, transfer, and utilisation of knowledge, but also the definition of specific knowledge management processes, e.g. for editing, structuring and removing knowledge. The developments may also include organisational changes, such as the formation of cross-departmental teams for improving direct communication.
- **Organisational Concept:** In order to realize the proposed changes, a strategy for bringing the changes into the organisation and to the people, needs to be developed. Such a strategy may consist of motivational aspects, conflict resolution methods, and training schemes.
- **IT Concept:** In this step, the IT concept for supporting the changed processes is developed. This includes selecting software tools, e.g. groupware systems or intranet servers and browsers, structuring contents, designing user interfaces, defining how groupware or intranet services (such as e-mail notification services, discussion lists etc.) will be used, and deciding how external sources (such as information services or the world wide web) are integrated.
- **Implementation:** Finally, the newly developed processes and systems can be implemented. This includes informing and training employees, preparing and managing organisational and process changes, implementing information systems, and testing and improving processes and systems.

Knowledge, Process and Enabling Technology

Many companies are implementing groupware systems and intranets for the company-wide distribution of information and for supporting communication between the members of the organisation. After the implementation of such a system, there is often great enthusiasm amongst the staff. However, in many cases, the usage decreases significantly after a short experimentation phase. What are the reasons for this low acceptance, which reveals a mismatch between expectations and real advantages?

In many cases, a lack of useful information and an abundance of useless information can be found at the same time. The users become frustrated when they spend a lot of time searching for information without getting satisfying results. On the other hand, many users complain that they receive too many emails. Most of these emails are unrelated to the receiver's work, but still need to be scanned in order to find the few important messages. Knowledge which could be useful for others (such as "lessons learned"-documents from finished projects) is not entered into the intranet, because of the additional effort which is required for doing so, and which - people feel - keeps them from doing their "real" work.

A thorough analysis of knowledge requirements and a re-design of the company's knowledge processing, as described above, are important prerequisites for avoiding these problems. The definition of intranet user interfaces and the configuration of groupware systems should be based on a business perspective rather than on a technology-driven approach and an unfocused attempt to put information on the Internet.

Insuring the documentation of knowledge and its inclusion into the intranet must not be regarded as an additional - more or less voluntary - task, but it requires the definition of specific activities and processes which are made an integral part of the company's business processes.

Various tools and systems used for different aspects of processing and managing knowledge can be integrated in the framework and assembled to a corporate KM system. These include:

- **Knowledge Process Design:** On the first level, tools are required for modelling and documenting corporate knowledge processing. Due to the close relationship between knowledge processing and business processes, such tools can be developed by extending the modelling methods of existing business process modelling tools. Companies which have already modelled their business processes can then complement their existing models with knowledge processing aspects within the same tool. Powerful modelling tools allow for easy handling of complex model-structures consisting of many connected diagrams. Thus it is possible to find all processes requiring a certain kind of knowledge or to determine the knowledge requirements of a certain person, based on the tasks of this person.
- **Knowledge Process Management:** For the tasks of this level, tools and functions are required allowing for controlling and monitoring knowledge processing, based on the definitions of level one. Such functions may include automated reporting of unsuccessful searches in an intranet, so that a knowledge manager can analyse the search requests and find out the reasons for the failed searches. These functions require a tight integration with the level three systems, since the data to be monitored can be found on that level.
- **Knowledge Process Control:** The systems of this level should provide a common structure and an interface for distributing, exchanging, searching, and accessing of knowledge. Such a solution can be based on groupware systems or internet technologies. The services and features are defined and configured according to the knowledge requirements on level one. The level three system provides data for level two, and it forms a common access structure to different types of knowledge which are processed and stored on level four.
- **Knowledge Process Application:** On level four, different kinds of applications can be used for creating, editing, viewing and storing knowledge contents, e.g. office applications, CAD systems, order processing systems, databases, standard software modules, or dedicated knowledge based systems.

A very important aspect is the full integration of the systems to be used on the four levels: The definitions of level one are used to determine the contents and structures of the other three levels. Level two uses data from level three for the analysis, and the analysis results need to be related to the definitions on level one, so that continuous improvement is possible. Level three integrates the heterogeneous systems from level four under a common structure.

The technology for realising the required functionality on all levels is available today. It is not difficult to extend business process modelling tools and to integrate methods for modelling knowledge processing. The functionality of today's groupware and Internet technologies is sufficient to cover the main requirements, and they allow for an integration of different types of applications. The main undertaking is therefore to configure these systems according to the definitions of the organization's business requirements.

At present, this needs to be accomplished manually, but further developments could partly automate the definition of an intranet structure, e.g. by using the models for generating personalised web-pages according to a company's knowledge requirements.

It is also feasible to use the knowledge processing models for finding knowledge, e.g. by converting the models into Web pages and assigning hyper-links to the knowledge icons in the models. Such a model-based structure provides an intuitive user-interface to knowledge contents which can be found from different models.

Conclusion

In this document, a framework for KM System has been outlined, which consists of: knowledge process design, knowledge process management, and knowledge process control and knowledge process application.

It has been described how corporate knowledge processes can be defined with knowledge structure diagrams, knowledge maps, and extended business process models. A procedural model for knowledge process redesign initiatives has been discussed. Finally, architecture for a corporate knowledge management technology infrastructure has been presented.

KM has become very trendy in recent years. Due to this inflationary use of the term KM, it may soon lose its attraction, and people may be disappointed from poorly organised KM initiatives. It is therefore necessary to follow a systematic approach, starting with a thorough analysis of a company's knowledge objectives and requirements. There are no off-the-shelf KM solutions, but every company must find an own way of improving its knowledge processing.

Currently, many organizations are implementing KM initiatives, but too often they concentrate on a single departmental problem, such as the implementation of a groupware system. Others simply have renamed their data warehouse into knowledge management system. Such systems may be useful, and they can form important elements of a more comprehensive KM network. However, a successful KM initiative requires the joint transformation of strategies, organisation, processes, technology, and - above all - the company culture.