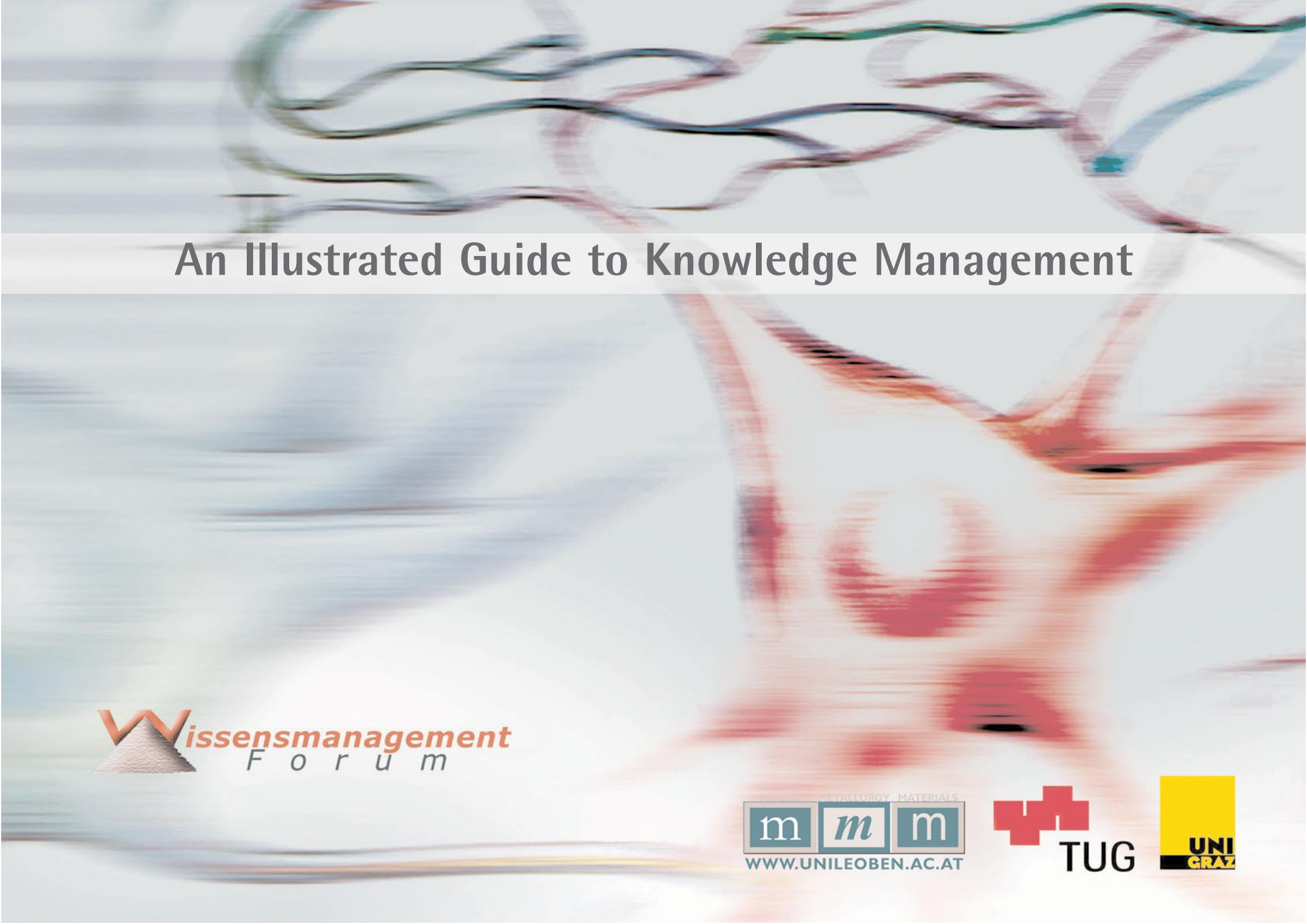
An Illustrated Guide to Knowledge Management



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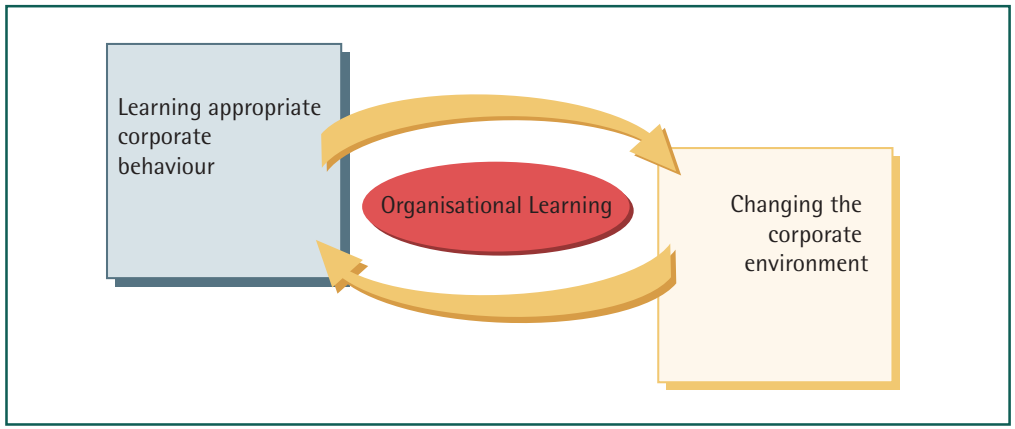


Fig. 1: The cycle of organisational learning

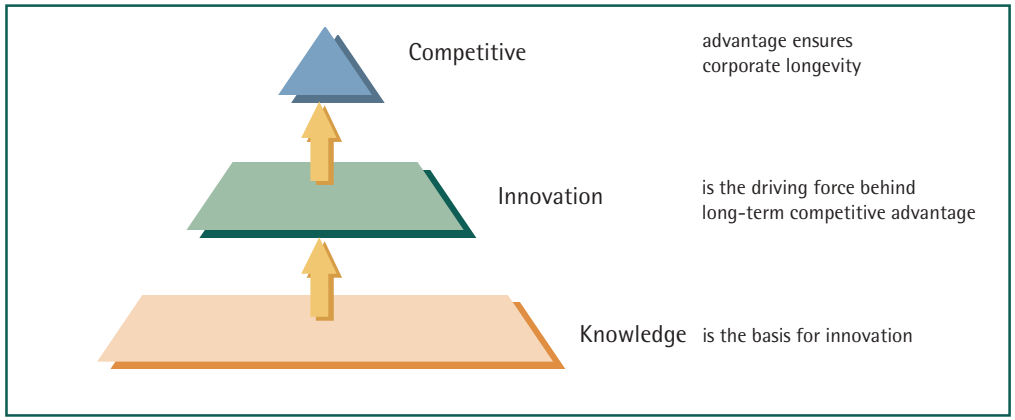


Fig. 2: Knowledge as basis for competitive advantage

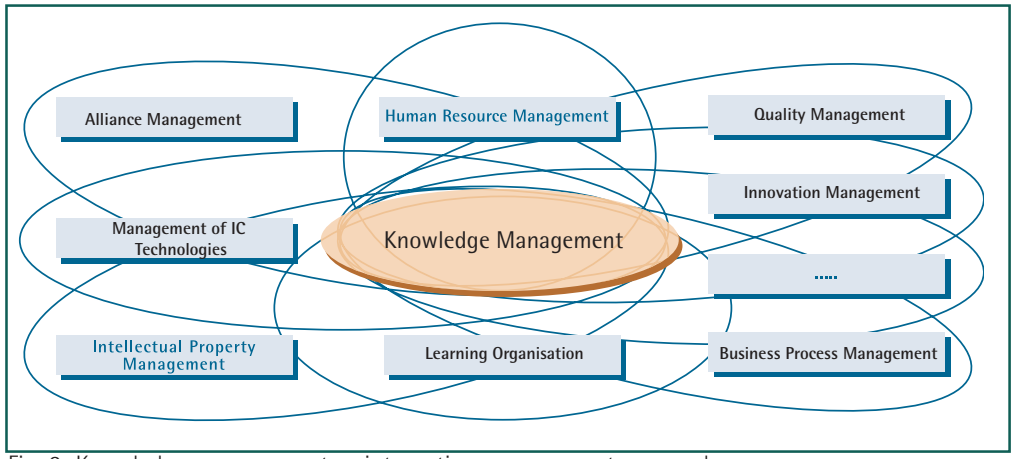


Fig. 3: Knowledge management as integrative management approach

Objectives and Benefits

The modern business world is characterised by dynamic, changing markets and continuous technological advance. To cope with these trends, organisations must become more flexible, and one certain way for them to do so is to **strengthen their potential to learn as organisations** (see Fig. 1).

Thus, "knowledge" becomes an essential organisational driver and a key factor in value creation. Increased focus must be placed on expanding the organisational knowledge base, either by learning from others (e.g. colleagues, partners, third party content, etc.) or by creating new knowledge through innovation. Both processes help secure sustainable competitive advantage (see Fig. 2).

Knowledge management can be seen as an integrated approach to achieving organisational goals by **placing particular focus on "knowledge"**, now widely considered as the new factor of production.

Knowledge management supports and coordinates the **creation, transfer and application of individual knowledge** in value creation processes. This can only be realised in a corporate culture that promotes knowledge management and actively supports information and documentation processes (e.g. through the systematic application of innovation and quality management tools and methods).

However, to manage an organisational knowledge base, it must also be measured. The inclusion of **intellectual assets** in this measurement adds a further dimension to the **assessment** of traditional factors of production. In this way, other factors (including traditionally elusive "soft factors") become more readily available for value creation processes.

Comprehensive knowledge management should ensure that "knowledge" is used as effectively and efficiently as traditional factors of production in achieving organisational goals. Added benefits include an improved **capacity for organisational learning** and a greater potential for action.

The major benefits of knowledge management for organisations include:

- Greater transparency of knowledge potential and gaps
- Knowledge-based value creation processes
- Increased motivation through staff involvement
- Increased competitiveness
- Long-term security and survival

Recommended Reading

Arthur, B. (1996): Returns and the New World of Business. In: Harvard Business Review, Jul.-Aug., pp.100-109

Drucker, P. (1994): Post Capitalistic Society; New York: Harper

Management Summary

Knowledge-intensive value creation requires a reassessment of the weighting of factors of production and increased recognition and understanding of the economic influence of knowledge.

Effective knowledge management not only forms the basis of successful innovation processes, it also greatly enhances an organisation's ability to innovate.

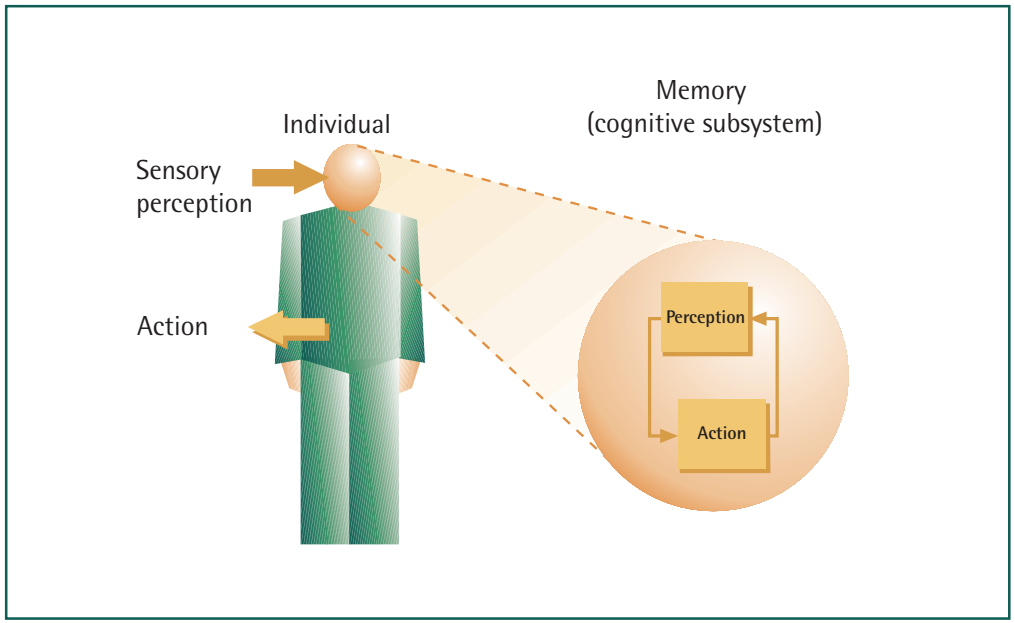


Fig. 4: Individual knowledge

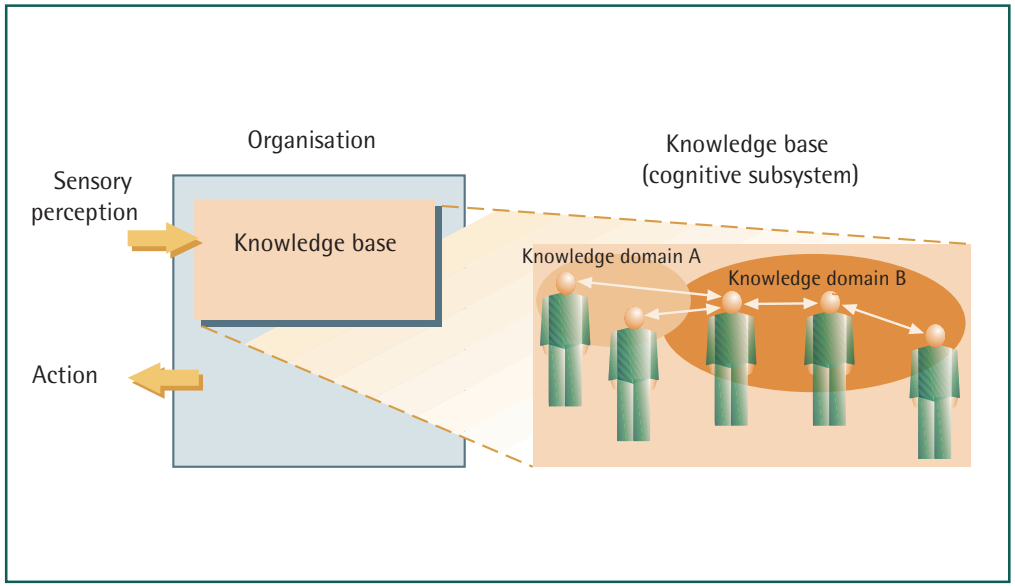


Fig. 5: Organisational knowledge

Basic Concepts

People use their **memories** to carry out physical and mental actions. They actively experience their environment through sensory perception. The perception of individual stimuli continuously triggers off cognitive processes in the brain, which, in turn, result in changes to the memory. This interaction between perception and action is known as **individual learning**, with the memory acting as human **cognitive subsystem** (see Fig. 4).

Based on these assumptions, individual knowledge can be defined as the set of all possible memory states (i.e. possible actions) an individual is able to perform at any given time. Knowledge represents an individual's potential for action and is thus always intrinsically linked to people.

Organisations need to harness the individual knowledge of their members and apply it in business processes to create economic value. Combining these individual memories to form a collective **organisational knowledge** base plays a decisive role in this process. This is far more than just a corporate database: It represents the interaction and communication between individual employees. Thus, organisational knowledge can be considered as the set of all possible actions (or business processes) an organisation can perform at a given time. This includes its ability to perceive its environment and react to changes. In analogy to individual memory, the collective knowledge base can be seen as the cognitive subsystem of the social system "organisation" (see Fig. 5).

There are two essential parts to a collective knowledge base: the individual knowledge of the members of the organisation and the framework that connects them, with interaction and communication structures also playing a decisive role. Consequently, one of the central tasks of knowledge management is to shape an organisational culture that supports effective knowledge exchange.

Organisational learning is the process of changing the organisational knowledge base and typically refers to learning by individual members and groups. This involves continuous perception of the environment (e.g. market changes, technology trends) and appropriate reaction to changes (e.g. new strategies or improved business processes). Despite its obvious advantages, the systematic combination and transfer of this new knowledge can be very time consuming, and an effective information and communication infrastructure will be required to ensure all concerned have the necessary time, space and tools to do so.

All members and groups in an organisation contribute to the collective knowledge base. As a result, the knowledge it contains comes from a wide range of different projects, tasks and business processes. To accommodate this diversity, a knowledge base should be organised in individual **knowledge domains**, each dealing with a specific subject or area.

Recommended Reading

von Foerster, H. (1995): Cybernetics of Cybernetics. 2nd edn; Mineapolis: Future Systems

Piaget, J. (1980): The Psychogenesis of Knowledge and its Epistemological Significance. In: Language and Learning: The Debate Between Jean Piaget and Noam Chomsky, Piatelli-Palmarini, M. (Ed); Cambridge, Mass.: Harvard University Press, pp.23-24

Management Summary

The organisational knowledge base contains the knowledge of the individual members of the organisation applicable to the value chain.

A learning organisation is capable of changing its knowledge base through systematic perception of the environment and adoption of appropriate information, documentation and communication processes.

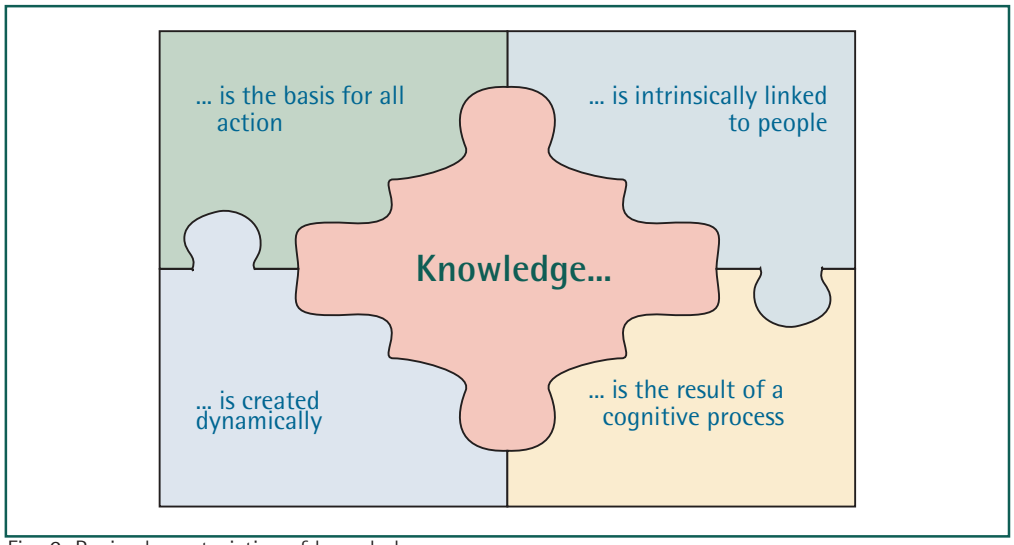


Fig. 6: Basic characteristics of knowledge

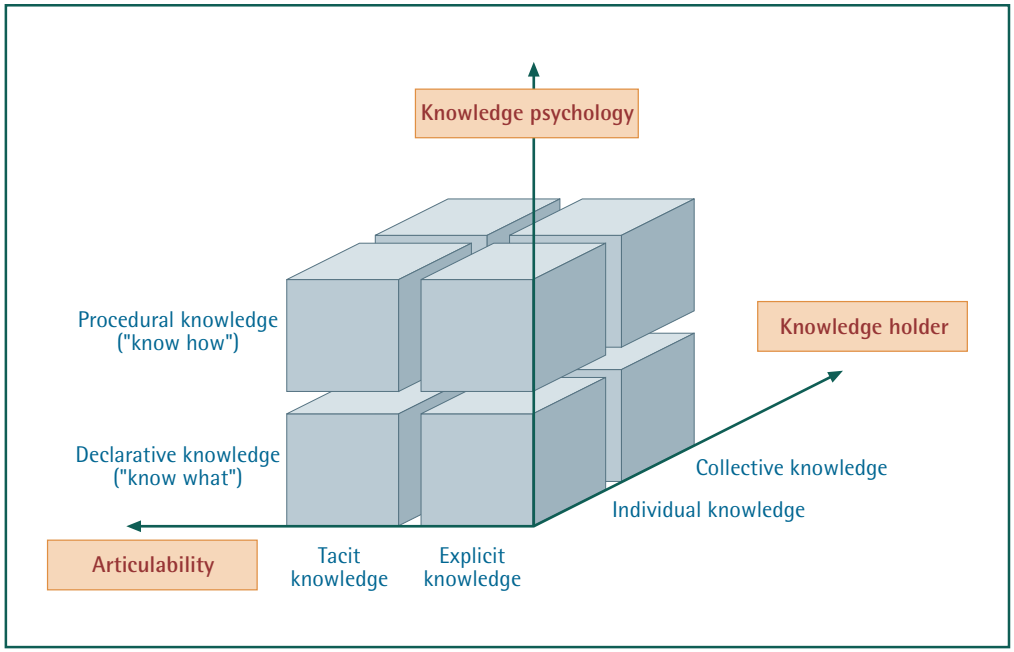


Fig. 7: Types of knowledge

Types of Knowledge

In general, the following characteristics can be attributed to **knowledge**:

- it is created dynamically (through changes to cognitive structures),
- it is intrinsically linked to people, and
- it is a prerequisite for human action.

One possible – and often useful – categorisation of knowledge (Fig. 7) is by:

- knowledge psychology,
- articulability, and
- knowledge holder.

Knowledge psychology differentiates between declarative and procedural knowledge. Whilst **declarative knowledge** refers to facts (issues, processes, etc.) and objects (persons, things, etc.), **procedural knowledge** concerns the way cognitive processes and actions are performed. Declarative knowledge is also described as knowledge of something (knowing), or "know what". Procedural knowledge is also described as process knowledge, or "know-how".

Structuring knowledge according to **articulability** focuses on whether or not the knowledge holder is consciously aware of the knowledge and can thus articulate it. This results in a differentiation between explicit and tacit knowledge. **Explicit knowledge** is knowledge that is consciously understood and can be articulated. In other words, knowledge the "knower" is aware of and can talk about. **Tacit knowledge**, on the other hand, is knowledge the "knower" is not aware of. It can only – if at all - be elicited, and thus articulated, with great effort and the use of special observation or interview techniques.

A categorisation according to **knowledge holder** differentiates between individual and collective knowledge. **Individual knowledge** is knowledge held by one person. It is not dependent on a specific context and is controlled by the individual concerned. **Collective knowledge** is knowledge that is relevant in a specific environment (e.g. company, club). It can include individual knowledge that only reaches its full potential when combined with that of others (e.g. an orchestral musician who plays better in a group than as an individual). It can also include knowledge shared by everyone, i.e. knowledge common to all members of a collective (e.g. everyone in the company knows who to contact if they have a problem with their PC).

Recommended Reading

Polanyi, M. (1983): The Tacit Dimension; Gloucester
Ryle, G. (1960): The Concept of Mind; New York

Management Summary

Knowledge is intrinsically linked to people and enables them to act. Categorising knowledge only really makes sense if it is done with a specific purpose in mind.

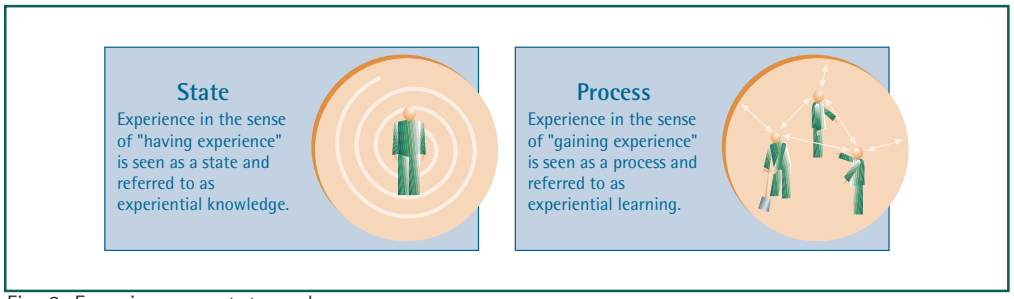


Fig. 8: Experience as state and process

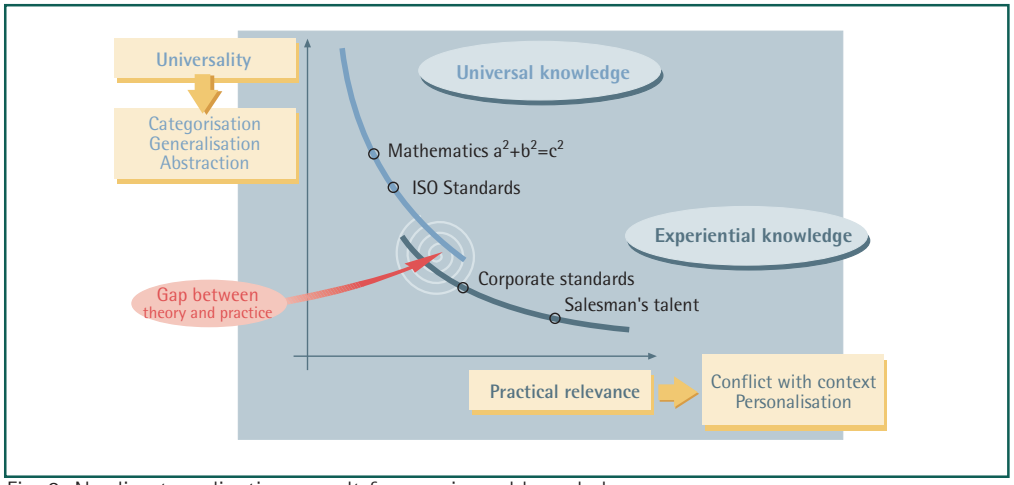


Fig. 9: No direct applications result from universal knowledge

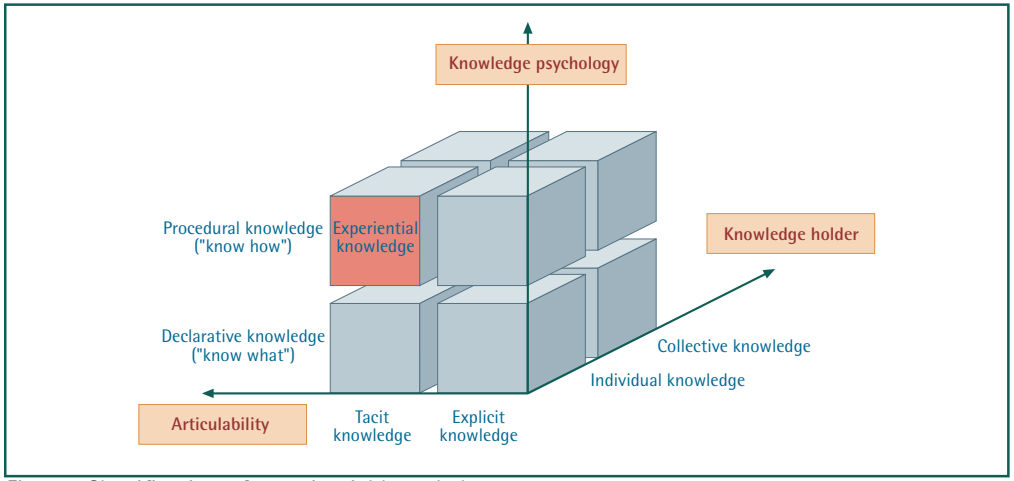


Fig. 10: Classification of experiential knowledge

Experience

The term experience is often used in connection with knowledge and learning. Experience as a **state** (having experience) is a subset of human knowledge and is referred to as **experiential knowledge** (Fig. 8). If, on the other hand, experience is seen as a **process** (gaining experience), it must then be seen as a learning process, namely **experiential learning**. The following central characteristics of experiential knowledge are relevant for knowledge management:

1. Experiential knowledge is often created through observing or carrying out actions and is therefore closely linked to procedural knowledge (Fig. 10). Repeatedly carrying out a particular action or actions will lead to a refining of procedural knowledge. For example, the speed and accuracy of a particular skill is continuously improved. An experienced grinder will make a far more sophisticated assessment of a cylinder's composition or differences in diameter than an apprentice. Experiential learning processes also help us to structure and link existing knowledge. This is why experienced employees are able to interpret new situations quickly, make appropriate decisions and initiate any action required. A driving instructor interprets the overall picture in a particular traffic situation, whereas a learner driver still notices the individual details (pedestrians, traffic lights, cars turning left, ...).

2. Experiential knowledge is primarily tacit (Fig.10) and, in most cases, transferring this knowledge requires a huge amount of effort. Experiential knowledge comes from personal experience of situations. It has far stronger links to a specific situation than universally valid knowledge (e.g. $a^2+b^2=c^2$). The limited degree of universal validity in experiential knowledge can, however, be meaningful in other situations. No practical applications can be derived directly from universal knowledge (Fig. 9).

3. Experiential knowledge is primarily individual knowledge (Fig.10), since it is by nature strongly linked to subjective feelings and emotions. We don't experience objects, people or situations simply as useful/impractical or new/familiar; we also experience them as beautiful/ugly or pleasant/repulsive. Indeed, the phrase "to act on instinct" clearly indicates the close links between experiential knowledge and feelings.

Recommended Reading

Dewey, J. (1983): Experience and Education; New York
Polanyi, M. (1983): The Tacit Dimension; Gloucester

Management Summary

Experiential knowledge is a subset of human knowledge and is by nature strongly linked to situations and people. Experiential knowledge is characterised by its practical relevance.

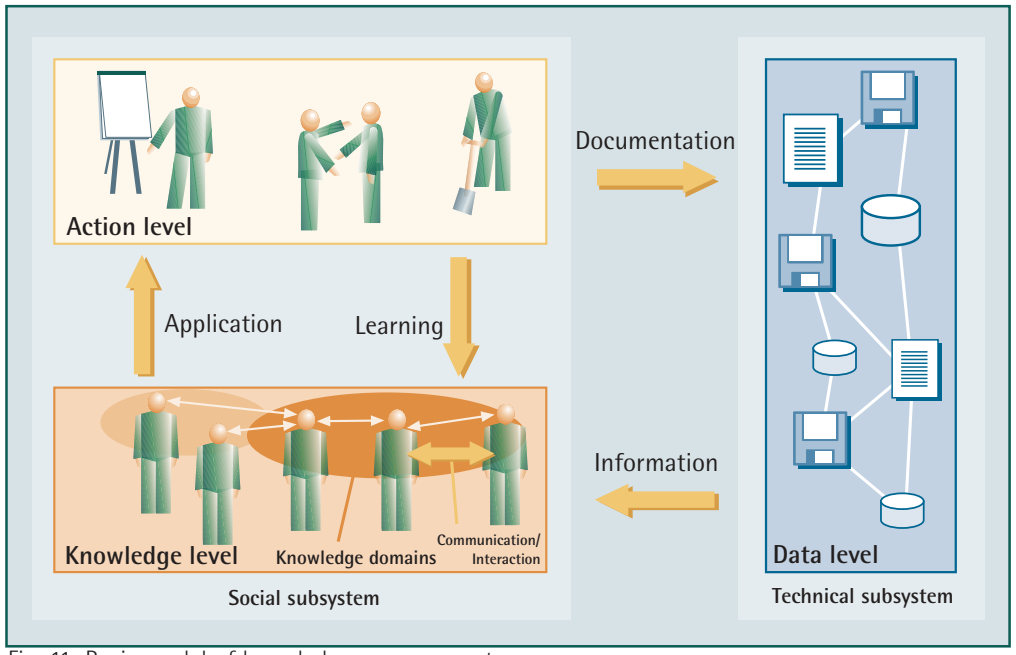


Fig. 11: Basic model of knowledge management

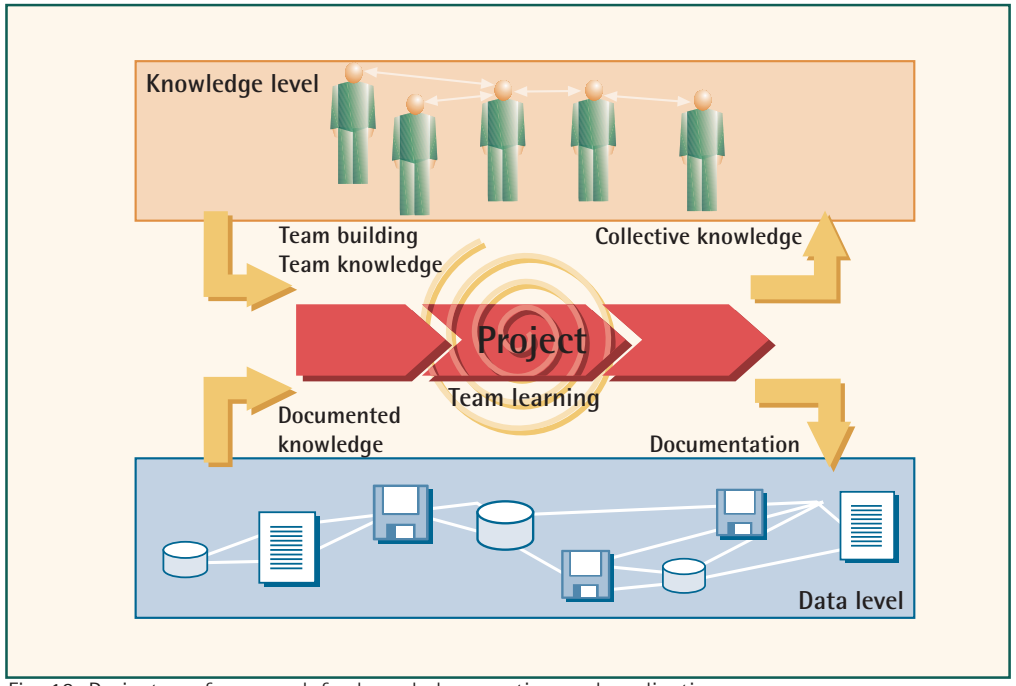


Fig. 12: Projects as framework for knowledge creation and application

Knowledge Management

Knowledge Management is the targeted coordination of "knowledge" as a factor of production and the management of the organisational environment to support individual knowledge transfer and the subsequent creation of collective knowledge, two essential factors in the value creation process. Knowledge management is therefore not the management of "knowledge" itself, but rather the **management** of the organisation with a **particular focus on "knowledge"**.

To simplify this process, we differentiate between two fundamental levels: the **data level** and the **knowledge level**. This is based on the traditional differentiation between knowledge on the one hand and data and stimuli on the other.

There are three main aspects to knowledge: individual knowledge, action and data. The first, individual knowledge (i.e. the sum of an individual's capabilities and experience), determines the possible actions open to an individual and, consequently, the contributions they are able to make to a particular project or task. The second aspect, action, includes both physical and mental actions (e.g. problem solving). The actions required to complete an individual task often result in large amounts of data, the third aspect to knowledge. This includes both internal data (e.g. from other projects) and external data sources such as libraries or online databases.

These aspects form the operational layers in the knowledge management model illustrated in Fig.11:

- Knowledge level
- Data level
- Action level

The **knowledge level** is made up of the knowledge of the individual members of the organisation and their interaction with each other. The **data level** consists of all available documented knowledge (e.g. in databases or as printed documents). The knowledge and data levels provide input for the **action level**. This is where business processes are enacted and represents the organisation's value creating processes.

These three levels are linked with the five core knowledge processes (information, documentation, communication, application and learning) to form a basic model of knowledge management.

Recommended Reading

Davenport, T. / Prusak, L. (1998): Working Knowledge: How Organizations manage what they know; Boston

Dierkes, M./Berthoin-Antal, A./Child, J./Nonaka, I. (Eds) (2001): Handbook of Organizational Learning & Knowledge; New York: Oxford University Press

Nonaka, I. / Takeuchi H. (1995): The Knowledge creating company. How Japanese Companies create the Dynamics of Innovation; New York: Oxford University Press

Management Summary

Knowledge management places particular emphasis on the role of "knowledge" in organisational management. One of the main aims of knowledge management is to establish an appropriate framework to support the optimal development and application of knowledge in value creating processes.

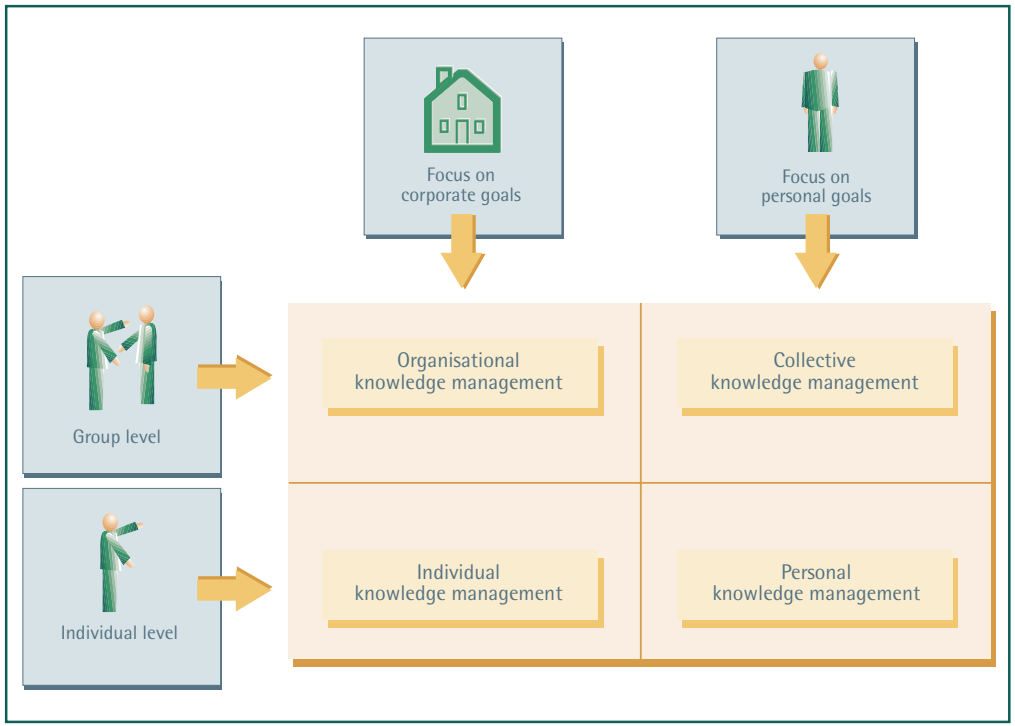


Fig. 13: Actors and goals in knowledge management

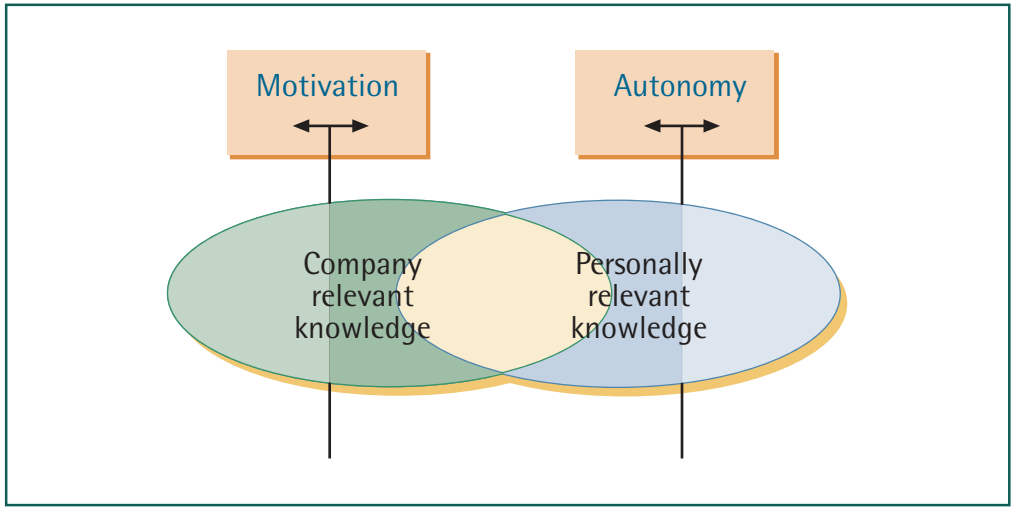


Fig. 14: Dealing with company and personally relevant knowledge

The Role of the Employee

Knowledge management can take many different forms, depending on the actual goals and/or individual actors involved (Fig. 13). The majority of common approaches deal with knowledge management by and for groups of employees (**organisational knowledge management**). However, this can be extended by considering the knowledge management activities that take place at the action level of individual employees.

This does not imply that **personal knowledge management** should be seen as diametrically opposed to a knowledge management focus on corporate goals. Indeed, many of the conflicts of interest that come to the fore in knowledge management activities have far deeper roots. A simple example of this is training. Most people also have an interest in improving their value on the employment market and, as a result, may well put in requests to attend training courses that have no direct relevance to corporate goals. Another classic example is the hoarding of knowledge by experts to protect their personal interests.

A closer look at the links between these two forms of knowledge management reveals that differences in corporate and personal goals make different knowledge relevant (Fig. 14). Where corporate and individual knowledge interests overlap, there is no immediate conflict of interests. However, from a knowledge perspective, there are often no clear boundaries between personal and work-related interests. The amount of effort a person is prepared to invest in knowledge that is important for the organisation, yet of no personal interest, is primarily a question of motivation, and can thus only be influenced indirectly. On the other hand, the extent to which a person can utilise their time at work to further their own knowledge interests (not necessarily relevant to the company) depends greatly on the amount of autonomy their employer is willing to grant. Both these factors can also influence a shift in boundaries (Fig. 14). Greater autonomy boosts motivation. Motivated employees are generally more productive and can be given more autonomy. Whilst there is no denying that greater autonomy might also result in a slight reduction in capacity, this should be more than compensated for by the benefits that come with increased motivation.

Recommended Reading

Barth, S. (2000): The power of one. In: Knowledge Management Magazine, Dec., URL:http://www.destinationkm.com/articles/default.asp?ArticleID=615

Slade, A.J./Bokma, A.F. (2001): Conceptual approaches for personal and corporate information and knowledge management. In: Proceedings of the 34th Annual Hawaii International Conference on Systems Sciences, HICSS-34, pp.418-425, IEEE Computer Society; Los Alamitos, CA, USA

Management Summary

To avoid unnecessary conflicts of interest, knowledge management must also consider the perspective of the individual employee. Motivation and autonomy establish the boundaries between company relevant and personally relevant knowledge.

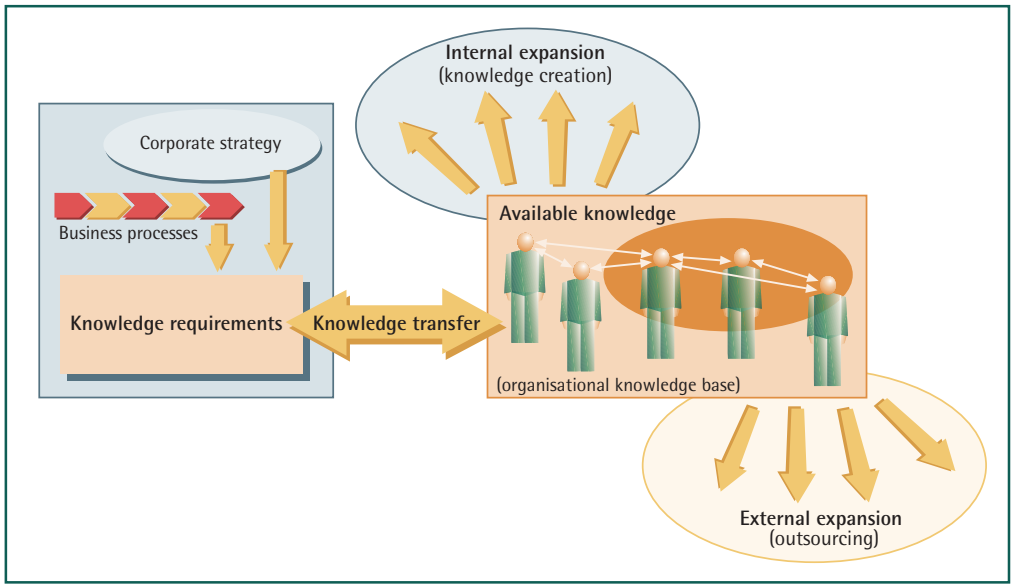


Fig. 15: Sphere of influence of knowledge management processes

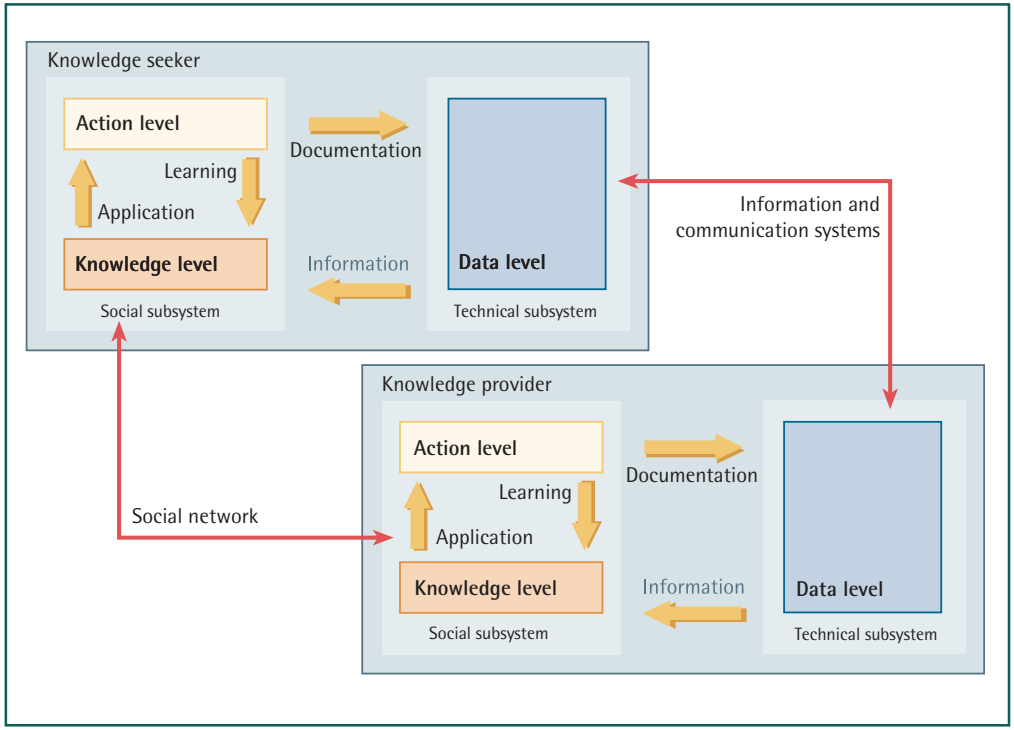


Fig. 16: Knowledge transfer between knowledge seekers and knowledge providers

Knowledge Logistics

Knowledge logistics handles knowledge requirements, available knowledge and knowledge transfer. **Knowledge requirements** form the starting point in the sphere of influence of knowledge management processes (see Fig.15).

Available knowledge is represented by the company's knowledge holders and corresponds to the organisational knowledge base.

Knowledge transfer is the process of linking knowledge requirements and available knowledge. This can occur either via human networks or via information and communication tools (Fig.16) as illustrated in the Basic Model of Knowledge Management on (see Fig.11).

To enable effective **knowledge transfer via human networks**, knowledge seekers and providers must have access to suitable communication methods (e.g. meetings, coaching sessions). Face-to-face communication is the most valuable and, at the same time, most time-consuming form of knowledge transfer and is particularly suitable for complex issues (e.g. clarification of R&D problems).

Knowledge is transferred via **information and communication networks** when a knowledge seeker accesses relevant stored data and turns this into knowledge. This requires prior knowledge of a particular knowledge domain (context). Special mention should also be given to knowledge transfer via telecommunications tools (e.g. telephones, video conferencing, ...), which enable communication across geographical boundaries. The possibilities now offered by video conferencing tools are very similar to those offered by face-to-face communication.

The above examples illustrate the main requirements for effective knowledge transfer in a business environment. Care should be taken to select a form of knowledge transfer that best meets the organisation's business requirements. Human networks are an excellent way of transferring knowledge on complex issues. For simple issues, knowledge transfer can also be effectively achieved using information and communication tools.

The context and background available to the knowledge seeker plays a key role in the selection of the appropriate form of knowledge transfer. Face-to-face communication provides knowledge seekers with the added benefit of being able to increase their contextual knowledge, whereas for information- and documentation-based knowledge transfer, they must already have the relevant contextual knowledge (although this can be acquired separately).

In addition to the selection of the right form of knowledge transfer, a suitable infrastructure and environment is also required (information and communication infrastructure, time, ...).

Recommended Reading

von Krogh, G. (2000): Enabling knowledge creation: How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation; Oxford Univ. Press

Senge, P.M (1994): The Fifth discipline: The Art and Practice of the Learning Organization; New York

Management Summary

Knowledge logistics handles knowledge requirements, available knowledge and knowledge transfer. Knowledge can be transferred via social networks and/or via information and communication technologies (data level).

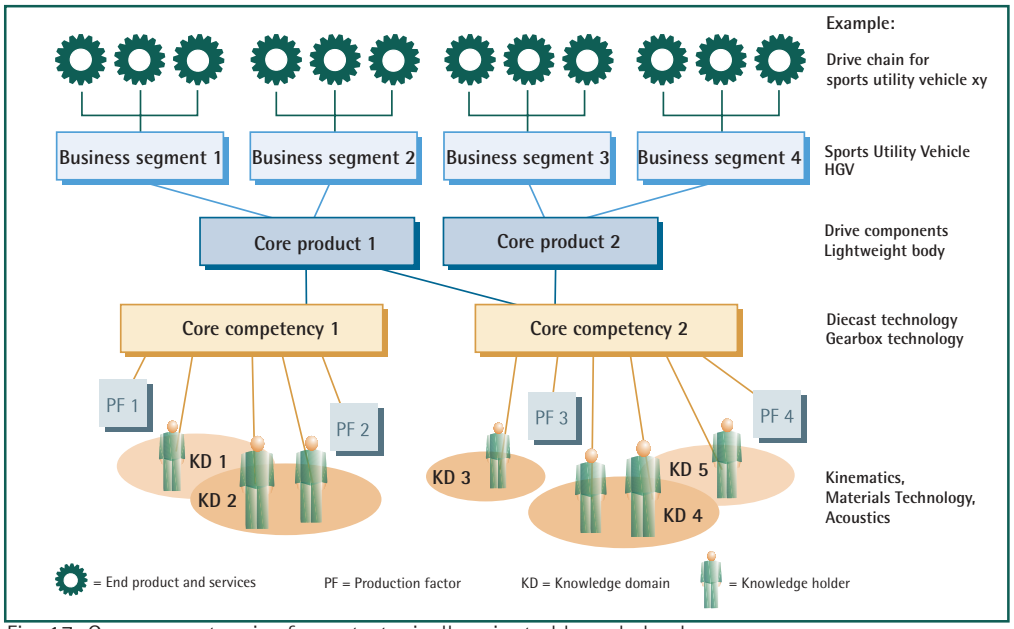


Fig. 17: Core competencies for a strategically oriented knowledge base

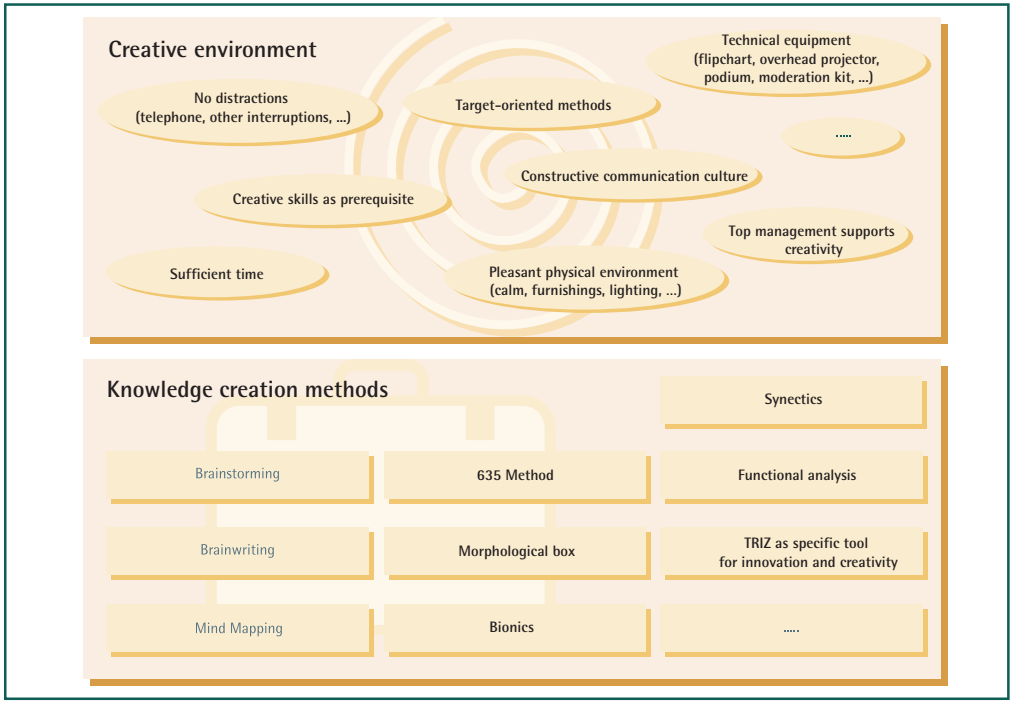


Fig. 18: Requirements and methods for knowledge creation

Changing the Knowledge Base

If an organisation cannot meet its knowledge requirements from its available knowledge, the gap will have to be filled either by **developing knowledge internally** or buying it in (in the form of external services). The method chosen will depend on the company's existing or planned core competencies (Fig. 18).

A company's **core competencies** are the basis of its success and are generally more durable than end products or services. Core competencies can be described as entrepreneurial excellence in a particular field, and are generally the result of extensive interaction between (groups of) experts and/or knowledge holders. This combines the knowledge in the corporate knowledge base and other resources to form a unique combination of skills and expertise (see Fig. 17). Core competencies also form the basis for the development of core products and core services and can generally be applied in different business segments. Customer requirements in different business segments ultimately determine which end products and/or services are developed.

Knowledge is developed internally through **knowledge creation**, one of the tasks of innovation management. This can only be achieved in an appropriate environment (see Fig. 18) and requires both teamwork and the effective use of creative potential. A wide range of creativity techniques are available (Fig. 18) to support these efforts. The participants in creativity workshops, for example, should come from as wide a range of professional backgrounds as possible and always include experts not directly involved in the actual problem or knowledge domain.

To enable a break with familiar methods and solutions and open up new possibilities, it may be appropriate in some cases to also include external knowledge holders and experts. The interaction and communication between participants in these workshops unearths new solutions, as a result, for example, of considering approaches used in other internal or external knowledge domains.

There are a number of **reasons** for including external knowledge sources in internal innovation processes, including:

- Economic/time restraints mean no internal resources are available to cover the knowledge domain
- It does not make strategic sense to develop the knowledge internally.

The knowledge base can be **expanded externally** through outsourcing. This involves buying in specific services, skills and expertise outwith the company's core knowledge domain(s), and can include both routine tasks and specific tasks that can only be accomplished by appropriate experts or knowledge holders. It also involves enlisting the support of external partners to establish and/or develop knowledge domains relevant to the company.

Recommended Reading

de Bono, E. (1990): Six Thinking Hats; London

Hamel, G. (1999): Competing for the future, 11th edn; Boston: Harvard Business School Press

Management Summary

An organisation develops its core competencies by combining internal and external resources and, in particular, knowledge.

The ability to expand or change its knowledge base through knowledge creation and the inclusion of external knowledge sources determine an organisation's ability to act and innovate.

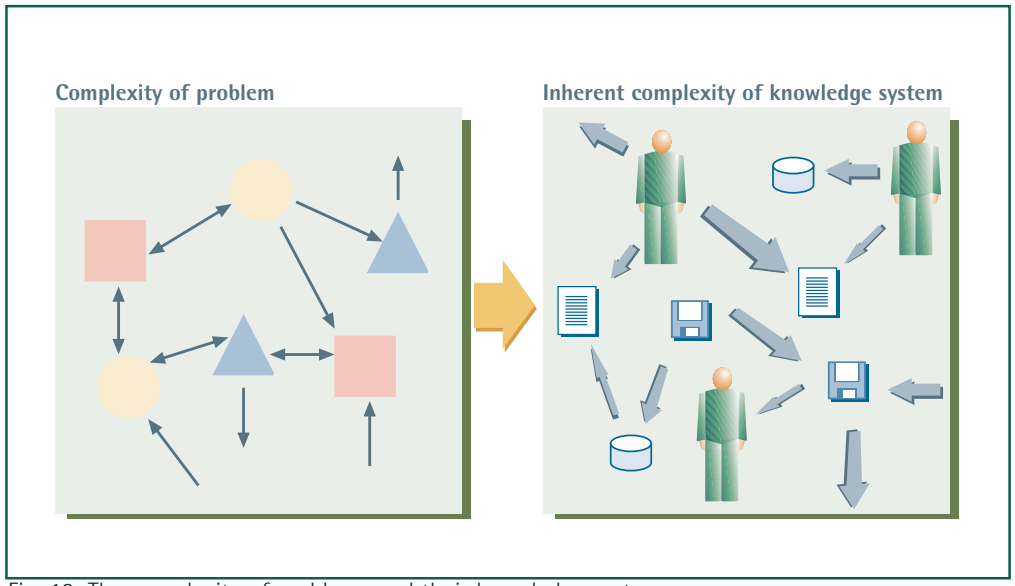


Fig. 19: The complexity of problems and their knowledge systems

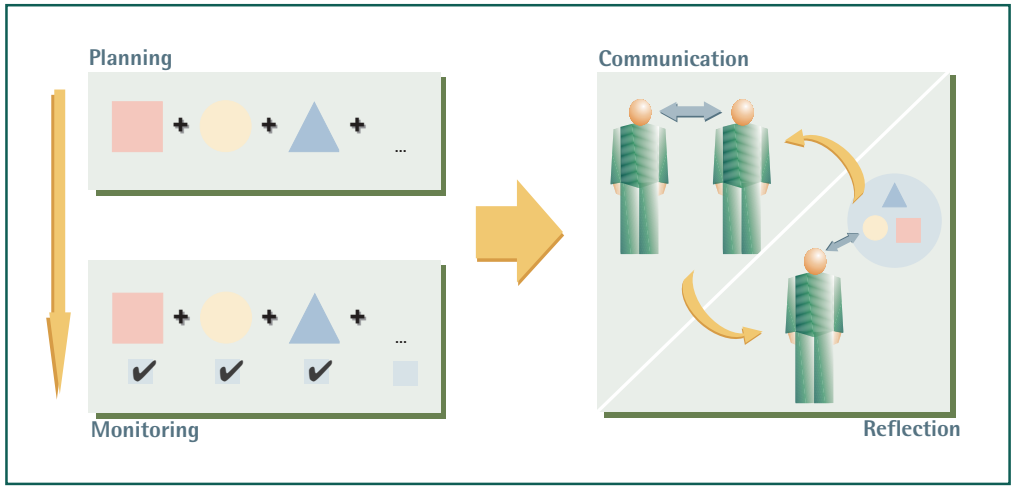


Fig. 20: Paradigm shift in project steering

Integration into Projects

One aim of projects is to complete a complex task or problem in the most efficient manner possible. The more complex the task or problem, the more complex the required project organisation and knowledge system will be (Fig.19). The inherent complexity is demonstrated, for example, in the degree of interdisciplinarity required in the project team.

Integrating knowledge management into project implementation processes involves three basic knowledge management functions:

The first is to **establish an efficient knowledge system for the project**. Any knowledge-oriented activities or interventions are relevant to that specific project and are based on the defined project goals. One way of improving the efficiency of the knowledge system is to pay increased attention (Fig. 21) to communication processes (e.g. the way status meetings are prepared and wrapped up) and reflection (e.g. reviews at the end of individual project phases). This extends the direct steering of projects at the data level through planning and monitoring processes to include indirect steering through communication and reflection processes at the knowledge level.

The second function concerns **knowledge transfer between projects.** This aims to re-use knowledge from similar projects in new projects and thus avoid "reinventing the wheel" (e.g. checklists). Transferring knowledge between projects has obvious benefits for the company behind the projects. One way of ensuring knowledge transfer is to integrate knowledge goals into individual project phases or final project goals. The inclusion of mandatory knowledge goals creates a necessity for knowledge transfer in projects.

The third function is the **transfer of experience between projects.** By transferring experience, systematic use can be made of prior learning processes in subsequent projects, thus avoiding "making the same mistakes twice" (e.g. Lessons Learned Workshops). Repeated learning by "trial and error" can be extremely costly for organisations, particularly since these are uncoordinated learning processes and can happen time and time again. The integration of mandatory learning goals into individual project phases or project goals will also help ensure that experience is transferred.

Project team members are usually fully aware of the importance and necessity of transferring knowledge and experience. However, they generally allocate a lower priority to these activities than to primary project goals (deadline, costs, quality). The integration of mandatory learning and knowledge goals into project goals plays a key role in the project-oriented knowledge management process.

Recommended Reading

Gareis, R. (1990): Management by Projects; Vienna

Schindler, M./Eppler, M. J. (2003): Harvesting Project Knowledge: A Review of Project Learning Methods and Success Factors. In: International Journal of Project Management, Vol. 21/3; Kidlington/Oxford: Elsevier Science Ltd., pp.219-228

Management Summary

Successful knowledge management in projects must resolve the conflict of interests between primary project goals and learning/knowledge goals.

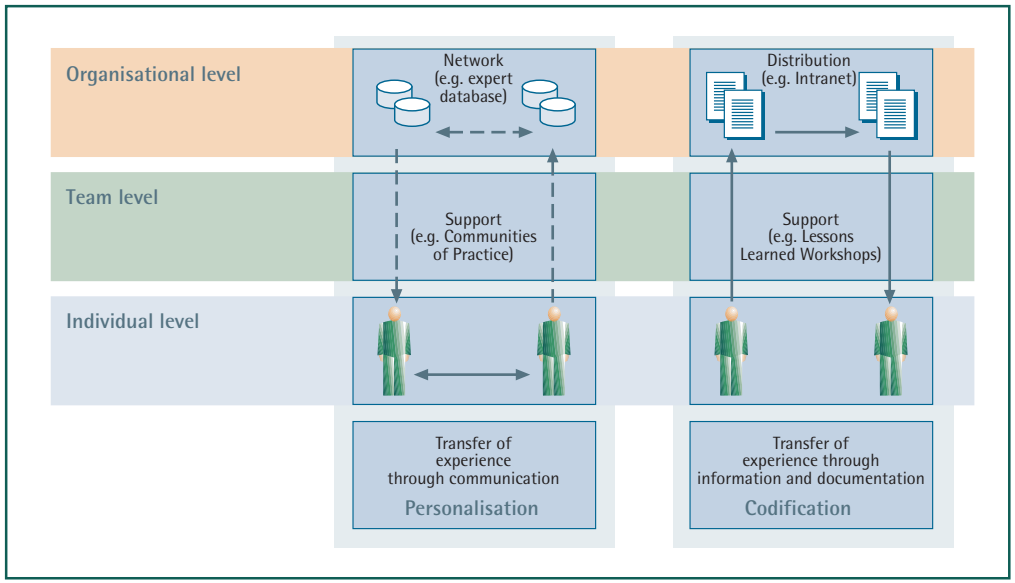


Fig. 21: Transfer of experience through personalisation or codification

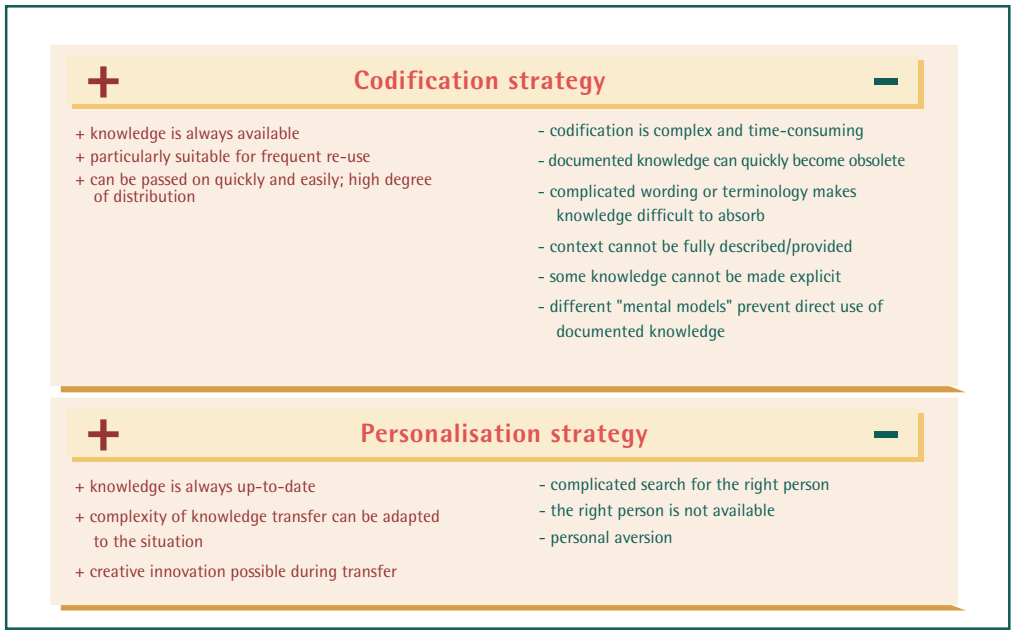


Fig. 22: Advantages and disadvantages of codification and personalisation strategies

Transfer of Experience

It is not possible to transfer experience through communication and/or documentation and information processes, all that can be transferred is a description of what was experienced and any insights gained. Experiential knowledge can only be created through the process of experiential learning and not through transfer processes.

The transfer of experience is a special form of knowledge transfer and, as part of a corporate knowledge management strategy, has two basic aims: Firstly, the transfer of experience should provide individual employees with a broader spectrum of decision-making options and possible courses of action in business situations. This avoids unnecessary effort and repeated learning through "trial and error". Secondly, the transfer of experience supports individual and organisational learning processes and helps to build up individual expertise and develop the company's capacity to learn. Two basic strategies play a role in the transfer of experience:

A **codification** strategy attempts to document the parts of experiential knowledge that can be made explicit (i.e. can be written down), thus detaching it from the individual employee and making it available to others in a codified form (Fig.22). Other employees who encounter similar situations can refer to and apply these documented learning experiences (e.g. Lessons Learned Reports) whenever appropriate without direct contact to the expert.

A **personalisation** strategy, on the other hand, focuses on transferring experience through direct contact (Fig. 22). The intention here is to encourage additional tacit knowledge transfer through processes of communication and mutual observation. To ensure that these contacts occur systematically, and are not just left to chance, a company must know what expertise its employees have. E-mails, project documents, minutes, reports, interviews, etc. contain good indications of what could be included in expert profiles.

The three levels indicated in Figure 21 serve as the basis for the analysis, design and development of the transfer of experience in a company. Transfer of experience will always begin and end at the **individual level**. In codification strategies, the **organisational level** represents the repository and distribution source for documented learning experiences, whereas in personalisation strategies it provides the necessary tools (e.g. expert profiles) for identifying colleagues and/or experts with the experience sought. The **team level** not only delivers the required context for the transfer of experience (e.g. projects), it also acts as an important link between the individual and organisational levels (e.g. Communities of Practice or Lessons Learned Workshops).

Recommended Reading

Argyris, C./Schön, D.A. (1978): Organizational Learning: A Theory of Action Perspective; Reading (MA)

Hansen, M.T./Nohria, N.; Tierney, T. (1999): What's Your Strategy for Managing Knowledge? In: Harvard Business Review, March-April 1999, Number 2; Boston

Kolodner, J.L. (1983): Maintaining organization in a dynamic long-term memory. In: Cognitive Science, Vol 7, No 4, pp.243-280

Polanyi, M. (1983): The Tacit Dimension; Gloucester

Management Summary

The transfer of experience is a special form of knowledge transfer. This type of transfer should serve to broaden the spectrum of decision-making possibilities and courses of action open to employees and avoid unnecessary repeated learning through trial and error.

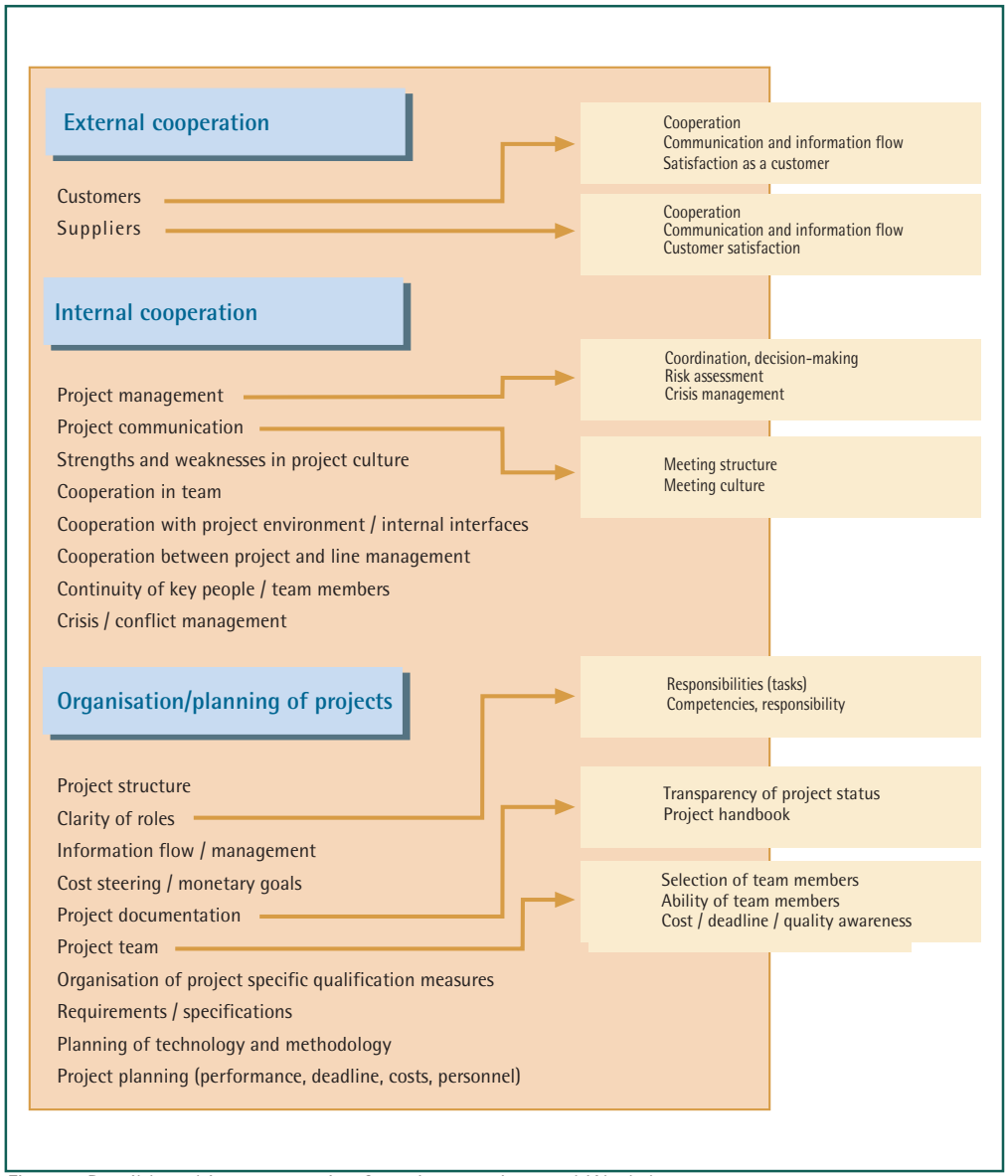


Fig. 23: Possible subject categories for a Lessons Learned Workshop

Closing a Project with a Lessons Learned Workshop

It is an extremely worthwhile exercise to close a project by passing on any lessons learned, positive experiences and suggestions for improvement to future projects. When a project is completed, the individual project team members often interpret what went on in different ways. These differing points of view result from the individual roles they played in the project and their experiences in these roles. This leads to a whole series of different interpretations, assessments and actions. **A Lessons Learned Workshop** gives team members an opportunity to present and discuss their individual points of view. It also encourages individual learning (personal measures) and organisational development (recommendations).

The method described below is a useful way of discussing and transferring experiences with a group of around 30 participants. The aim is to enable effective and efficient transfer of experience in **one day.** Insight should be gained into the following issues:

- What was done well in the project?
- What could have been improved?
- What would be the ideal situation for points that could have been improved?
- What would I personally do differently in the next project?
- What should the organisation do differently in the next project?

The most important stages in this procedure are:

- Defining the relevant issues (Fig. 23)
- The Lessons Learned Workshop (Fig. 24)
- Processing and applying the results

If a one-day workshop is planned, it makes good sense to **define the relevant issues** in advance in a smaller group (e.g. project managers, sub-project managers, quality managers, ...). Examples of possible issues are given in Fig. 23.

Defining the issues in advance will steer the workshop strongly in a particular direction. This restriction will prevent other issues identified by the participants during the workshop from being discussed. If such issues are to be included, then it makes sense not to define the issues in advance, but rather to do so with the whole group at the beginning of the workshop. This will double the time required for the workshop.

This shows the importance of including experienced project team members in the definition of issues.

Management Summary

It is a worthwhile exercise to close a project by passing on any lessons learned, positive experiences and suggestions for improvement to future projects. Defining the issues in advance will save time during the workshop.

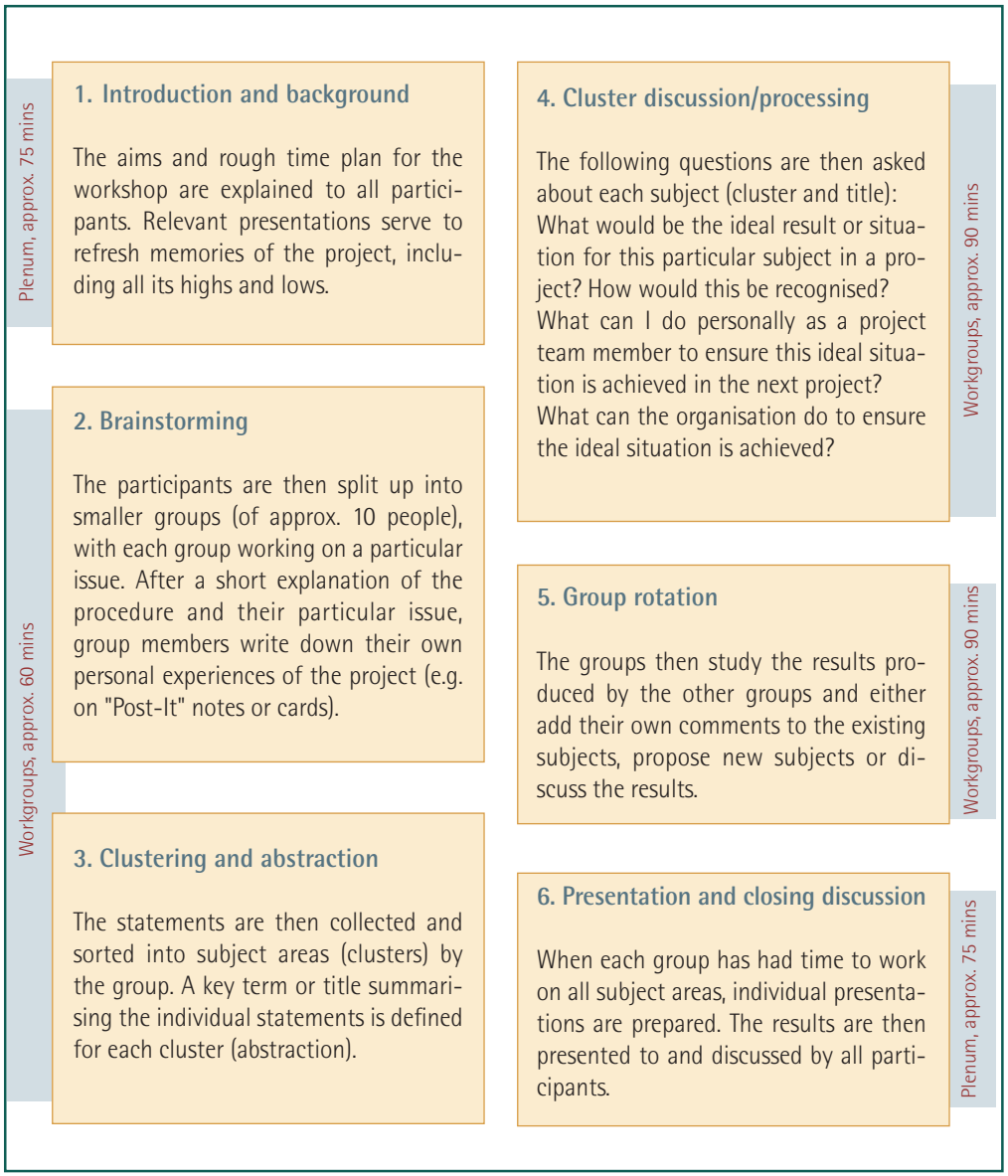


Fig 24: Lessons Learned Workshop

Lessons Learned Workshop

The most important stages in a workshop of this kind are:

Background:

The introductory session should include clear and detailed presentations of the project (from start to finish). In this way, participants will be reminded of what actually went on during the project. Emphasis should be placed on early events, since these are more likely to have been forgotten in the meantime.

Cluster building:

The input from the brainstorming sessions is collected and sorted into subject areas. A key term is defined for each subject area (cluster) that best describes its content. This abstraction simplifies subsequent work with the individual clusters.

Lessons learned:

An ideal target situation is defined for each issue where improvement was considered necessary. Each participant then notes what he or she could do in his or her individual project roles to ensure this ideal target situation is achieved. These are summarised to produce a list of recommendations for the organisation.

Fig. 24 provides a more detailed time schedule for this kind of Lessons Learned Workshop.

Although one of the goals is obviously individual learning on the part of the workshop participants, other colleagues not directly involved in the workshop or project should also be able to profit from any lessons learned.

After the workshop, it is vital that any insights and proposed measures are implemented appropriately. For this to happen, the results and knowledge must be passed on in a suitable form to the appropriate places or bodies to initiate organisational learning. The insights gained in a Lessons Learned Workshop can have long-term effects on the organisation, for example, through:

- Introduction of new training measures/ programmes
- Corrections/additions to project and quality handbooks
- Presentation of results to the Board and management
- Publication in the Intranet.

This method of transferring experience includes elements of both codification and personalisation strategies, whereby the focus is on codification. Consequently, it strives to ensure that lessons learned are transferred through information and documentation processes between experts and problem solvers.

It is also advantageous to include selected (inexperienced) employees as participants in the workshop, since they will learn from direct (face-to-face) communication with experts (personalisation strategy).

Recommended Reading

Davenport T./Prusak, L. (1998): Working Knowledge: How Organizations Manage What They Know; Harvard Business School Press

Senge, P. (1994): The Fifth Discipline; New York

Management Summary

Lessons Learned Workshops are an effective and efficient way of transferring experience in a relatively short period of time (one day). The results are then passed on to the appropriate people in the organisation to initiate organisational learning.

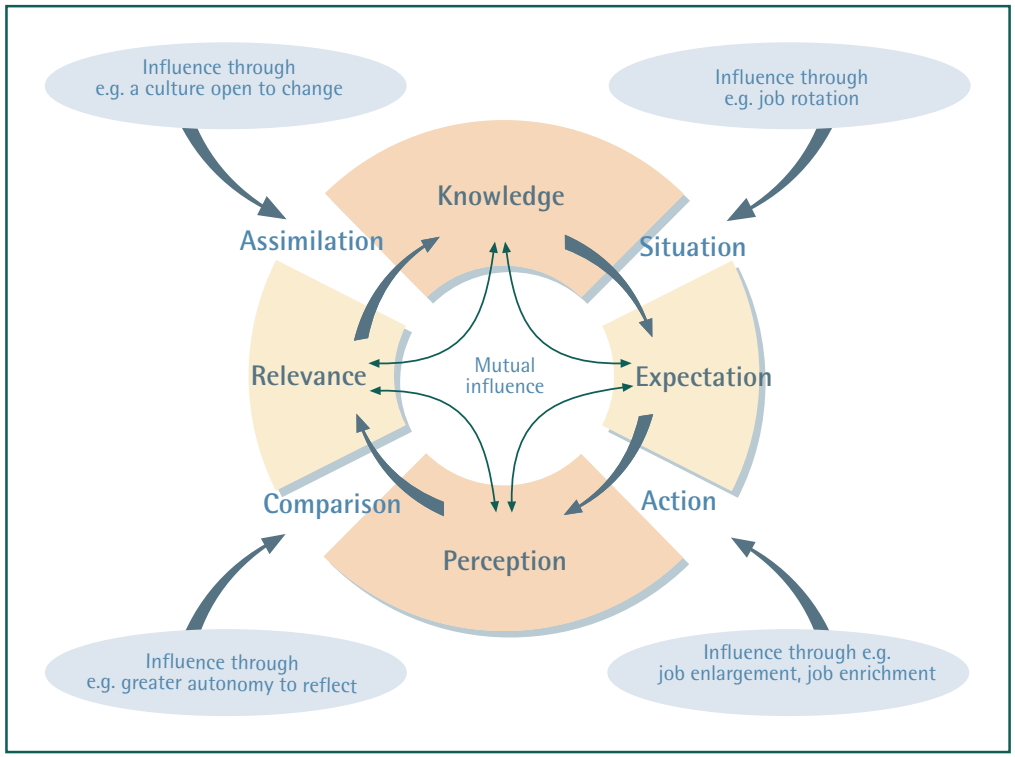


Fig. 25: The cycle of experiential learning

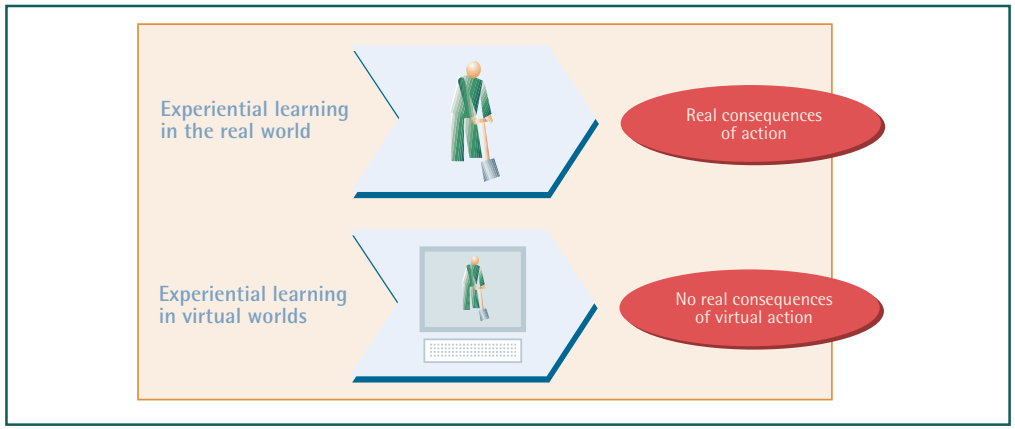


Fig. 26: Experiential learning: Comparison between reality and virtual realities (e.g. flight simulators, business simulation games)

Experiential Learning

Experiential knowledge can only be gained through the process of experiential learning. Figure 25 shows a simplified model of this process.

Knowledge is a necessary basis for experiential learning. Even a "random attempt" requires a certain amount of declarative and procedural knowledge. Knowledge (and the knowledge holder) should be considered as part of a **situation**, whereby any connection resulting from the situation is often described as context.

By applying their existing knowledge to a situation, people develop **expectations** of what it will entail and what the results of any planned or observed actions will be. Even the assumption that nothing will happen is an expectation. **Action** is only required in the case of direct learning through "trial and error". No deliberate action is required in experiential learning through observation.

It is the individual's perception that makes sense of what the situation actually entailed and the consequences of any actions taken or observed. A subsequent **comparison** of what was perceived and what had been expected will result in either an agreement or a deviation. Agreement confirms both expectations and original knowledge.

The person determines the **relevance** of any positive (success) or negative (failure) deviation. This is a prerequisite for the acquisition of experiential knowledge. Any **change** to existing knowledge constitutes the end of the current and the beginning of a new experiential learning process.

Knowledge, expectation, perception and relevance play decisive roles in experiential learning processes and all have a very strong influence on each other. For example, expectations will greatly affect perception.

There are a number of possibilities open to management for influencing experiential learning processes and thus the creation of experiential knowledge, including:

- Placing people in **situations** that foster experiential learning (e.g. job rotation)
- Encouraging people to take or observe **action** (e.g. job enlargement, job enrichment)
- Creating space for reflection and systematic **comparison** of expectations and perceptions (e.g. regular project reviews).
- Establishing a culture that is open to change in established knowledge (e.g. where people can admit to and learn from mistakes)

Rapid advances in technology now make it possible to create artificial situations and environments (virtual realities) for experiential learning (Fig. 26).

Recommended Reading

Dewey, J. (1938): Experience and Education; New York

Kolb, D.A. (1984): Experiential Learning: Experience as The Source of Learning and Development; Englewood Cliffs (NY)

Schön, D.A. (1983): The Reflective Practitioner; New York

Management Summary

Experiential knowledge can only be gained through the human process of experiential learning. However, companies can influence both experiential learning processes and the creation of experiential knowledge.

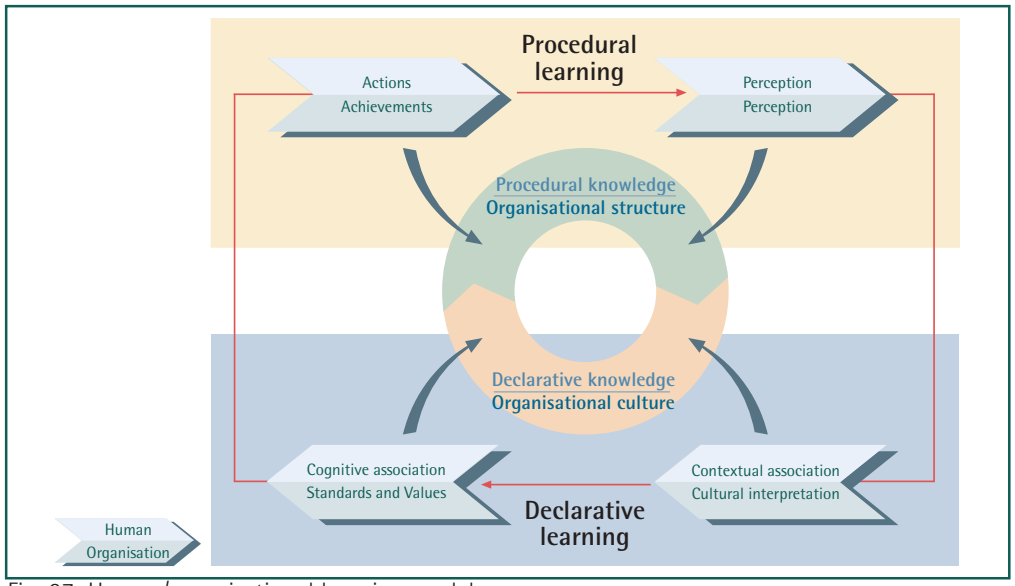


Fig. 27: Human/organisational learning model

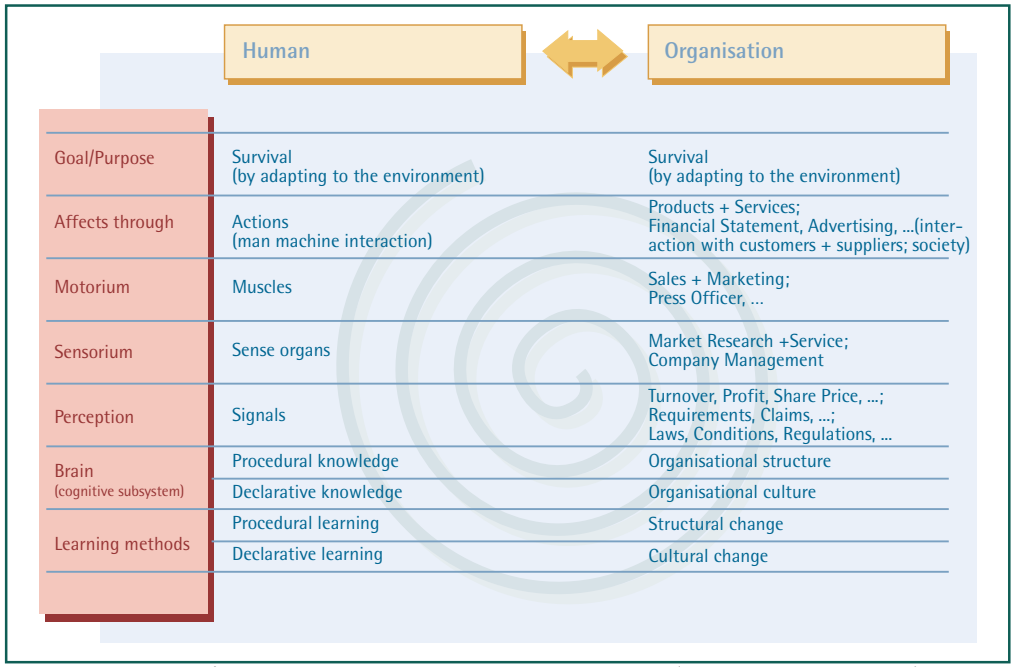


Fig. 28: Comparison/analogy between humans and organisations (in this case a company)

From Individual to Organisational Learning

A learning model for humans (Fig. 27) shows the learning process as a four-phase cycle, with different types of knowledge created in each phase. This new knowledge then forms the starting point and object of the next learning activity.

Procedural learning in humans involves the perception of stimuli and the initiation of appropriate behaviour (action). The analysis of prior experiences (contextual placement) and the development of behavioural guidelines (cognitive association) are known as **declarative learning**. However, this dichotomy should not be misinterpreted: Both levels of learning (and types of knowledge) are in fact activated in and interact with the learning process, even if one of them assumes a more prominent role.

A comparison of analogies between humans and organisations (Fig. 28) shows organisational structure as a procedural element and organisational culture as a declarative element in organisations. These analogies are based on the following assumptions:

- People use **procedural knowledge** (know how) to interact with their environment through action. In comparison, organisations use appropriate **structures** (procedures, processes) to generate activities and interact with their environment.

- In humans, **declarative knowledge** (know what) is the starting point for procedural knowledge and any subsequent actions. Correspondingly, **culture** can be described as the declarative knowledge of an organisation, since it provides the meaning and guidelines for behaviour and thus forms the basis of all actions.

Consequently, the organisational learning process follows comparable phases to its human counterpart, whereby any changes in structure can be seen as **procedural learning** and changes in culture as **declarative learning** in an organisation. Although it is again possible that one particular learning process will assume a more prominent role, in practice they will always interact.

Individual learning processes form the starting point for organisational learning. It is individual learning that provides the impetus for organisational change. The implementation of any such change also requires individual learning processes, which can involve all members of the organisation or smaller groups, depending on the scope of the actual change.

Recommended Reading

Argyris, Ch. (1999): On Organizational Learning; Oxford

Kolb, D.A. (1984): Experiential Learning: Experience as The Source of Learning and Development; Englewood Cliffs (NY)

Management Summary

Organisational learning can be seen as being analogous to individual learning. It is based on individual learning processes and involves changing the organisational structure and/or culture to guarantee survival in a dynamic environment.

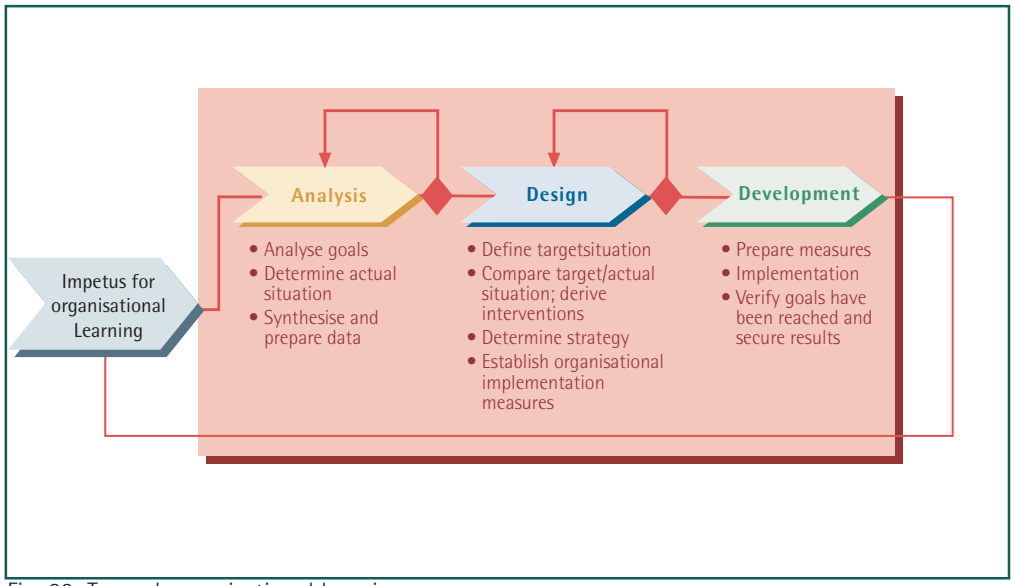


Fig. 29: Towards oganisational learning

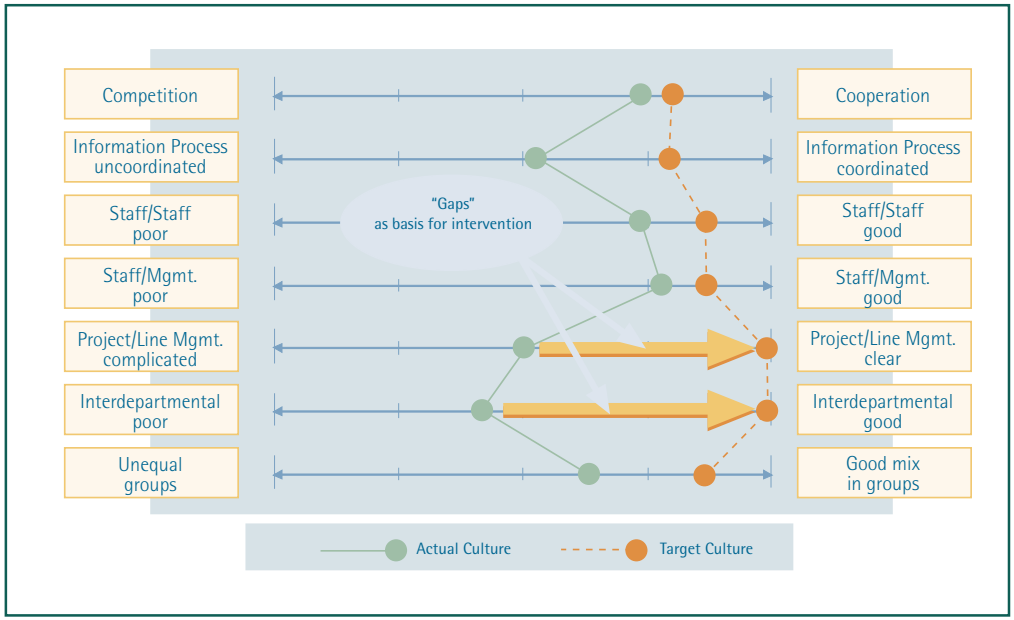


Fig. 30: Example target/actual culture comparison for "interpersonal relationships"

Procedure and Analysis

A general, three-step (analysis, design and development) sequential model (Fig. 29) can be applied to organisational learning.

The following dimensions and their characteristics can be used as the basis for the analysis and design of the **organisational structure:**

- Specialisation (specialised – generalised)
- Coordination (impersonal – personal)
- Configuration (hierarchical – heterarchical)
- Delegation of decisions (centralised – decentralised)
- Formalisation (bureaucratic – unbureaucratic)

The analysis and design of the organisational culture can be based on basic cultural assumptions. These include views on and attitudes to:

- Environment (threat – opportunity)
- Reality (facts – creativity)
- Human nature (independent – dependent)
- Human action (control – trust)
- Interpersonal relationships (competition – cooperation)

Once the **impetus for organisational learning** has been given, i.e. a need for organisational change recognised in reactions from the environment, the analysis phase can begin. In this phase, goals should be defined and the actual situation (structure and/or culture) established and processed.

In addition to the goals for the entire learning process, sub-goals should also be defined for each individual (sub-)stage. Sub-goals are derived from appropriate main goals and can be extended to include any requirements specific to a particular issue. When formulating goals, attention needs to be given to the fact that these should be specific, measurable, ambitious, realistic and scheduled.

Any research methods used will depend strongly on the resources available and should consider content, human resources and economic factors. Questionnaires are a quick and easy way of establishing a general picture of the current climate, whilst semi-standardised interviews (Fig. 30) take a more detailed look at the interviewee's individual situation. Observation methods are used primarily to support and/or verify other research methods.

Recommended Reading

Kotter, J.P./Heskett, J.L. (1992): Corporate culture and performance; New York

Pugh, D.S./Hickson, D.J./Hinings, C.R./Turner, C. (1968): Dimensions of Organization Structure, ASQ 1968, Vol. 13, pp. 65 – 105

Schein, E. (1992): Organizational Culture and Leadership; New York

Siehl, C./Martin, J. (1988): Measuring Organizational Culture: Mixing Qualitative and Quantitative Methods. In: Jones, O., Moore, D.; Snyder, C. (Eds): Inside Organizations, Understanding the Human Dimension; Newbury Park, pp.79-103

Management Summary

Organisational learning can be achieved systematically through the analysis and design of structural and cultural dimensions.

Environment
• Does the organisation dominate its environment?
• Is the environment considered a challenge for XY?
• Does everyone know the organisation's goals?
• Are the goals clear, and do they match the organisational environment?
Reality (Truth, Time and Space)
• Are tried and tested solutions preferred to new (creative) ones? Will consideration be given to external solutions or only to internal possibilities?
• What is the general approach to time? Is the focus more on the past, the present or the future?
• Is enough time allowed for asking/answering questions? Which "medium" is used?
• Is there sufficient opportunity/space for informal knowledge transfer?
Human Nature
• Who makes decisions? How are decisions made? Do people make use of any freedom they might have to take decisions?
• How is work/performance checked? (self-assessment, trust, milestones, etc.)
• How does the organisation approach responsibility? Who has responsibility? Is this consistent throughout the organisation?
• Are there any incentive systems in place? If so, do they work? Should there be incentives for knowledge sharing?
Human Action
• Is this focus more on completing tasks (routine processes) or on active learning (knowledge creation)?
• Does the organisation tolerate and how does it react to mistakes?
• Relationship between work and leisure: totally separate or a way of life?
Interpersonal relationships
• Attitude to knowledge sharing: "knowledge is power" vs. cooperative knowledge exchange? "Each to his own" vs. team oriented approach?
• What is the relationship like between colleagues? How do they communicate with each other? Relationship/communication between staff and management?
• How does interdepartmental communication work?
• How are groups formed? (age, experience, personality, etc.)

Fig. 31: Interview guidelines for culture survey (excerpt)

Design and Development

The next stage in the design process is to define a desired target situation, compare this with the actual situation and derive appropriate interventions from the results of this comparison. The objective is not to present a finite picture of the characteristics of the individual dimensions used in the analysis, but rather to identify those that **deviate** most from the defined target situation.

The target situation can either be established during the analysis of the actual situation or in workshops with "opinion makers" (e.g. management, staff representatives, etc.) and staff. Graphical representations are an excellent way of presenting the results of the situational analysis and/or a target/actual comparison (e.g. Fig. 30), since managers often think and act "in numbers", and show greater interest in dealing with any shortfalls presented to them in this form.

An appropriate strategy should now be defined to address these shortfalls. This will depend on the degree of deviation between the target and actual situations and the urgency of any identified issues. The changes can either be introduced slowly on a step-by-step basis (evolutionary approach) or quickly in larger chunks (revolutionary approach). One advantage of a step-by-step approach is that it allows time for staff to be fully involved in the change process, whilst a radical (less promising) change process leaves limited if any time for staff involvement.

Utmost care should be taken in the planning and organisation stages, since the way a project of this kind is handled at the start can have a major influence on how any measures are subsequently accepted.

The process then moves into the development stage, where any proposed interventions are implemented, i.e. suitable measures are developed, introduced and evaluated to ascertain how effective they have been for the goals set.

Marketing plays a particularly important role in the preparatory stages and serves to promote the project throughout the organisation, raise its image and increase acceptance among staff.

The project can either be implemented on a step-by-step basis (e.g. as a pilot project) or on a company-wide scale ("big-bang).

Repeated analysis of the individual dimensions serves to verify the efficiency and effectiveness of any measures introduced. In this way, the process can be continuously refined to successively reduce or eliminate any deviations determined between target and actual situations.

Management Summary

Organisational learning takes the form of change projects, which must be handled differently to classic projects. Success factors include staff involvement and management participation (e.g. as role models).

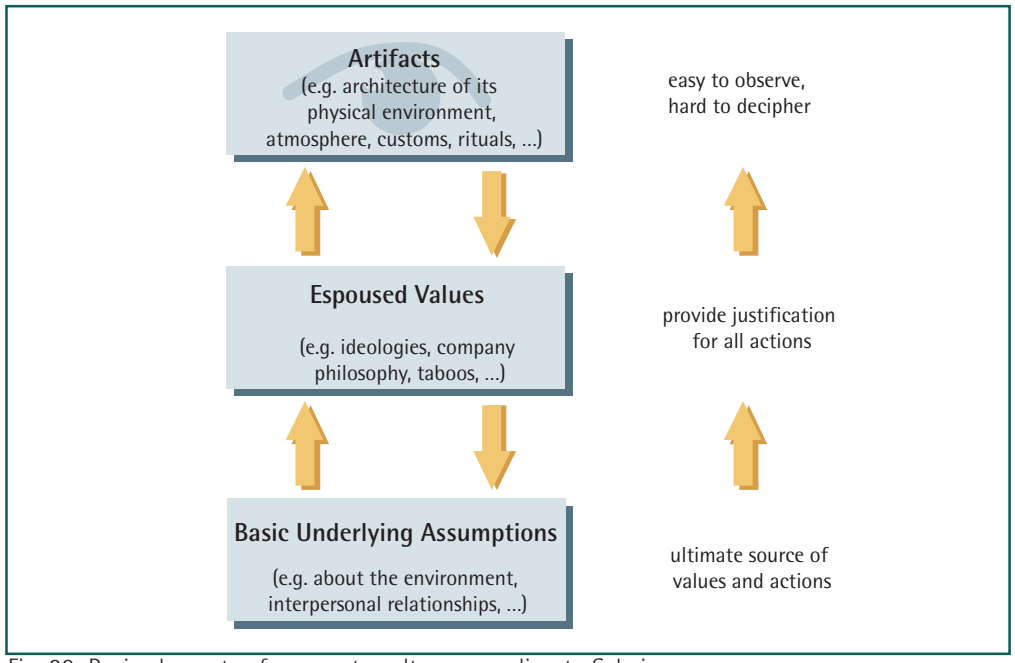


Fig. 32: Basic elements of corporate culture according to Schein

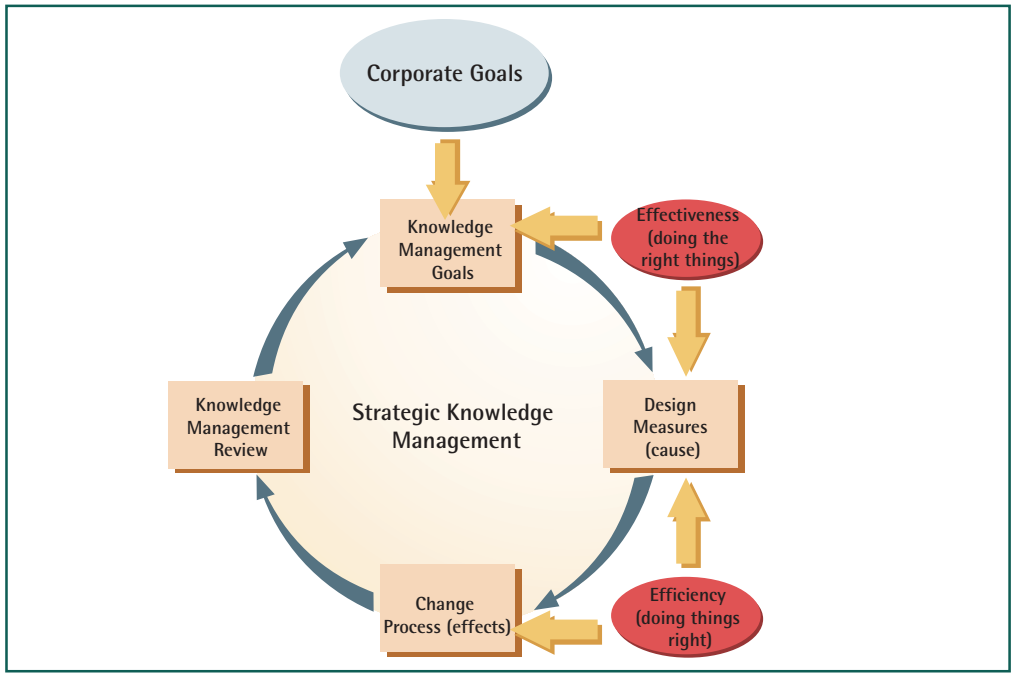


Fig. 33: Cycle of strategic knowledge management

Corporate Culture and Strategic Knowledge Management

Corporate culture includes all the values, traditions, rituals, standards and beliefs that determine how people act in an organisation.

We know from chemistry that **catalysts** activate and accelerate processes. Corporate culture assumes the role of the catalyst in knowledge management, thereby playing a key role in all analysis and design activities. In analogy to knowledge management, it can therefore be assumed that corporate culture also needs to be lived and constantly driven and promoted by management.

Corporate culture can be determined by carrying out periodic reviews of the basic elements of corporate culture illustrated in Figure 32. The resultant "gaps" between the actual culture and a target culture open to knowledge management form the starting point for strategic management intervention. Indeed, **management** is in a unique position to create, steer and change corporate culture.

A **strategic orientation** in knowledge management should not only ensure that all related activities are based on general corporate goals; it should also help to continually improve and institutionalise the knowledge management processes themselves. This requires the following steps:

- Setting knowledge management goals
- Establishing and implementing design measures
- Initiating change processes
- Periodic assessment reviews.

All these activities form part of a typical management process. To ensure knowledge management activities are fully integrated into actual working practices, management must continually observe any cause-effect relationships. In practice, evaluations based on the business indicators "effectiveness" and "efficiency" have proved highly successful (see Fig. 33).

Using **effectiveness** as an indicator of the dynamic relationship between knowledge management goals and design measures determines the **strategic gap** (i.e. if the correct measures have been implemented).

Assessing **efficiency** as an indicator of the effect any measures have had on the change process provides the **operating gap** (i.e. if the measures have been implemented correctly).

The **cycle of strategic knowledge management** thus allows a company to adapt appropriately to any dynamic changes in its environment, yet at the same time remain true to its knowledge-oriented goals.

Recommended Reading

Ansoff, H. I. (1984): Implanting strategic management, 2nd edn; Englewood Cliffs

Schein, Edgar H. (1997): Organizational culture and leadership. 2nd edn; San Francisco

Management Summary

Corporate culture assumes a central role in knowledge management and requires constant impetus from management. Strategic knowledge management considers all corporate goals and allows continuous improvement of knowledge management processes.

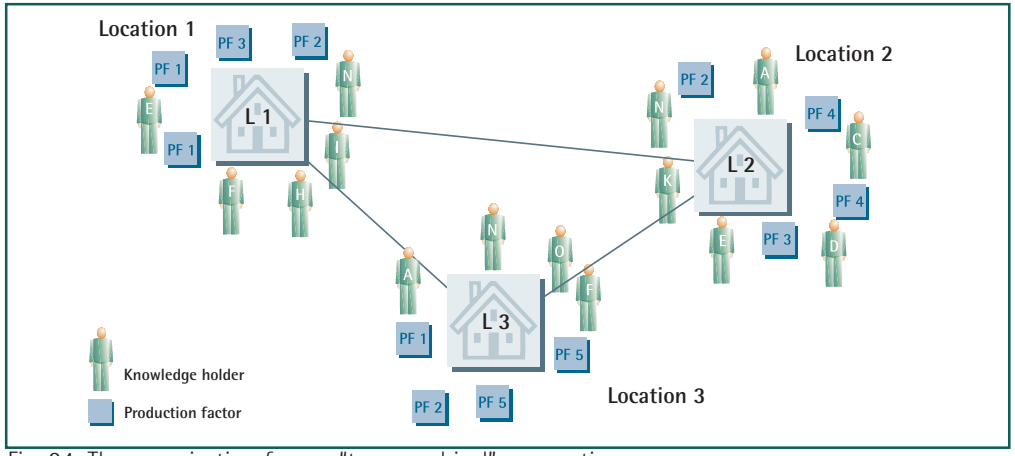


Fig. 34: The organisation from a "topographical" perspective

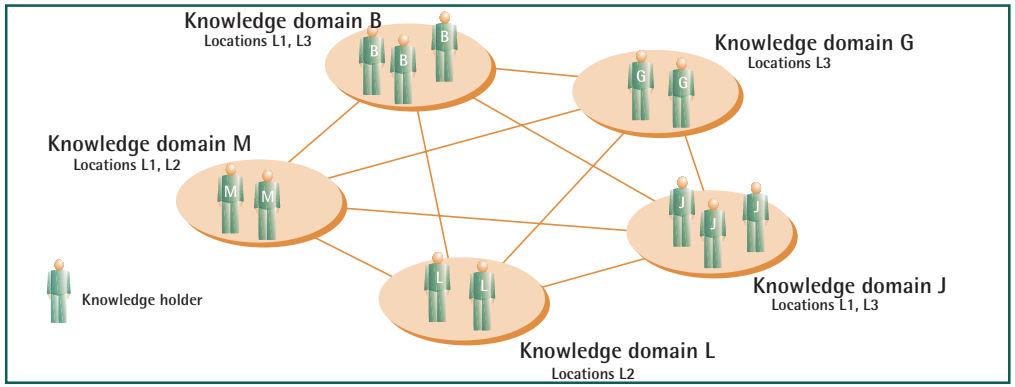


Fig. 35: The organisation from a "knowledge" perspective

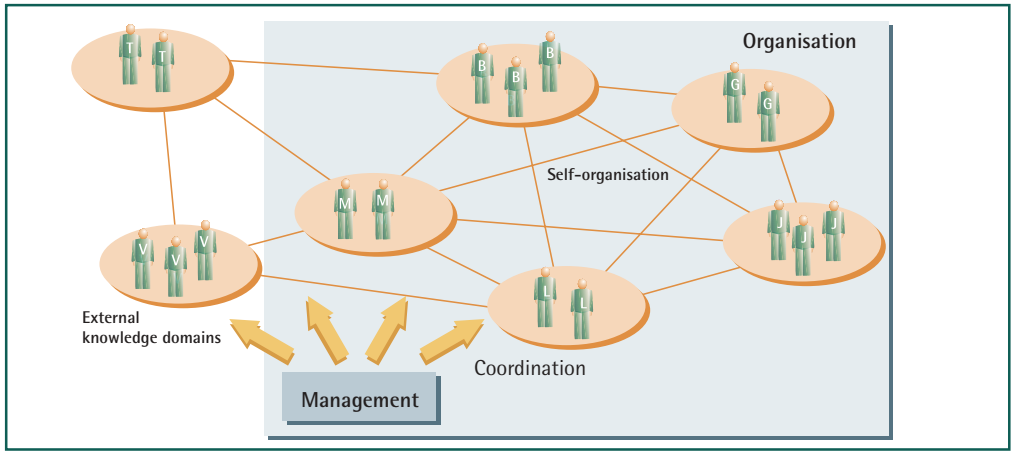


Fig. 36: Model of a knowledge-based network organisation

The Knowledge-based Network Organisation

One of the main requirements for effective knowledge management is an organisational framework that supports the optimal acquisition and networking of knowledge. The knowledge-based network organisation is one such possibility.

Since knowledge is intrinsically linked to people, location plays an equally important role for knowledge as it does for other factors of production. In "**topographical**" terms, an organisation can be described as the sum of its locations and departments (see Fig. 34).

However, if the focus is placed on "**knowledge**", the change in perspective yields a totally different picture. The organisation now appears as a network of individual knowledge domains. This can be seen clearly in Figures 34 and 35, which depict the same organisational structure, but in two different forms.

A **knowledge domain** is not a subject area in the lexical sense: It is a social system that concerns itself with a common area of interest. Knowledge domains can also be thought of as virtual departments "set up" to enable collective knowledge creation. Since the individual members of a given knowledge domain can be spread across different departments or locations, they will require support to ensure effective communication. This can be achieved with an appropriate organisational framework, e.g. virtual departments with the same status as "traditional" departments.

Knowledge domains can also encompass members of other organisations. These might include research staff at universities and research institutions, or the employees of customers and suppliers integrated in value creation processes.

One good example of this is the innovation process. New, innovative products are often the result of close cooperation work with customers and suppliers. Some innovation activities may even be outsourced to external partners. For example, companies often finance research projects, dissertations or doctoral theses.

The network of internal and external knowledge domains is described as a **knowledge-based network organisation**. The responsibility for coordination of the individual knowledge domains lies with management, who need to make two decisions based on the organisation's business strategy:

- Which knowledge domains to set up and develop internally (core competencies) and which to outsource
- The knowledge goals for the individual knowledge domains (see Fig. 36).

Recommended Reading

Buchanan, M. (2002): Nexus: Small Worlds and the Groundbreaking Science of Networks; W.W. Norton & Company

Castells, M. (2000): The Rise of the Network Society; Blackwell Publishers

Wenger, E.C./Snyder, W.M. (2000): Communities of Practice: The Organizational Frontier. In: Harvard Business Review, January-February, pp.139-145

Management Summary

Networking knowledge adds a new dimension to organisational design. In addition to internal networking and links with other company locations, increasing importance is now being placed on networking with external partners.

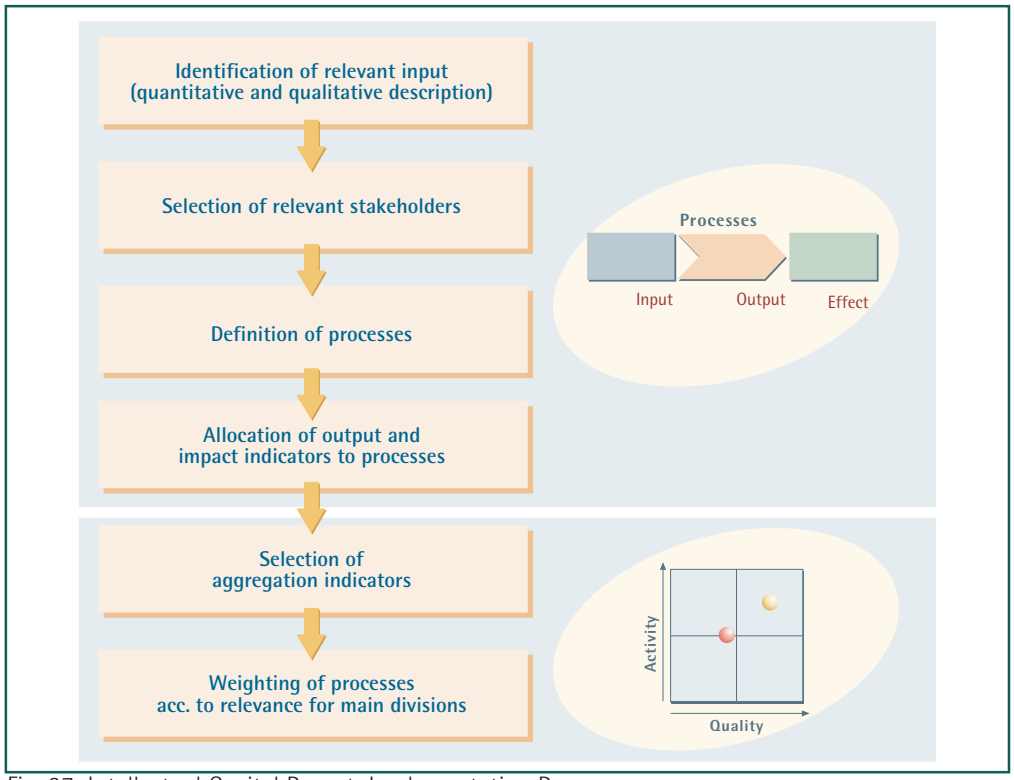


Fig. 37: Intellectual Capital Report: Implementation Process

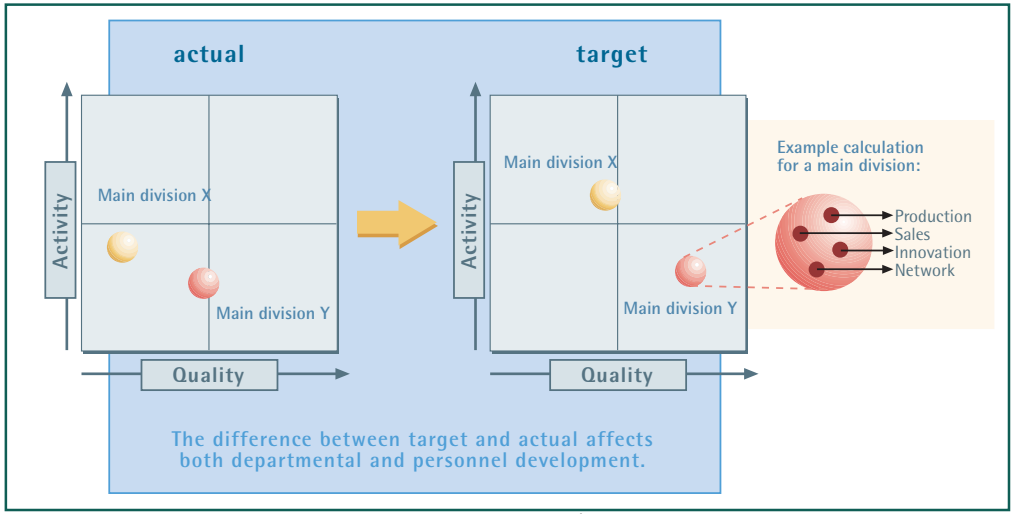


Fig. 38: Derivation of strategic measures through target/actual comparison of work profiles

Strategy Implementation with the Intellectual Capital Report

The process selected for the implementation of an intellectual capital report will depend very much on the way an organisation currently operates (management approach, business indicators, etc.). However, the first step will always involve examining existing **business processes** to identify any relevant (and documentable) **input**. Emphasis should be placed on those business processes that most affect the defined stakeholders. The indicators selected for these processes describe the **output**. The **effect** of this output on the stakeholders can also be illustrated using relevant indicators or qualitative descriptions. These initial steps establish the **intellectual capital report model** for the organisation in question.

When implementing strategy, it is important to evaluate the individual main areas of focus and establish **activity** (efficiency index) and **quality** (effectiveness index) indicators. If the intellectual capital report is to be used as a **steering instrument**, output indicators that affect the total result of each individual selected area (e.g. product quality, reliability) must be chosen to calculate the activity. Activity is thus an aggregated value made up of selected contributory factors from the individual business processes (output).

In the same way, only selected process indicators should be used to determine the **quality indicator**. To consolidate the indicators for each area, the individual business processes are weighted according to their contribution to building up expertise in a particular field.

The calculated activity can be combined with defined employee skills and plotted on a **knowledge map** or included in an **activity/quality portfolio** (see Fig. 38).

The activity/quality portfolio provides valuable information on the **actual situation** in an organisation and illustrates current activities across all selected areas. This can be used to define future goals and **draw up** a target profile of activities (see Fig. 38).

This type of aggregation offers organisations a means of breaking down their strategic goals to a departmental or individual employee level. Appropriate changes in the activities carried out or quality levels achieved in individual areas can also be initiated. For example, existing staff may need further training or additional staff may need to be recruited to increase activity in a particular area. To improve quality, customer satisfaction must be measured and the results analysed to identify appropriate measures.

Recommended Reading

Graggober, M. (2002): Intellectual Capital Statement an instrument to control strategic topics of an University Institute. In: 3rd Multinational Alliance for the Advancement of Organisational Excellence Conference; Scotland: University of Paisley; Emerald

Management Summary

If an intellectual capital report is to be used as a strategic steering instrument, it must be carefully planned and include clearly defined indicators. An activity/quality portfolio provides information on the specific business activities in an organisation.

Knowledge Markets as Strategic Interfaces between Organisations

What function do organisations perform in a society in which mobile knowledge workers are faced with the choice of working freelance (i.e. independence) or adapting themselves to fit in an established organisational structure (i.e. financial security)?

Even small, highly specialised companies have to choose between pooling their resources and using the synergetic effects of larger (virtual) organisations, or remaining independent and retaining their flexibility.

Can knowledge really be exchanged as fairly and effectively in this kind of (often instable and unclear) marketplace as it is in the clearly defined, stable processes common to an organisational environment?

Markets use price mechanisms to regulate supply and demand. However, some of the characteristics of knowledge make it difficult to "**barter with**". This can force a company trying to establish a long-term position on the competitive knowledge marketplace to have to make an important strategic decision.

Depending on both the market situation and their internal requirements, organisations or individual bidders have two alternatives: Either intensive, long-term cooperation with a strategic partner (insourcing) in a stable, specialised environment, or flexible cooperation and even buying in knowledge on a short-term basis via markets or outsourcing partners in a highly dynamic environment.

At least three problems arise when negotiating non-standard services such as knowledge:

- **Describability**: Buyers do not always know what they want and may find it difficult to determine whether they have received what they wanted, even after having been provided with a description of what to expect.

- **Assessibility**: Due to the difficulties involved in predetermining the quality of the services, buyers cannot assess a fair price prior to receipt of the knowledge.

- **Transfer**: Once knowledge has been transferred "on a trial basis", this cannot be reversed. Transferred knowledge might then not be paid for (e.g. if it were to become clear that the "wrong product" had been supplied).

These problems lead to the following considerations for strategic protection of knowledge resources:

The closer the link to core competencies, the greater the focus should lie on internal knowledge; the greater the distance, the more feasible it becomes to acquire the required knowledge via the marketplace. However, it remains unclear how these kinds of markets might best be organised to ensure effective and fair knowledge transfer. Regulatory measures and legal restrictions will be necessary to minimise the risks of a loss of company-sensitive knowledge via (free) markets.

Recommended Reading

Skyrme, D. J. (2001): Capitalizing on Knowledge: From e-business to k-business; Butterworth-Heinemann,
URL: http://www.kikm.org/portal/page2.htm

Management Summary

From a strategic point of view, it would appear wise to build up the core knowledge an organisation requires to remain competitive internally, and only draw supplementary knowledge from free markets.

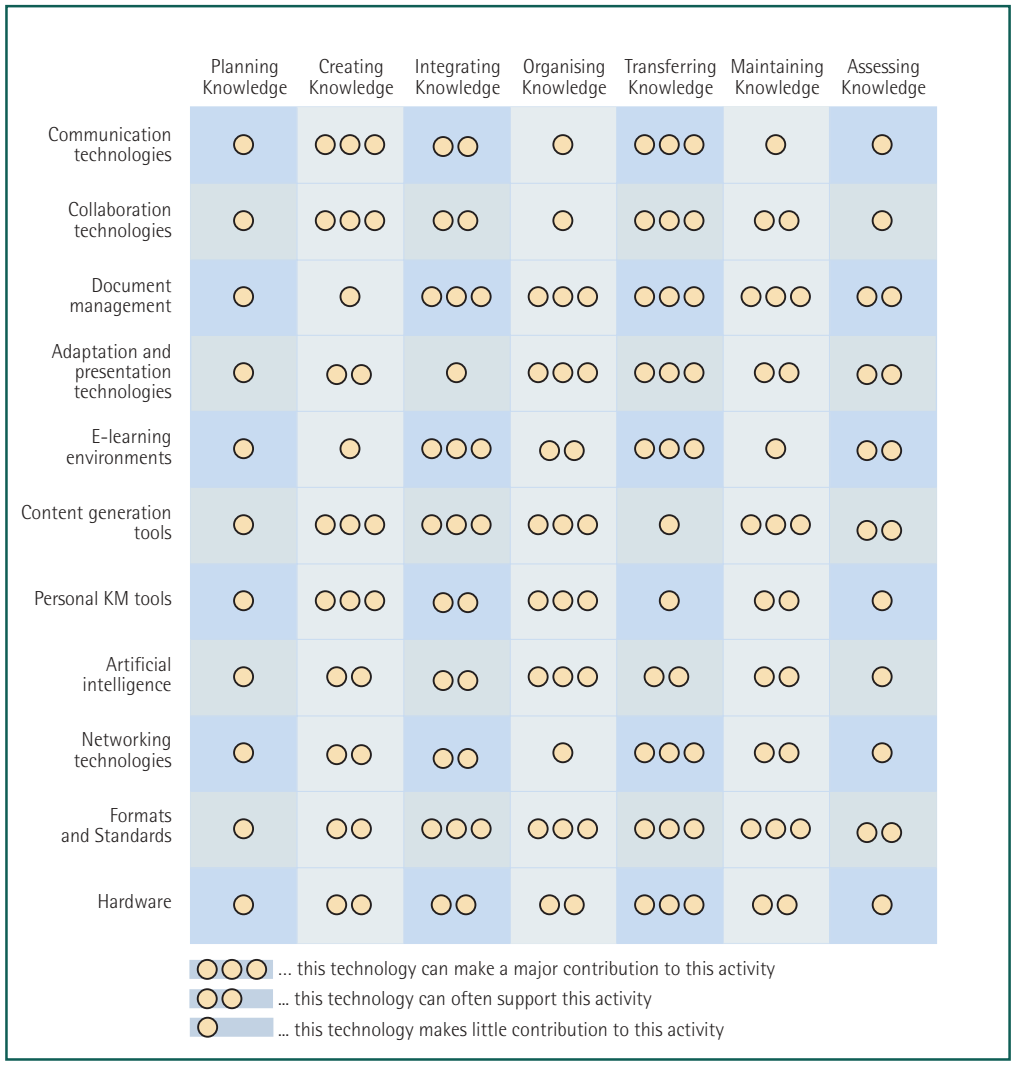


Fig. 39: Extent of support provided by technology for knowledge management activities

Relevance and Overview of Technologies

Information and communication technologies (ICTs) offer valuable support for **knowledge management activities**. Indeed, many tasks in knowledge management (e.g. communication across geographical boundaries and time zones) only really become feasible through the use of appropriate technologies.

However, to ensure that they provide the support required, the decision for any technology-based solution(s) should be **driven by knowledge management needs** and not by technical considerations. Discussing specific technical solutions before the actual knowledge management goals have been set, or even adjusting goals to suit technical constraints (and without considering people-oriented alternatives) are clear warning signals.

Establishing an overview of the different technologies available and the activities they support can be very useful in the knowledge management implementation process. The example given in Figure 39 considers different technologies with a view to seven basic knowledge management activities. **Knowledge planning** activities include the definition of knowledge management goals and strategies. **Knowledge creating** focuses on the development of new knowledge, whilst **knowledge integration** makes existing (internal or external) knowledge available throughout the company. The role of **knowledge organisation** is to bring structure into all this knowledge. **Knowledge transfer** includes both planned, institutionalised transfer as well as spontaneous knowledge exchange. **Knowledge maintenance** activities ensure obsolete, out-of-date knowledge is identified, updated or even "forgotten". Finally, **assessing knowledge** provides an overview of the knowledge available and determines how it has developed over time. It also indicates the extent to which knowledge goals have been reached.

Figure 39 gives an overview of the support that the different technologies available can provide for knowledge management activities. An **overall consideration** shows that knowledge planning activities benefit least from information and communication technologies, and that they also only provide limited support in knowledge assessment. They are, however, particularly effective in knowledge transfer activities and also provide sound support for knowledge integration and organisation.

However, if all seven knowledge management activities are considered as a whole, the actual differences in the extent of the contributions made by the individual technology groups are less pronounced. Furthermore, the relevance of formats, standards and content generation tools should not be overlooked. They play a remarkably important role, yet are often neglected. Document management systems continue to play a major role in information technology based support for knowledge management. Figure 40 describes the most important contributions each of the different technology groups makes to the individual knowledge management activities.

Recommended Reading

Rollett, H. (2003): Knowledge Management: Processes and Technologies; Boston: Kluwer Academic Publishers

Shariq, S.Z. (1998): Sense making and artifacts: An exploration into the role of tools in knowledge management. In: Journal of Knowledge Management, 2(2), pp.10-19

Management Summary

Information and communication technologies can provide a wide range of support for knowledge management activities. However, technology should be seen as an enabler and any knowledge management initiatives should not be primarily technology driven.

Information and Communication Technologies

Communication technologies such as e-mail and video conferencing are particularly useful for knowledge transfer activities. They can also make a significant contribution to knowledge creation activities, where success often depends on communication between many people and/or across different locations.

Collaboration technologies combine different communication technologies with other tools (such as virtual whiteboard and brainstorming tools) and make them available in one single interface. Consequently, they can also contribute significantly to knowledge transfer and knowledge creation activities. Workflow management systems support structured forms of collaboration, in particular knowledge maintenance.

Document management and content management systems play a major role in integrating content, since they act as a collection point for all documented knowledge. Classification schemes are one way of organising this content. Search mechanisms facilitate knowledge transfer. One of the core functions of these types of systems is the simplified maintenance of large amounts of data.

Adaptation and presentation technologies include personalisation tools, visualisation tools and automatic recommendation tools that forward relevant content. All these tools help facilitate knowledge transfer. Visualisation techniques also help to give a better overview of the complex structures involved in knowledge organisation.

The strengths of **eLearning environments** lie primarily in the integration of different content and in helping users both to understand this content and communicate with each other, leading ultimately to further knowledge transfer. The testing components included in eLearning systems make them one of the few technologies that can help with a detailed assessment of non-explicit knowledge.

Content generation tools include authoring tools and technologies for automatically generating new content. They provide support for knowledge creation and knowledge integration. Specialised tools are also available to help with the handling of the complex structures encountered in organising knowledge. Most of these technologies are not only useful for generating content, they also provide support for knowledge maintenance activities.

There are still relatively few **personal knowledge management tools available,** but solutions do exist to support activities like mind mapping or bibliography management. These tools focus more on the development, organisation, integration and maintenance of knowledge for personal use than on knowledge transfer.

Artificial intelligence is now being increasingly used in knowledge management applications. These technologies are of most benefit to knowledge organisation activities, for example, the automated classification of documents. Agent technologies also support knowledge integration and transfer.

Networking technologies rarely take centre stage in knowledge management initiatives. However, they provide the necessary infrastructure for many activities, and are particularly important for knowledge transfer.

The **formats and standards** relevant for knowledge management range from file transfer formats and meta data standards to common classification schemes. These are a necessary requirement for the efficient integration, organisation, and maintenance of content within an organisation and play a special role in knowledge transfer across corporate boundaries.

Last, but not least, **hardware** provides the necessary infrastructure for all the other technology groups already mentioned. Suitable input and output devices are becoming more and more important for knowledge transfer activities, with audio/video equipment and mobile devices playing an ever increasing role.

Fig. 40: Contribution made by IC technologies to knowledge management activities

Recommended Reading

Marwick, A. D. (2001): Knowledge management technology. In: IBM Systems Journal, 40(4), pp.814-830

Smith, R.G./Farquhar, A. (2000): The road ahead for knowledge management. In: AI Magazine, 21(4), pp.17-40

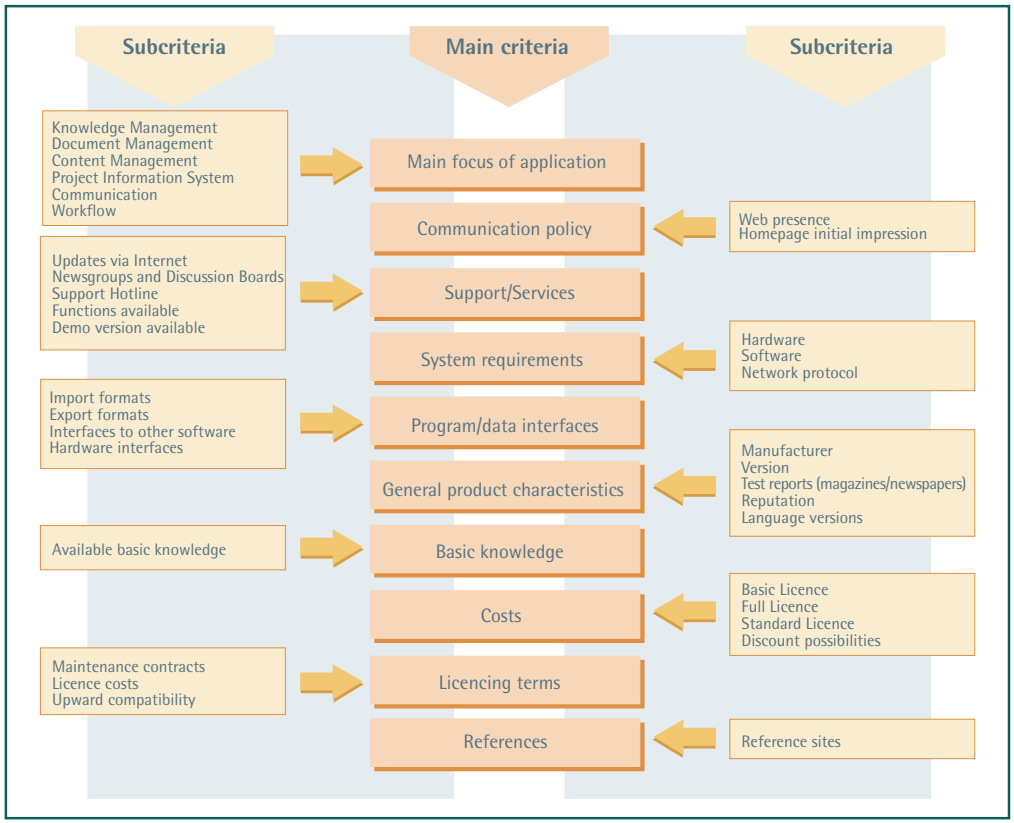


Fig. 41: Possible criteria for evaluating software products

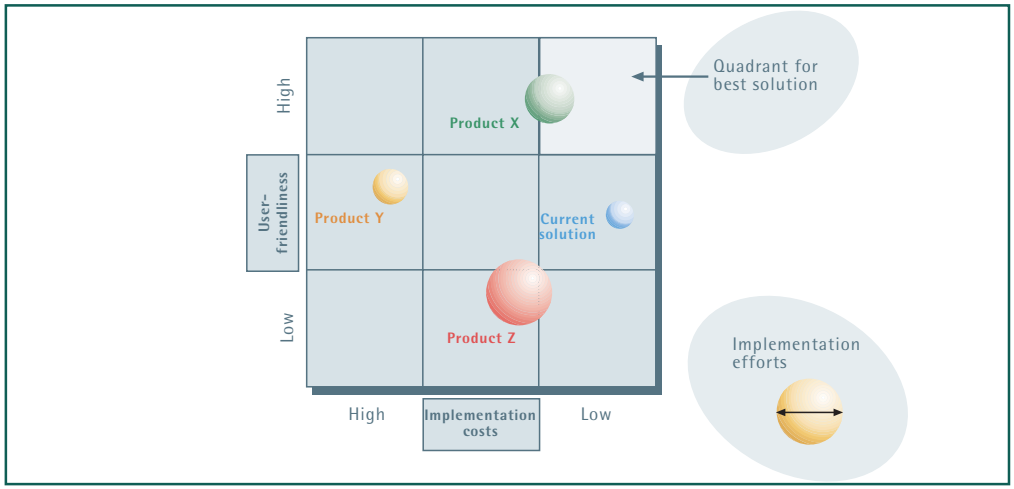


Fig. 42: Portfolio for visualising evaluation results

Selection Procedure

Information and communication technologies can obviously make a significant contribution to operative knowledge management. However, it makes little sense to focus on the actual technologies to be used before work processes have been analysed and the relevant links between data and knowledge identified. The technical selection process should always be based on the goals a company has set for its knowledge management activities. This, of course, requires a detailed consideration of all aspects involved.

A strengths/weaknesses analysis of the existing computer infrastructure determines the **technical starting basis** in the organisation. The results of this analysis can then be used to draw up the list of criteria for the remainder of the selection process. Additional requirements can also be identified by holding personal interviews with selected potential users (this process of "involving the involved" is highly recommended). In a subsequent two-stage evaluation process, the most appropriate information and communication technologies can then be selected from the wide range available.

The fact that there is no need to actually test the product in the first stage of the evaluation process increases the efficiency of the selection process. At this stage, a cost-benefits analysis using appropriate, predefined criteria should be sufficient. Figure 41 lists some possible analysis criteria.

Only three to five of the "top" software products from stage one should be selected for inclusion in the second stage of the evaluation process. Possible selection criteria in this stage include user-friendliness and the time and costs that are likely to be involved in implementing the solution (incl. customising). The results of the evaluation can then be plotted on a portfolio analysis grid (Fig.42). **User-friendliness** can be evaluated using a number of scenarios designed to test the product in realistic day-to-day business cases. A cost-benefits analysis can also be used to assess user-friendliness. In this phase, it is particularly important to compare the test products with any existing solutions in the organisation to establish a clear picture of the potential improvements they could bring. **Implementation costs** include both hardware and software costs. The time and effort required to implement the chosen solution (training courses, internal implementation) should also be calculated as part of the **implementation costs.**

Any costs incurred in the evaluation process (primarily in phase two, including the costs of defining test scenarios, operational tests, software costs, etc.) should be seen as a **necessary investment** in a comprehensive selection process. These costs should later be amortised by the selection of a tool that best suits company requirements.

Recommended Reading

Stallings, W. (1992): Operating Systems; New York

Management Summary

A systematic and methodical approach to the selection process enables an organisation to select the technology best suited to support their knowledge management activities. This requires a holistic approach and must begin with an analysis of the existing situation in the organisation.

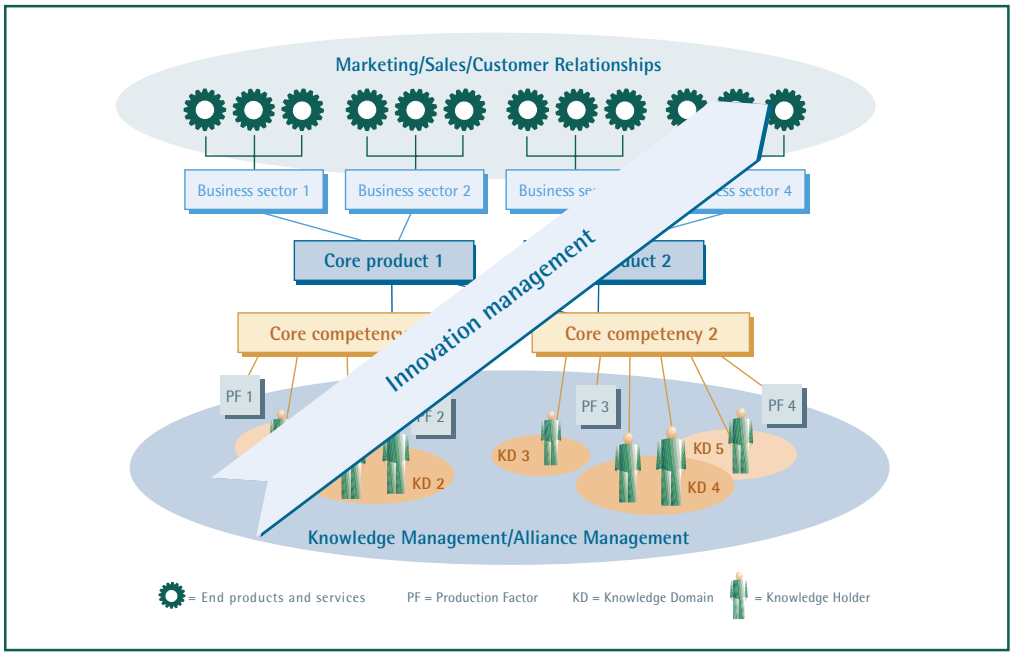


Fig. 43: Innovation management turns knowledge into profit

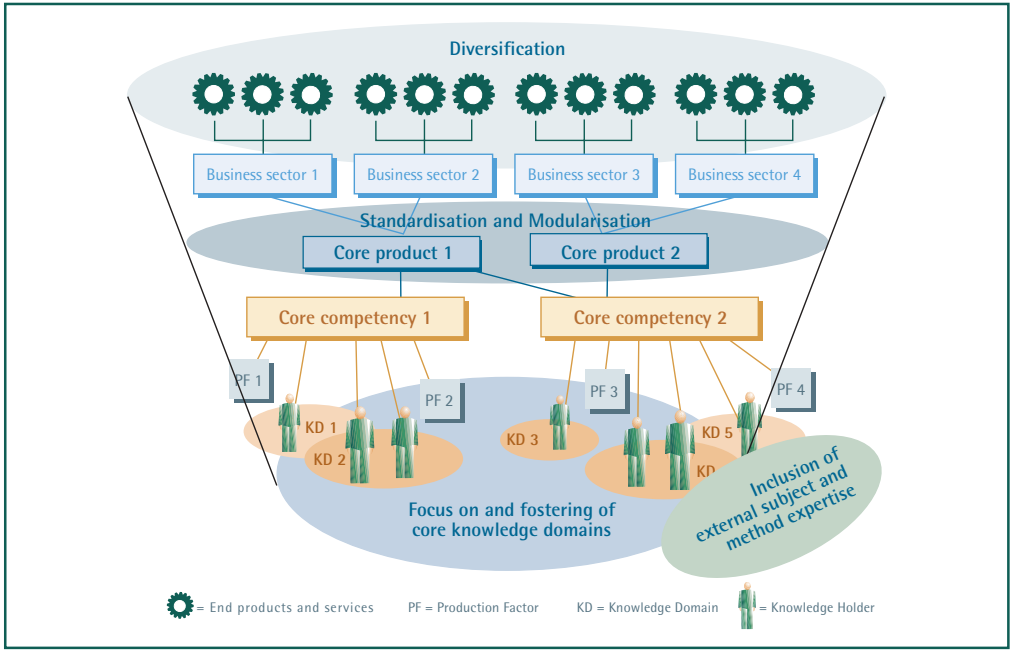


Fig. 44: Managing the core competency tree

Linking Innovation and Knowledge Management

Innovation means renewal and change, but in today's business world it has come in particular to mean the development of new corporate services, products, processes and structures. The development and application of new knowledge is the basis of innovation, emphasising the strong links between innovation and knowledge.

The **core competence** of a company can be divided into several levels (Fig. 43). Activities at a knowledge domain level focus on the continued development of the core knowledge domains. In general, this involves a variety of different knowledge holders and can also include external knowledge domains and expertise from cooperation partners.

Combining the factors of production (including in this case knowledge) leads to the development of core competences, core products and, ultimately, end products. In other words, returns are generated from any knowledge created.

This can be a long process and it may well take several years from knowledge development until a response is received from the target market for the products and services. Organising this process is one of the tasks of professional innovation management. Effective innovation management steers the process from knowledge development to realisation and commercial exploitation of the results.

The market therefore acts as an external evaluator of innovation and knowledge management. An internal evaluation can be carried out by visualising the development of the company's core competences and culture in form of a core competence tree. Ideally, the core competence tree should be constructed in such a way that the same knowledge can be used to realise any number of different customer solutions (Fig. 44).

Individual customer demands and requirements can be taken into consideration through customisation and diversification at an end product level. This can only really be achieved by focusing on a standardised, modular range of core products. Many companies neglect this factor and are instead forced to invest heavily in new development to meet customer orders.

Recommended Reading

Hamel, G. (1999): Competing for the future, 11th edn; Boston: Harvard Business School Press

Porter, M.E. (1998): Competitive strategy: Techniques for Analyzing Industries and Competitors; New York

Management Summary

The core competence tree forms the basis for the planning and implementation of innovation projects and emphasises the close links between innovation and knowledge management.

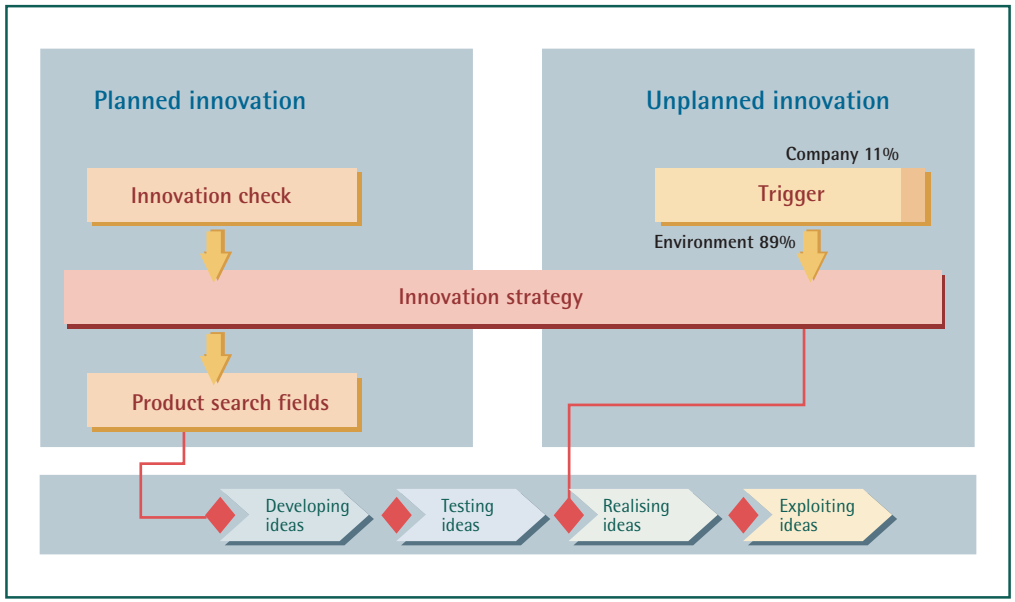


Fig. 45: Different innovation activities in a company

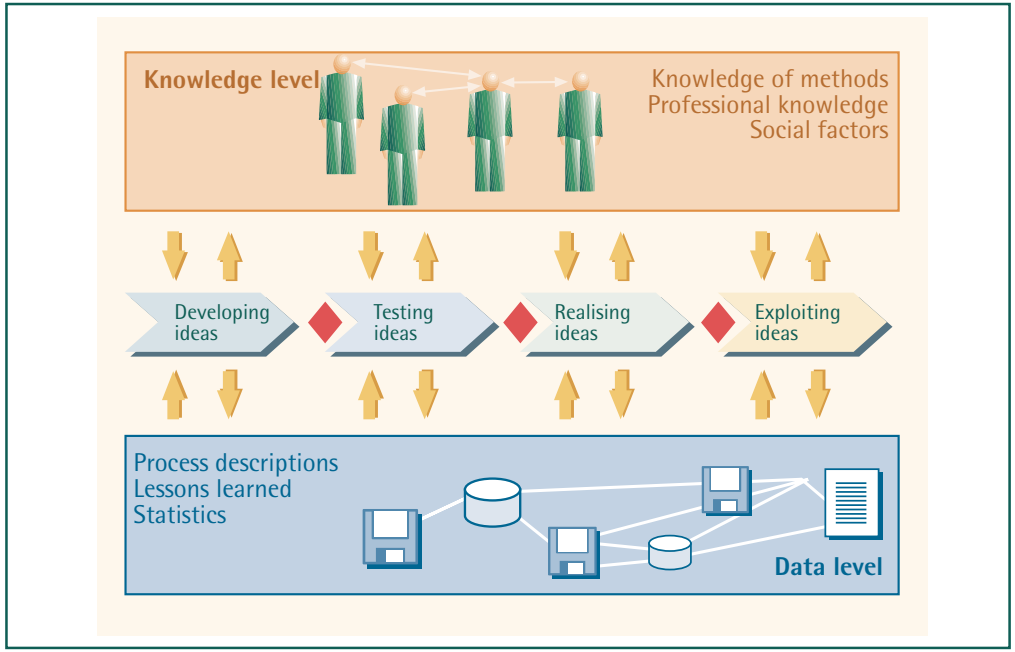


Fig. 46: Knowledge processes in innovation projects

Supporting Innovation with Knowledge Management

The impetus for innovation projects can come from two different sources (Fig. 45): Unplanned innovation occurs directly in day-to-day business activities and is often the incremental result of a new customer project. **Planned innovation** on the other hand actively utilises the knowledge resources available both in and to the company in developing new value-creating projects.

Periodic innovation checks serve to analyse the status of a company's core competence tree, as well as relevant trends and developments in its environment. The results can then be used to develop or modify an innovation strategy and define the scope and aims of innovation projects.

In practice, it has proved effective to split an innovation process/project into the following phases:

- Developing ideas
- Testing ideas
- Realising ideas
- Exploiting ideas

The **development phase** focuses on applying creativity methods (e.g. brainstorming) to identify or unlock creative potential. The most promising ideas (success rate approx. 12%) are then filtered out in the **testing phase**. The ideas should now be researched in detail to ensure they are not already covered by existing intellectual property rights. New knowledge can by protected by strategic patenting.

Promising ideas that pass the testing phase are then developed in the subsequent **realisation phase**. Project management, knowledge logistics, business planning and innovation marketing activities are all key elements in this phase. In the **exploitation phase**, the new products, services or licences must be turned quickly into profits.

Knowledge management forms the basis for effective and efficient innovation management. In line with the Basic Model of Knowledge Management described in Figure 11, this involves interaction between three different levels (Fig. 46). The **project level** must be clearly structured into the four innovation phases described above. The experts (with their professional and methodological knowledge and social skills) are located on the **knowledge level** and communicate directly with the project level. All the data and documents relevant to innovation are collected at the **data level**. These can be made available throughout the innovation process using modern information and communication tools. Smooth integration between the knowledge and data levels is a key factor in successful innovation projects.

Recommended Reading

Hamel, G. (1999): Competing for the future, 11th edn; Boston: Harvard Business School Press

Porter, M.E. (1998): Competitive strategy: Techniques for Analyzing Industries and Competitors; New York

Management Summary

A clear definition of the individual innovation phases and optimal links between the knowledge, data and project levels form the basis for successful innovation processes.

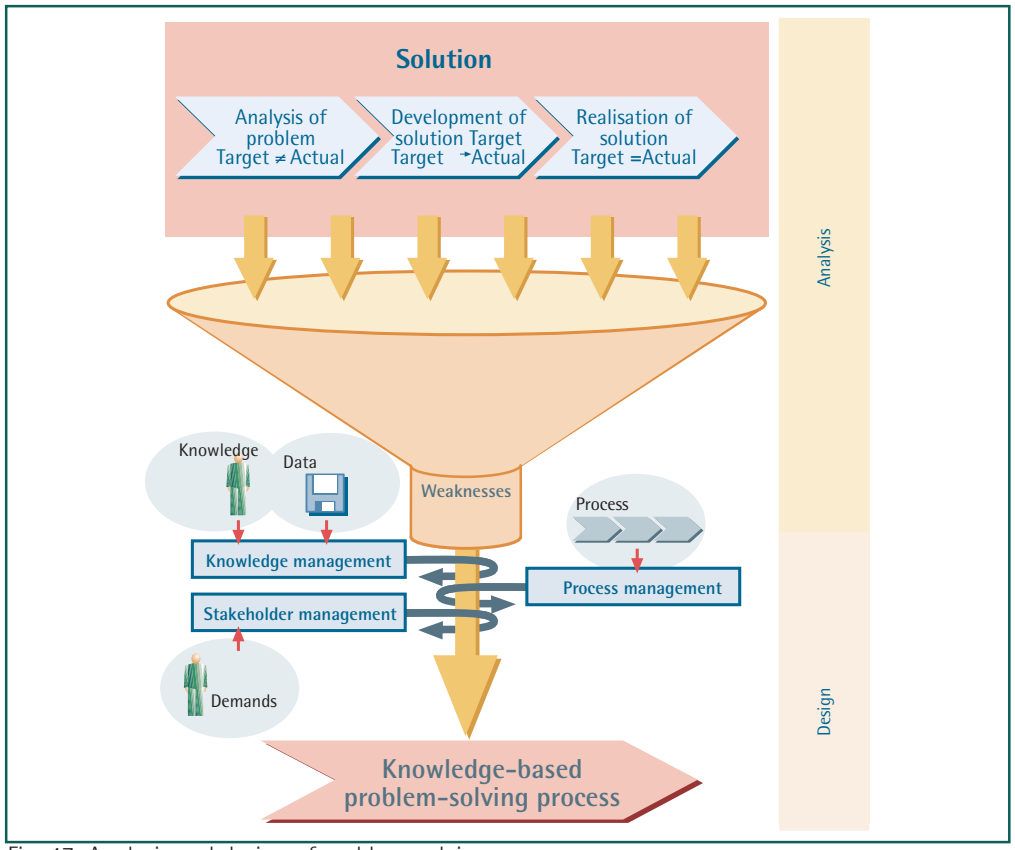


Fig. 47: Analysis and design of problem-solving processes

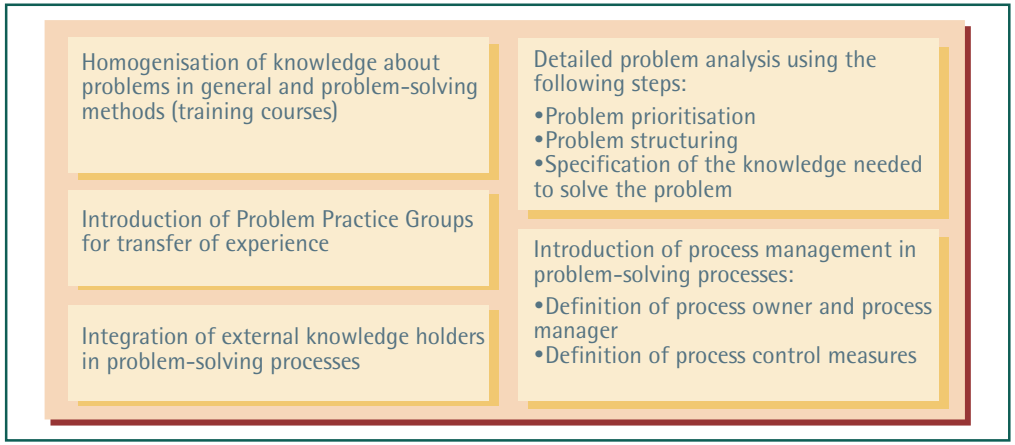


Fig. 48: Design suggestions for problem-solving processes

Optimising Problem-solving Processes

Despite the appearance of a large number of electronic support tools, there have been relatively few other changes in the way problem-solving processes are carried out. A process-oriented approach to problem-solving can greatly improve efficiency and effectiveness. A focus on the knowledge perspective in the organisation of such processes emphasises the potential synergies between process and knowledge management, as the procedure shown in Figure 47 clearly illustrates. Problem-solving processes have to be designed to suit the actual business case and should **make use of existing company knowledge**. For example, involving the actual staff affected in the design of problem-solving processes can turn acceptance into a success factor and can lead to radical improvements in the way problems are solved. The following list shows some common examples of **weaknesses** in actual problem-solving processes:

- No problem-solving process is defined.
- "Bad experiences" were suffered with existing problem-solving processes.
- Experiential knowledge is not used to improve the process (e.g. databases or expert groups).
- Problem-solving does not form part of day-to-day business routines. No additional resources (time/staff) are allocated to problem-solving and no motivation systems exist.
- No systematic analysis of the cause of a problem is carried out and more emphasis is placed on curing the symptoms. Problems are assessed subjectively "by instinct".
- A problems database with a complicated user interface and bureaucratic access restrictions blocks information and documentation processes.
- Knowledge requirements are not identified for the individual phases in the problem-solving process. Staff are allocated to a problem according to availability (and not for their expertise or knowledge).
- No consideration is given to the possibility of integrating external knowledge holders in the problem-solving process.
- Developing the solution is not seen as part of the problem-solving process.
- The development of the solution is not planned in advance, which causes delays in the whole process.

If an organisation demonstrates **more than two** of the above weaknesses, it would be urgently advised **to review and improve** its problem-solving processes. Some possible suggestions for improvement are given in Figure 48.

Recommended Reading
Bateson, G. (1972): Steps to an ecology of mind; New York

Management Summary

As the number and complexity of problems continue to grow, an optimisation of problem-solving processes becomes increasingly essential. The degree of urgency can be determined by evaluating a few key factors.

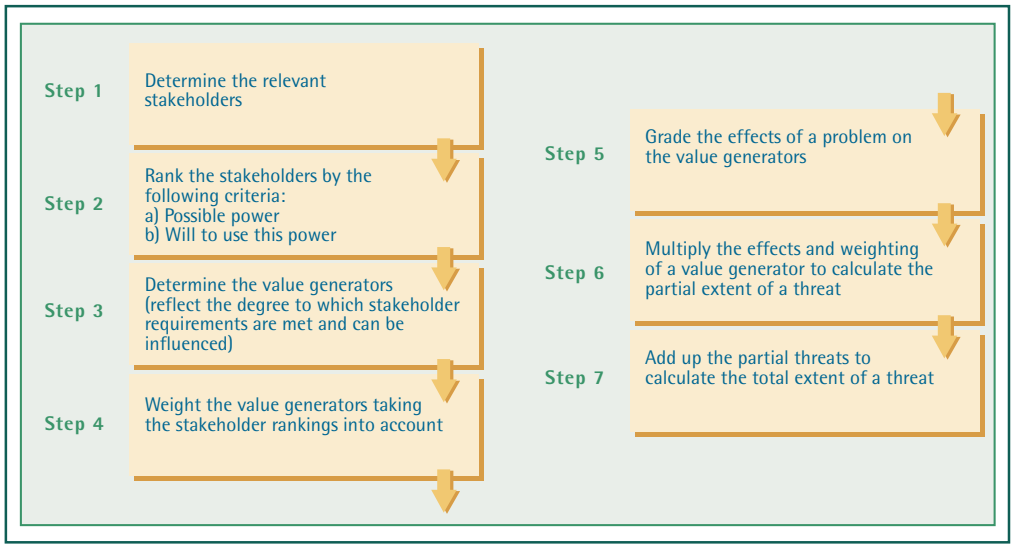
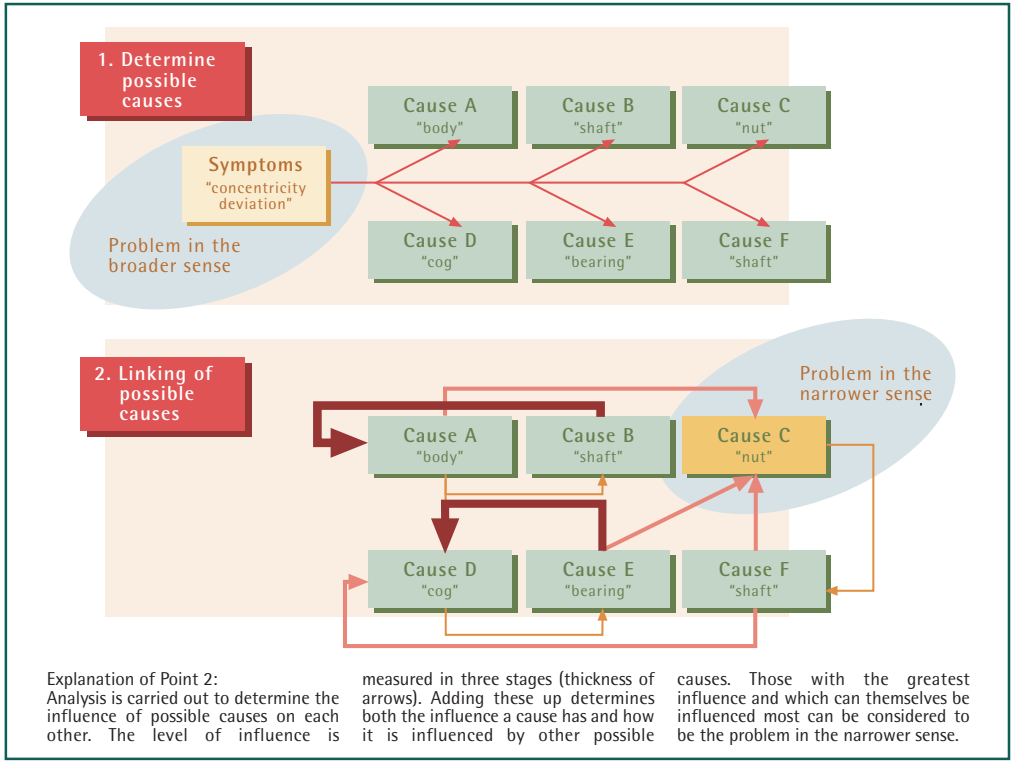


Fig. 49: Determining the possible extent of a threat



Explanation of Point 2:
Analysis is carried out to determine the influence of possible causes on each other. The level of influence is measured in three stages (thickness of arrows). Adding these up determines both the influence a cause has and how it is influenced by other possible causes. Those with the greatest influence and which can themselves be influenced most can be considered to be the problem in the narrower sense.

Fig. 50: Determining a problem in the narrower sense

Evaluating Problems

One of the key issues in problem-solving is determining the **potential threat** an unresolved problem could pose to the company. This factor can be used to prioritise problems and allocate appropriate resources to find a solution. The threat potential is a non-dimensional indicator of the extent to which an actual problem jeopardises company survival. The ability of an organisation to survive depends primarily on its capacity to meet stakeholder requirements. From a knowledge management perspective, this requires acquiring appropriate knowledge on the stakeholders and their requirements, which can then serve to determine the possible effect a problem might have on the organisation's ability to meet these requirements and, ultimately, to survive. One possible method for determining the threat potential is illustrated in Figure 49.

From **symptom to problem**: The term "problem" is generally used to refer to any deviation between the target/actual situation or desired situation/reality. A systematic approach to problem-solving looks to differentiate between the symptoms (i.e. the problem in the broader sense) and the **roots of the problem** (i.e. the problem in the narrower sense). The following example clearly illustrates the relevance of this differentiation: A gearbox manufacturer realised that a ball bearing was breaking down after only a few hours of operation, causing enormous problems for its customers. The urgency of the situation prompted the manufacturer to take the immediate action of adjusting the tolerance of the bearing. Although this was a slight improvement, it did not solve the actual problem, and the gearbox manufacturer found itself faced with huge costs as a result of the continued breakdowns. No attempt was made to determine the root cause of the problem, and the measures taken only really addressed the symptoms, not the problem itself. In this example, a comprehensive assessment of the threat potential would, however, have uncovered the urgent need for a detailed analysis of the problem.

In addition to tried-and-tested methods (e.g. the Ishikawa diagram), **analysing the factors involved** is an excellent way of determining the cause of a problem, since it isolates the "main" cause (i.e. the problem in the narrower sense) from the larger number of possible causes (Fig. 50).

Management Summary

Prioritising problems according to their threat potential is a particularly effective method of ensuring appropriate resources are allocated to company-wide problem-solving activities. The identification of the root cause of the problem must play a central role in any problem-solving process.

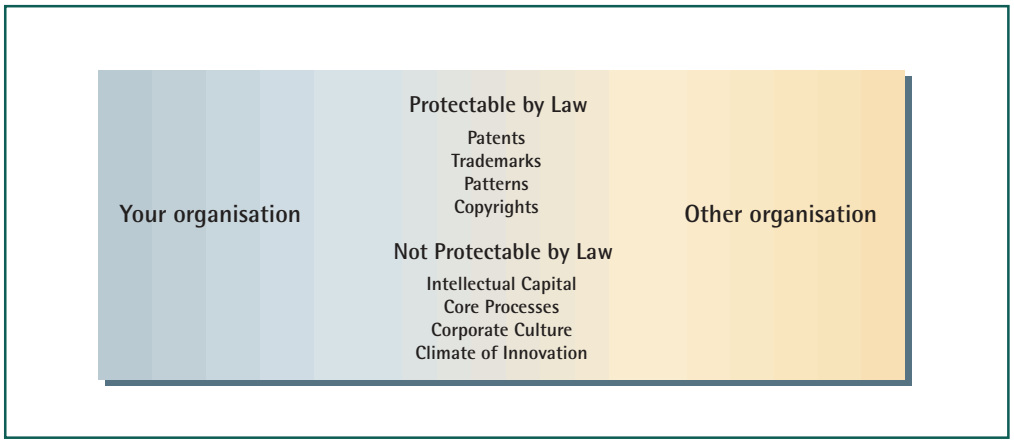


Fig. 51: Classes of intangible assets

In addition to the "visible" or tangible assets that are well documented in classic financial accounting, Sveiby also refers to an "invisible" part, which analogously represents the roots below the (earth's) surface for the financial gains that it grows.

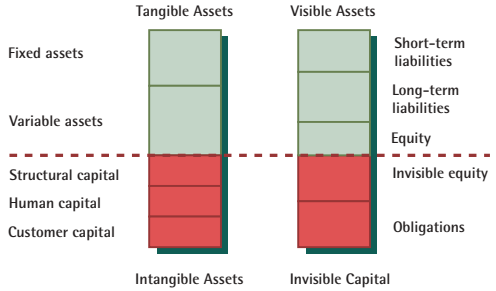


Fig. 52: New balance sheet dimensions

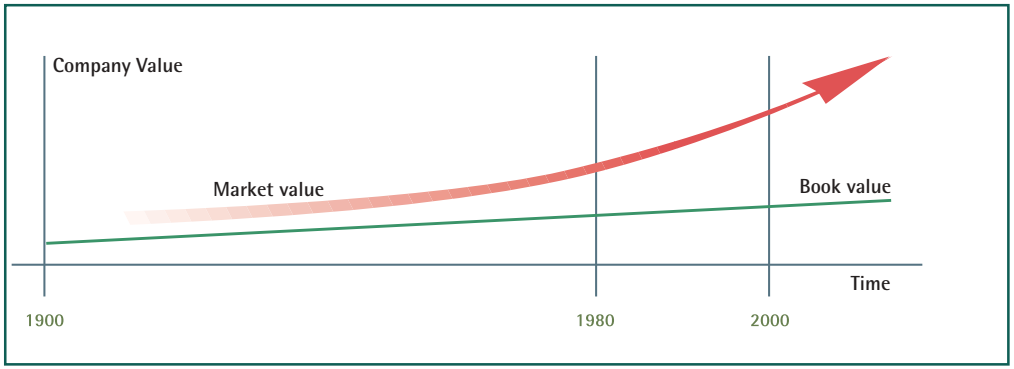


Fig. 53: Decoupling of market and book value

Basics of Measurement

A closer look at the issues involved in "**knowledge measurement**" requires a broader definition of knowledge than given at the beginning of this guide. There are two main reasons for this: The problems involved in embedding knowledge in operational processes and the complexity of **knowledge processes**. Consequently, no single measuring method will be suitable for all processes.

Intangible assets can be divided into a number of categories (see Fig.51), with each category posing its own challenges. These include intangible assets **protectable by law** (e.g. by patents, trademarks, copyrights, etc.) and those for which **no legal protection is available**. This distinction is particularly relevant for creditor protection.

Although intangible assets are often referred to in controlling or accounting terms as "**intellectual capital**", "intellectual assets" is in fact a more accurate term. Intellectual capital is made up of three components: Human capital, structural capital and customer capital. In the past, these were not included in financial statements, and are therefore often referred to as the "invisible" balance sheet (Fig.52).

There are a number of **reasons for measuring** the productivity of knowledge and intangible assets. The relative proportion of intangible assets (Fig.53) to both total corporate assets and the goods and services that constitute gross national product has been on the rise for many years and currently stands at 60%. This increase comes at the expense of traditional resources such as capital and (manual) labour, and continued observation of this trend will become increasingly important in the future.

Intangible assets show a positive marginal utility, thus contradicting the classic rules of economics (i.e. although the development costs of knowledge products are only incurred once, the products themselves can be sold over and over again). This increases profits and, ultimately, corporate value.

The vast majority of organisations now use comprehensive cost calculation methods to determine production costs and establish pricing levels. The challenge in the future will be to determine and assess intangible assets, thus enabling them to also be taken into account in **pricing calculations**. Some of the best examples of this can be found in the services sector, where soft factors (e.g. creativity, working atmosphere, communication flows, organisational culture, etc.) play a far more important role in the development of new products or services than material flows.

However, the most important reason for addressing the issue of measurement is that it will inevitably direct the discussion back to questions of corporate strategy, internal communication, organisational goals, etc. This initiates an **organisational development process**, which, in turn, promotes increased awareness of the new rules of business. This "detour", which in itself would usually be sufficient grounds to merit a project, will almost always have a positive (soft!) effect on overall productivity.

Recommended Reading

Edvinsson, L./M.S. Malone. (1997). Intellectual Capital: Realizing Your Company's True Value by Finding its Hidden Brainpower; New York: HarperBusiness

Edvinsson, L. (1997): Developing Intellectual Capital at Skandia. In: Long Range Planning. Vol. 30, Nr. 3: pp.366-373

Stewart, Th. (1998): Intellectual Capital, The New Wealth or Organizations; Bantam Books

Sveiby, K.E. (1997): The New Organizational Wealth. Managing and Measuring Knowledge Based Assets; San Francisco

Management Summary

"If it's not measured, it can't be managed". However, effective measurement requires appropriate indicators and transparent cause-effect relationships. Neither of these are always readily available, particularly in the case of intangible assets. As an added benefit, both the actual process of measuring and the communication initiated by measurement processes have a positive influence on the organisational knowledge base.

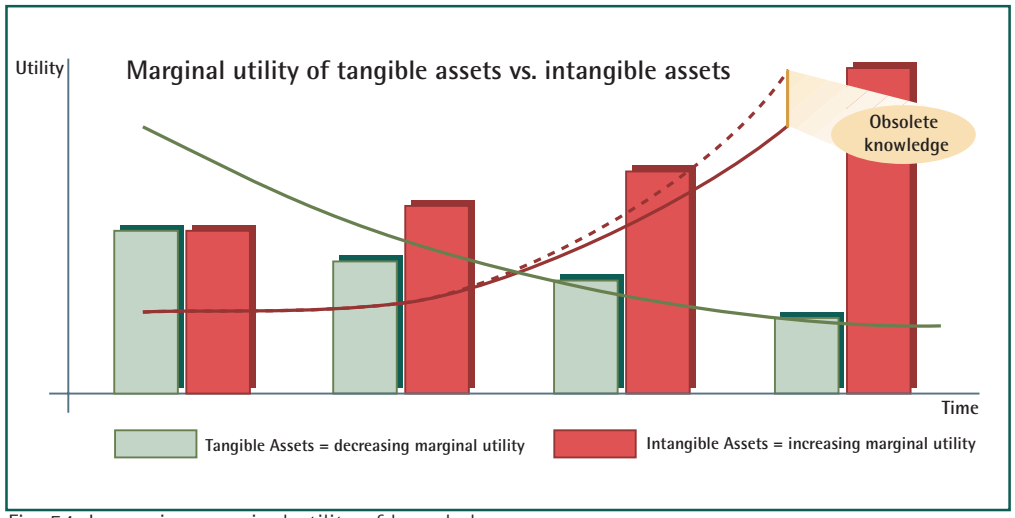


Fig. 54: Increasing marginal utility of knowledge

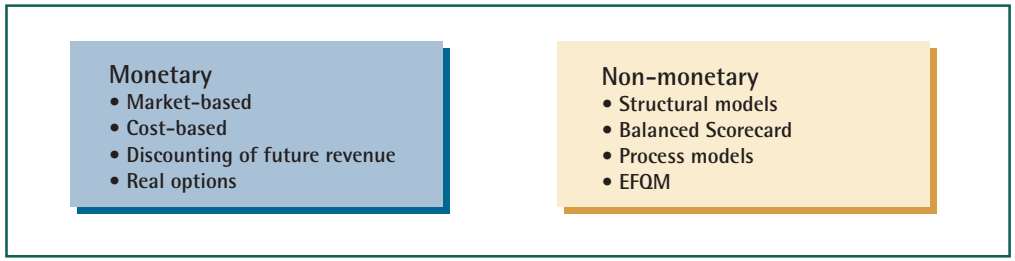


Fig. 55: Measurement methods

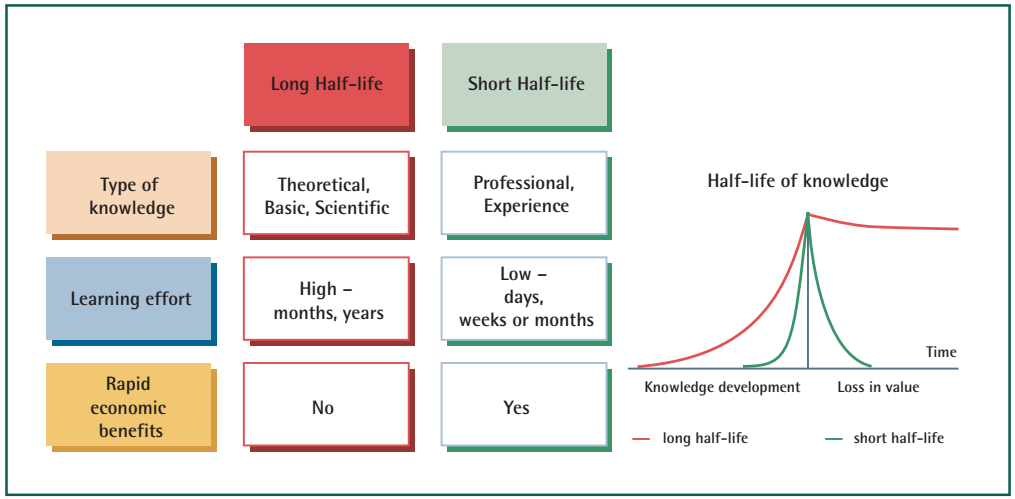


Fig. 56: Half-life of knowledge

Measurement Methods

Based on the knowledge processes defined in Figure 68, **key areas** important to each relevant issue (e.g. the effectiveness of knowledge transfer processes) are identified. Barriers to knowledge transfer may also emerge at this stage (e.g. communication problems, organisational peculiarities or privileges).

Once the key areas have been determined, a detailed discussion of what they involve will usually suffice to determine potential bottlenecks or indicators. This discussion leads to the creation of a complete set of **indicators or financial metrics**, which then need to be made manageable. It is extremely important that the indicators chosen make sense both to the people involved and to management and that a consensus is reached on any definition(s). Although not essential at this stage, it can also be useful to consider their compatibility with external benchmarks.

Typically, **gaps** will be identified between the target situation (e.g. knowledge goals or design measures) and the actual situation, and measures will have to be introduced to address these gaps (e.g. additional training courses, organisational changes, process redesign). This is when the complete spectrum of measures available to knowledge management comes into its own. Furthermore, these gaps are generally an excellent source of further relevant indicators. There is now a wide range of **measurement methods** available, although not every method is suitable for every purpose.

There are basically two approaches to measuring intangible assets (see Figure 55):

a) **Monetary**: Using financial indicators such as markets, costs or discounted cash flows (DCF)

b) **Non-monetary**: Using other indicators drawn perhaps from balanced scorecards or strategic planning.

Whilst both these approaches are in essence equally effective, they are not always interchangeable for a number of reasons, including:

- The lack of a market to act as a basis for measurement
- Costs do not reflect value: Either no real value was generated (i.e. a loss) or positive scale effects led to multiple returns on investment not relevant for measurement
- No accurate prediction can be given of the possible return on investment (the basis for calculating amortisation)
- Problems with the discount factor when applying DCF methods

Similarly, many of the indicator systems designed to determine company-specific, relevant intangible assets are open to the following criticisms:

- The indicators used are not comparable with those used by competitors or other industry branches,
- Intangible assets indicators have to be interpreted in a complete corporate context (i.e. take into consideration factors such as the market, product life cycles, degree of corporate development, etc.).

Recommended Reading

Mouritsen J./Larsen H.T./Bukh P.N.D. (1998): Intellectual Capital and the 'Capable Firm': Narrating, Visualising and Numbering for Managing Knowledge; Copenhagen Business School and Aarhus School of Business

Reinhardt R./Bornemann M./Pawlowsky P./Schneider U. (2001): Intellectual Capital and Knowledge Management: Perspectives on Measuring Knowledge. In: Dierkes M./Berthoin Antal A/Child J./Nonaka, I.: Handbook of Organizational Learning; London

Management Summary

Traditional measurement methods are no longer proving adequate in today's "new economy". New indicators must be found and adapted to suit corporate requirements. In addition to the selection of an appropriate measurement method, an accurate interpretation of results is of primary importance for subsequent strategic decisions.

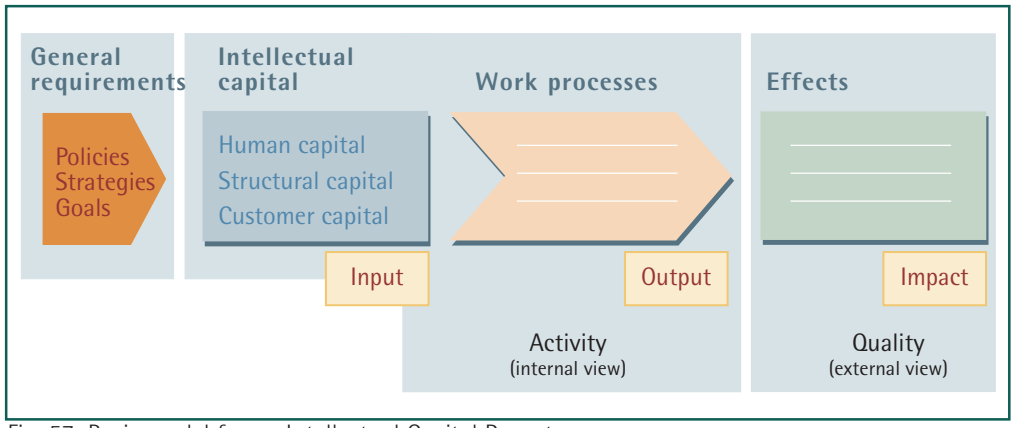


Fig. 57: Basic model for an Intellectual Capital Report

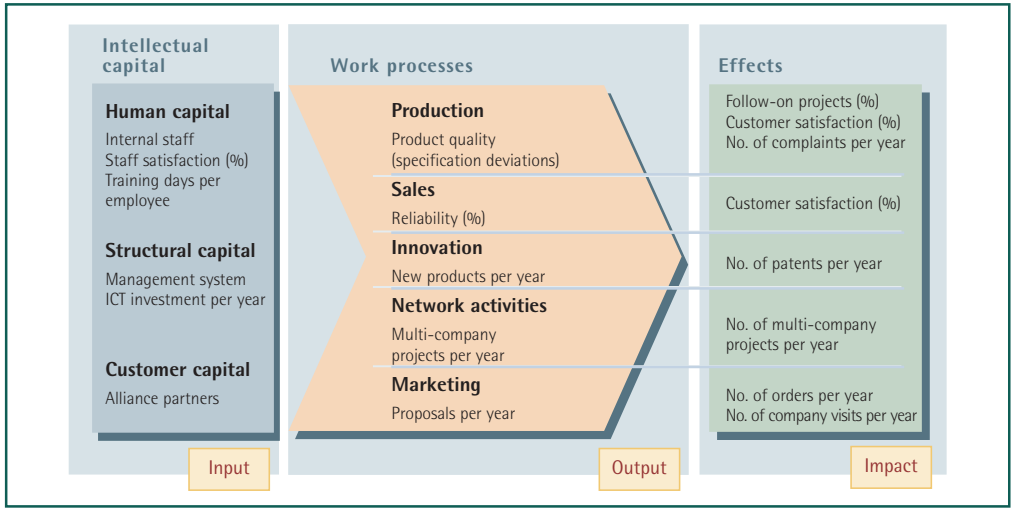


Fig. 58: Intellectual capital model showing processes and example indicators

- Choose a simple, clear and transparent model for the intellectual capital report
- Integrate and use it in existing management systems
- Involve as many employees as possible in the development process and communicate results throughout the organisation
- Avoid multiple collection of the same data
- Don't simply use the method to produce a report once a year, use it internally in day-to-day work

Fig. 59: Practical hints for implementing and using an intellectual capital report

Intellectual Capital Report Model

There is no longer any doubt of the increasing importance played by knowledge in value-creating processes. The challenge now faced is how to make the most effective use of **intangible assets.** This requires both representation and measurement of the organisational knowledge base, which in this case includes not only human capital, but also other factors such as existing organisational structures and customer relationships. **The intellectual capital report** has already established its suitability as a representation and measurement tool and is an effective method of communicating corporate goals, strategy and business activities to both external and internal audiences. However, its more important application lies in its use as a **strategic instrument** in the steering of key organisational areas and in supporting personnel development.

Figure 57 shows a basic model for producing an intellectual capital report focusing on the following components: **General requirements**, input, work processes, output and effect. General requirements can be set externally by stakeholders and market requirements and internally by corporate strategy and goals. They influence the focus of the **key areas** of corporate activity and also have an effect on any personnel development measures directly related to these activities.

The **input** indicated in the model represents the intellectual capital available to an organisation to carry out its business objectives. Intellectual capital is divided into human, structural and customer capital, and each of these three categories are generally described either in terms of quantity (using indicators) or quality. These assets are actively applied in the company's **business processes**. If key processes have already been defined (e.g. as part of quality management procedures), they will generally only need to be marginally adapted for use in an intellectual capital report. The results are then allocated as output to the individual processes and are usually described quantitatively using indicators. The input is then compared with the relevant **output** to draw conclusions on how efficiently the company's intellectual capital is being put to use.

The effect of this output on society, industry and the environment is represented by **impact indicators**, collected, for example, through surveys or by measuring customer and stakeholder satisfaction. This is probably the most difficult and time-consuming factor to assess. It is represented in terms of quality, e.g. the subjective opinions of customers, and is measured using a standard scale. Figure 58 shows a simplified model of this process and includes some example indicators and company processes.

Recommended Reading

Danish Agency for Trade and Industry (2003): Intellectual Capital Statements - The New Guideline; Copenhagen: Danish Agency for Trade and Industry. URL: http://www.vtu.dk/icaccounts

Edvinsson, L/Malone, M.S. (1997): Intellectual Capital: Realizing your company´s true value by finding its hidden brainpower; New York: HarperCollins

Sveiby, K.E. (1997): The New Organisational Wealth: Managing and Measuring Knowledge-Based Assets; San Francisco: Berrett-Koehler Publishers, Inc.

Management Summary

An Intellectual Capital Report supports an organisation in the identification and effective use of its intellectual capital. A process-oriented, structured approach can be used to assess how efficiently this capital is being invested. Impact indicators describe the effect of the organisation's products and services on its environment.

HOW TO FAIL AT KNOWLEDGE MANAGEMENT

- Redefine your organisational goals at regular intervals
- Restructure your organisation at regular intervals
- Start several unrelated projects and label them all "knowledge management"
- Use a model that is far too complex
- Keep indicators as vague as possible
- Use indicators that neither hurt nor interest anyone
- Get several project groups or departments to collect the same data at the same time
- Organise long meetings just to discuss definitions (goals, strategy, etc.)
- Focus on qualitative indicators and change the people involved on a regular basis
- Don't explain the benefits to either management or staff
- Consider knowledge management as a one-man-show and avoid discussing it with others
- Don't discuss results or set any actions
- Let your tax advisor, PR agency, journalists or management consultants draw up your assessment models.

Fig. 60: Failure criteria

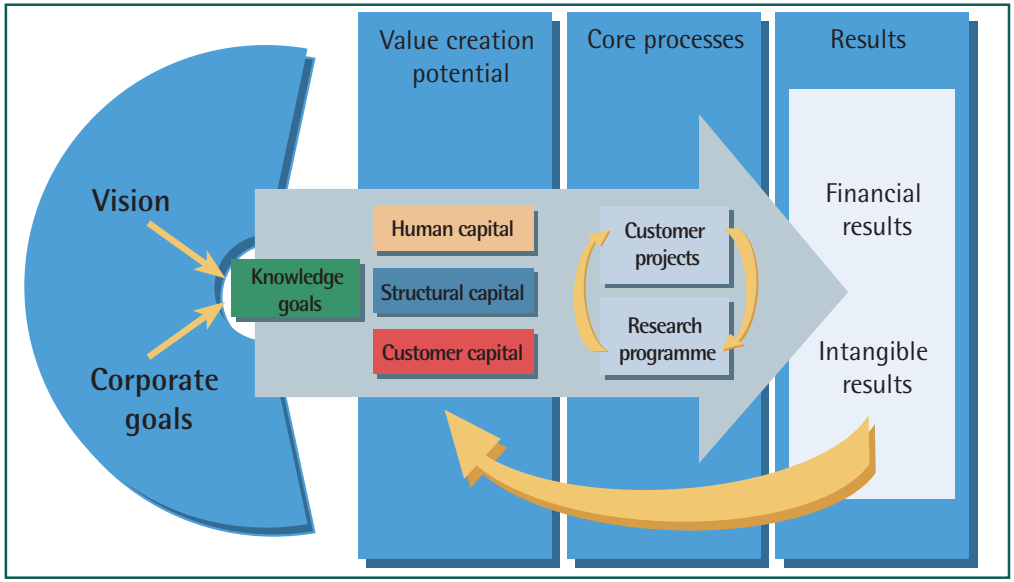


Fig. 61: IC model used at Austrian Research Center Seibersdorf

Learning Effects

The Austrian Research Center Seibersdorf has developed an excellent, integrated model for measuring intangible assets. Their "Intellectual Capital Report" addresses all stages of the corporate life cycle: From definition of vision and strategy, setting of knowledge goals and individual operational processes, through to exploitation of results.

Knowledge processes and intangible assets are different to traditional (material-based) business processes. Appropriate measurement indicators can be defined at all points where these value-creating and knowledge processes meet. These indicators can then, in turn, be integrated into the organisation's management processes. However, a correct interpretation of the results is far more important than the actual indicators themselves. This is by no means an easy task, since (unlike financial indicators) there is a distinct lack of standard reference models available for measuring intangible assets.

The intellectual capital report follows the model illustrated in Figure 61 and is the result of 18 months of intensive research. A number of valuable lessons were learned in the course of this project, and some of the most important lessons learned have been summarised to form the list of failure criteria for knowledge management shown in Figure 60.

This project further confirmed both the importance of organisational culture in knowledge management and the relevance of the (time-consuming, yet worthwhile) implementation process. Real value can only be created in a culture that is open to knowledge sharing and in which knowledge management forms an integral part of day-to-day business.

Recommended Reading

Bornemann, M./ Leitner, K.H. (2002): Measuring and Reporting Intellectual Capital. The case of a Research Technology Organisation. In: Singapore Management Review

Choo, C.W. / Bontis, N. (2002) The Strategic Management of Intellectual Capital and Organisational Knowledge; Oxford

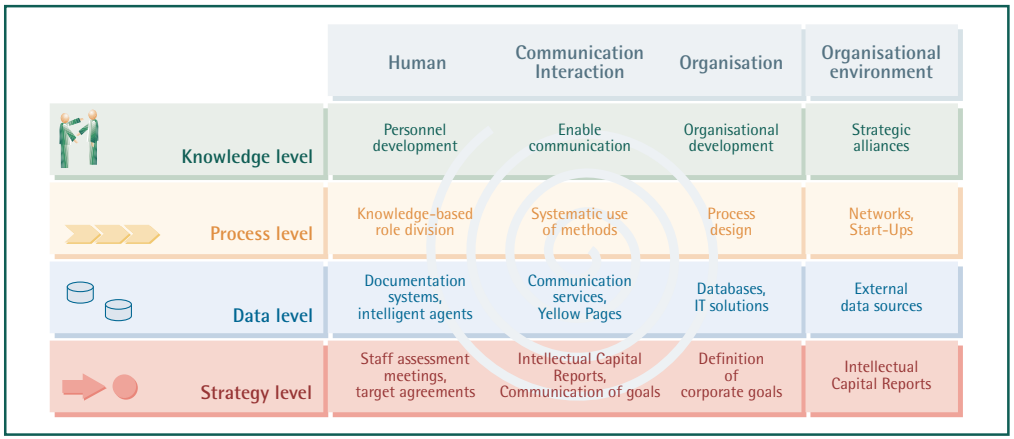


Fig. 62: Grid and examples of possible fields of action

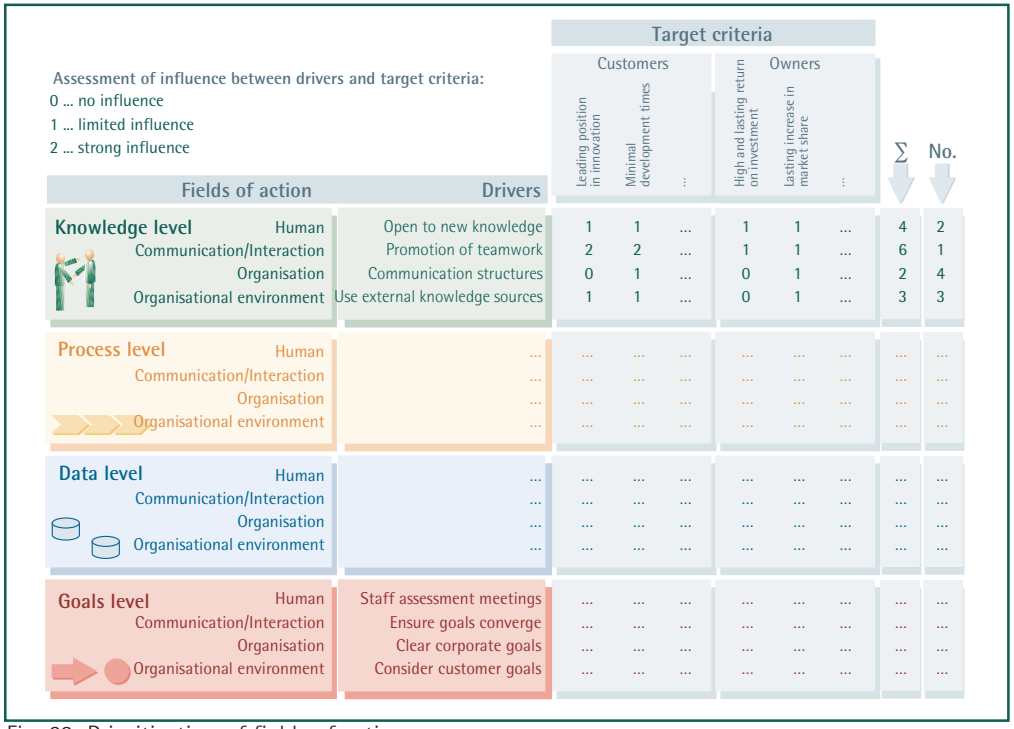


Fig. 63: Prioritisation of fields of action

Knowledge Management Assessment

The aim of a knowledge management assessment is to measure the benefits to the organisation of any knowledge management activities. The basis for this assessment is a selected range of relevant measures derived from the basic model of knowledge management. These measures can be presented in a matrix diagram (Fig. 62) consisting of four individual levels (the knowledge, process, data and goals levels) and four different perspectives (human, communication/ interaction, organisation and organisational environment).

The purpose of the assessment is to evaluate the extent to which an individual measure influences the organisation's ability to meet stakeholder goals. In this way, the organisation is able to determine the actual contribution a particular knowledge management activity makes to meeting stakeholder expectations and, at the same time, illustrate the real benefits generated by knowledge management.

The analysis takes the form of a self-assessment of the organisation (or an individual division) by an assessment team. The makeup of this team is extremely important and to ensure that high quality, wide-ranging results are achieved, care should be taken to select members with a wide spread of knowledge and experience of all activities, processes and relationships/context in the area to be assessed. It is also advisable to involve members of the management team and relevant subject experts.

The assessment is carried out in seven steps:

1. **Identify target assessment area:** Select the target area for the knowledge management analysis.
2. **Establish target criteria:** Define the relevant stakeholders for the area to be assessed and establish target criteria to describe their expectations.
3. **Define the ideal situation:** Define the desired ideal situation for the goals, knowledge, process and data levels based on stakeholder expectations.
4. **Determine factors of influence:** Determine the factors that influence the ideal situation from the human, communication/interaction, organisation and organisational environment perspective on each of the four levels.
5. **Identify drivers:** Identify the most important drivers for each of the sixteen fields of action.
6. **Prioritise fields of action:** Assess the influence of these drivers on the target criteria and use the results of this assessment to prioritise the fields of action.
7. **Set measures:** Set specific measures to be taken in each field of action, taking into consideration the main factors of influence for each area.

The result is a prioritisation of all sixteen fields of action (Fig. 63). This enables the organisation to set knowledge management priorities and decide whether it would, for example, be more beneficial to introduce measures in the field of personnel development or to opt for the implementation of a new software tool. This is extremely important if, as is often the case, the organisation only has a limited budget for knowledge management activities and has to select from a large number of proposed, bottom-up projects.

Recommended Reading

Bornemann, M./Sammer, M. (2003): Assessment Methodology to prioritize Knowledge Management related activities to support Organizational Excellence. In: Measuring Business Excellence. Vol. 7, No. 2,
URL:http://www.knowledgecheck.net/download/km_assessment.pdf

Management Summary

A knowledge management assessment offers organisations a systematic method of determining the relevance of individual fields of action and setting priorities for knowledge management activities.

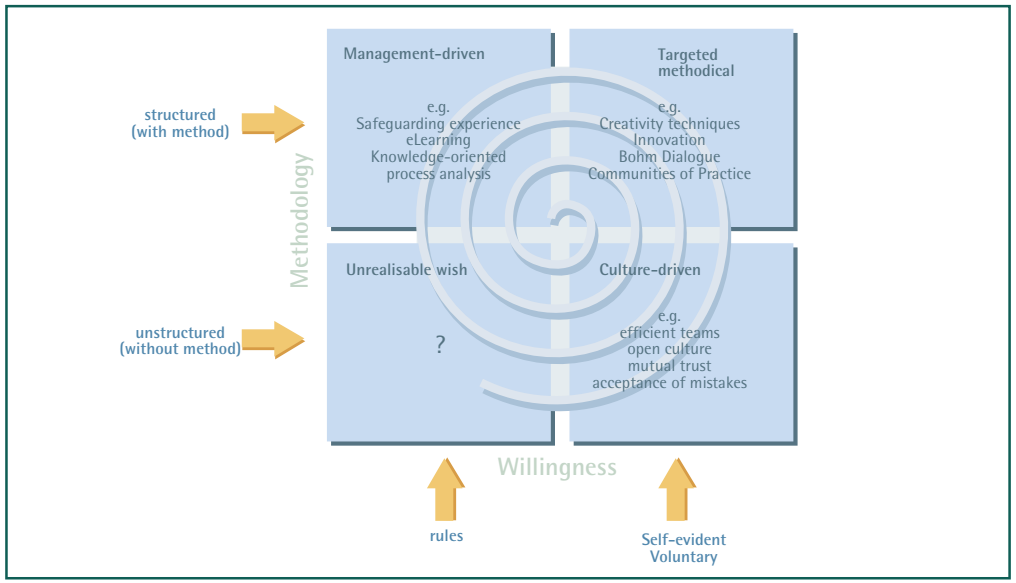


Fig. 64: Approaches to introducing knowledge management

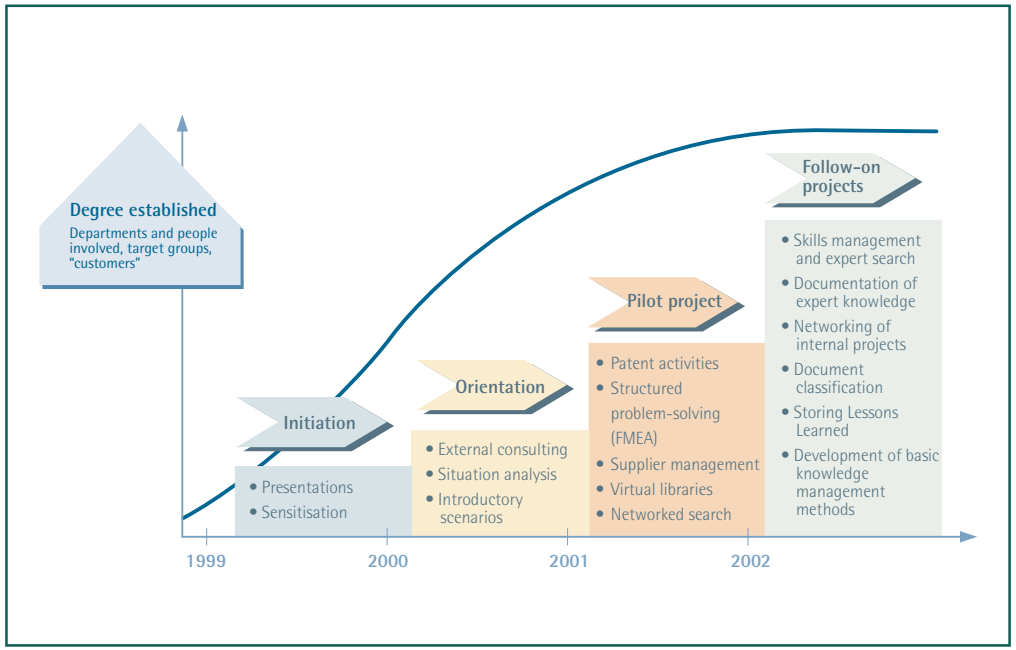


Fig. 65: Example of how to introduce knowledge management

Approaches to Introducing Knowledge Management

Two of the key factors in the successful implementation of knowledge management are willingness on the part of the employees involved and a methodological approach to any initiatives (Fig. 64). If either of these aspects is ignored, there is an increased risk that the project will not achieve its goals. **Willingness** comes from those aspects of corporate culture that allow the members of an organisation to act appropriately in a given situation, such as motivation and values. **Methodology**, on the other hand, highlights the use of particular procedures and concepts in knowledge management.

A **culture-driven** introduction of knowledge management (quadrant 1) is characterised primarily by a high degree of voluntary action, rather than deliberate application of specific methods. It focuses on raising awareness of the importance of knowledge in all aspects of work. In this kind of environment, sharing knowledge with others and actively reflecting on knowledge is considered second nature. "Sharing knowledge" becomes far more important than the idea that "knowledge is power".

A **targeted, methodical** implementation (quadrant 2) looks to actively steer the "flow of knowledge" between all members of staff. In this case, appropriate methods are introduced to focus creative potential on the organisation's strategic goals. This type of approach concentrates on generating, developing, distributing and evaluating knowledge in line with **company strategy.**

A **management-driven** introduction (quadrant III) focuses on the targeted and continued development, adaptation and application of specific knowledge management methods in pilot projects or areas.

Unfortunately, the lasting success of any efforts will remain nothing more than an **unrealisable wish** (quadrant IV) if people are not willing to participate and no concrete methods are used. It would appear impossible for knowledge management to make a positive, lasting contribution to company success without taking cultural aspects into consideration or without methodological support. What can be done to improve the situation if staff are neither motivated nor open to knowledge management and no concrete methods are available?

Figure 65 shows some examples of possible methods and suitable projects for each of the three different approaches described above. The introduction of such methods will increase the chances of success of any knowledge management implementation.

It is important at this stage to mention the **role of information and communication technologies** (ICTs) in the portfolio of measures discussed. ICT tools cannot be placed definitively in any one particular quadrant, since they can play a key role in each of the possible approaches. ICTs assume an important support function, but should not be the primary focus in the introduction of knowledge management.

Recommended Reading

Kolb, D.A. (1984): Experiential Learning: Experience as The Source of Learning and Development; Englewood Cliffs (NY)

Nonaka, I./Takeuchi, H. (1995): The Knowledge-Creating Company; Oxford University Press

Management Summary

Willingness of staff to participate and the specific use of appropriate methods are two of the key factors in the introduction of knowledge management.

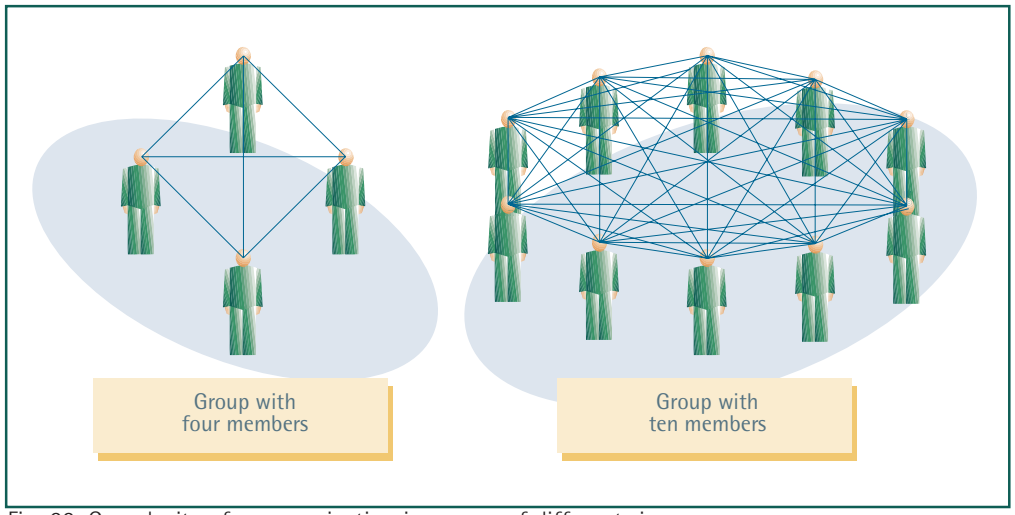


Fig. 66: Complexity of communication in groups of different sizes

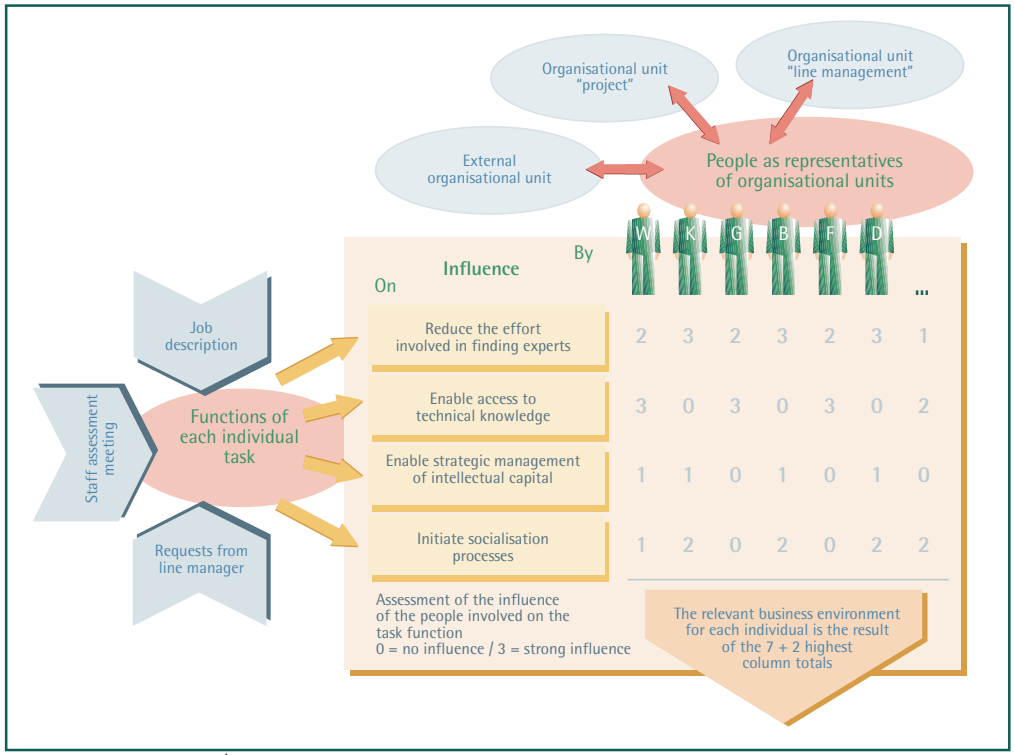


Fig. 67: Example task/enviroment analysis

The Individual Working Environment

In general, the success of the work we do is often measured in terms of the amount of cooperation it involves and the degree of recognition and acceptance it receives from **other people** in the organisation.

However, in most cases people do not have enough personal knowledge to fully meet the **knowledge requirements** of the work they do. This means that they have to generate the knowledge necessary to successfully complete their task(s) as quickly and effectively as possible.

Of course, in an ideal situation, each employee in a company would know which activities and tasks all the other members of the organisation were involved in and could align his/her own activities appropriately to best meet corporate requirements. However, the larger the organisation, the more complex this process becomes (see Fig. 66). Furthermore, people only have a limited capacity to process all that they perceive. One result of this is that the maximum number of people with whom a person is able to **cooperate** directly lies between five and nine people.

From an individual knowledge management standpoint, this makes it all the more important for individual employees to identify their own **relevant working environment**.

A task/environment analysis (Fig. 67) helps staff to identify and establish the environment relevant for each of their tasks and make this information available both to themselves and to others. In other words, it brings together the appropriate knowledge holders for a particular task.

The task(s) that a particular employee is involved in will be set by their job description, in their staff assessment, as direct requests from management, etc. Each individual task must fulfil a range of **functions** within the organisation, and each of these functions brings, in turn, a defined added value for other people (both internal and external).

The potential members of a person's individual working environment include the **people** who represent any related internal organisational or project units, as well as members of external organisations.

Task holders initially identify their relevant working environments by assessing the influence of any potential members on the desired function of one of their tasks: Those people with the strongest influence should make up the relevant working environment. The **identification process** is repeated until all members of the working environment see themselves as "stakeholders" for the task, thus basically ensuring their support in its completion. If more than 7 + 2 people are identified as stakeholders, this is a strong indication that the task can no longer be completed by one person alone. In this case, responsibility for the task should be spread over a larger group.

Recommended Reading

Ackoff, R.L./Emery, F.E. (1972): On purposeful Systems; New York: Aldine Atherton

von Foerster, H. (1984): Principles of Self-Organization - In a Socio-Managerial Context. In: Ulrich, H./Probst, G.J.B. (Ed.): Self-Organization and Management of Social Systems - Insights, Promises, Doubts, and Questions; Berlin: Springer-Verlag, pp.2-24

Herschel, R.T./Nemati, H./Steiger, D. (2001): Tacit to explicit knowledge conversion: knowledge exchange protocols. In: Journal of Knowledge Management, Volume 5, Number 1; MCB University Press, pp.107-116

Javitz, H.S./McEachron, N.B. (1983): Improving White Collar Productivity - Strategies for meeting tomorrow's competitive Challenge, Research Report No. 687, Business Intelligence Program; SRI International

Management Summary

A task/environment analysis supports staff in the systematic identification of their relevant working environment. This enables them to locate the knowledge required to complete the task and, consequently, to increase the value of their results.

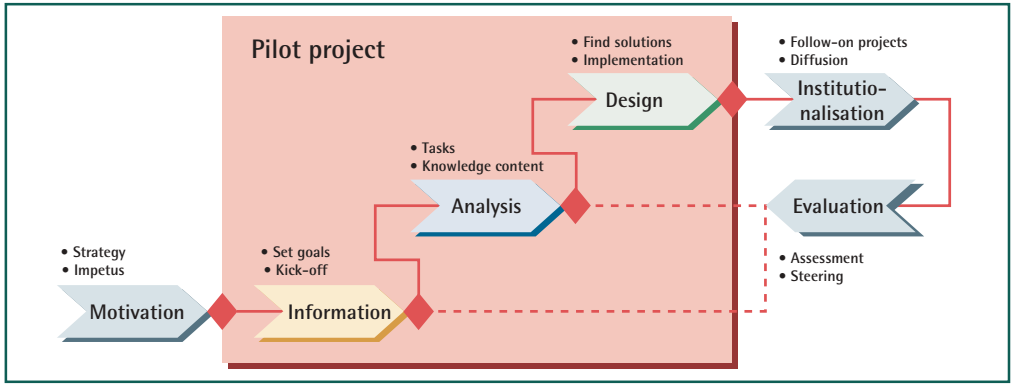


Fig. 68: Knowledge management implementation process

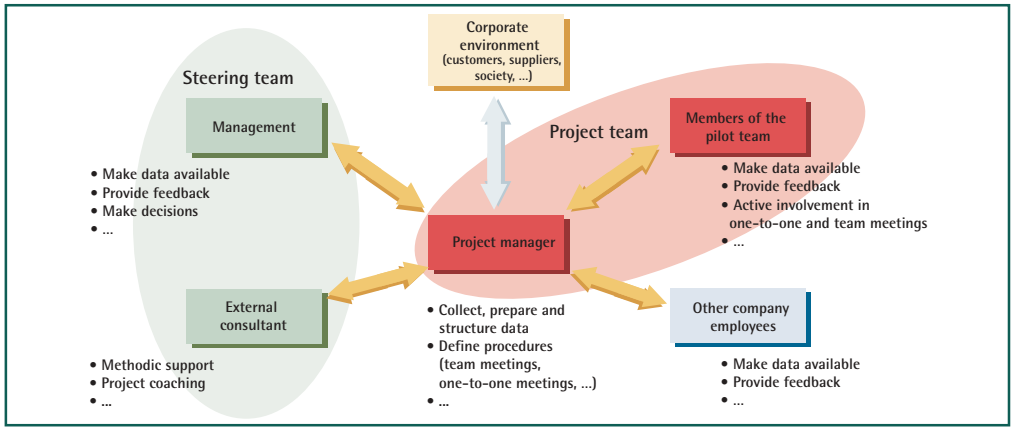


Fig. 69: Tasks and members in a pilot project

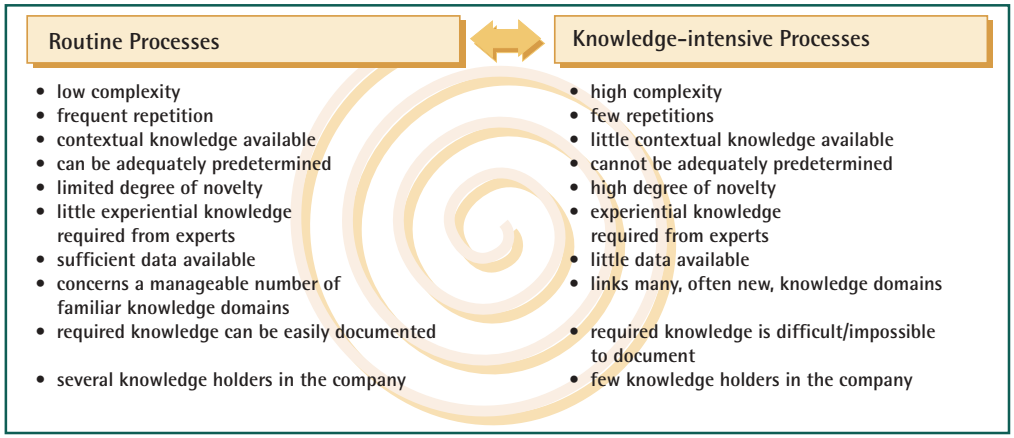


Fig. 70: Differentiating between routine and knowledge-intensive processes

Initiation Phase

This section describes the knowledge management implementation process illustrated in Figure 68. Knowledge management can be introduced either for historic reasons or to plan for the future, i.e. as a direct consequence of the urgency of a situation (e.g. ever increasing information overload), or as a strategic management decision. Whatever the reason, everyone should be informed of this decision before any definite steps are taken. This could be through an article in the staff newspaper or an introductory presentation or workshop. It can also be beneficial to enlist external support in the initiation phase, since this also provides access to additional relevant experience gained in comparable projects.

The first definite step towards knowledge management often takes the form of a **pilot project.** Since pilot projects can have both a positive and a negative influence on any subsequent company-wide roll-outs, they should be carefully planned and include a clear distribution of roles (see Fig. 69).

A pilot project should ideally be targeted at a particular division or group of employees that is comfortable dealing with change and new challenges. It should also directly involve everyone who will play a part in or might be affected by any measures introduced. In this way, the project "involves the involved" from the start and can take advantage of their experience in determining possible solutions and measures.

In general, the selection of any key areas for knowledge management should concentrate primarily on **knowledge-intensive processes critical to company success** (Fig. 70).

The next stage is then to set the goals for the pilot project. These might include:

- Improving knowledge transfer in selected areas
- Improving access to data and knowledge
- Encouraging the use of creative potential
- Activating previously untapped or unused knowledge.

The following **questions** need to be asked when implementing knowledge management:

- Which business processes are particularly knowledge-intensive and critical to company success?
- In which processes is it extremely difficult to support knowledge transfer through documentation?
- Are there knowledge-intensive areas that can only be covered by a few (individual) members of staff?
- Are there any areas in the company where knowledge is particularly stable or unstable?
- Which areas will readily accept and are in urgent need of change?

Management Summary

Setting clear goals and involving everyone concerned are two major success factors in the introduction of knowledge management. Quick wins generated in an effective, yet manageable pilot project can be of great significance for the success of any subsequent larger scale initiatives.

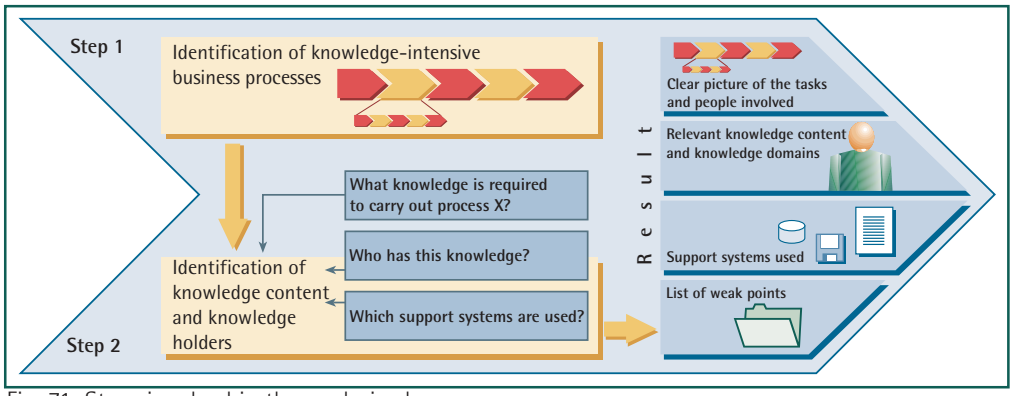


Fig. 71: Steps involved in the analysis phase

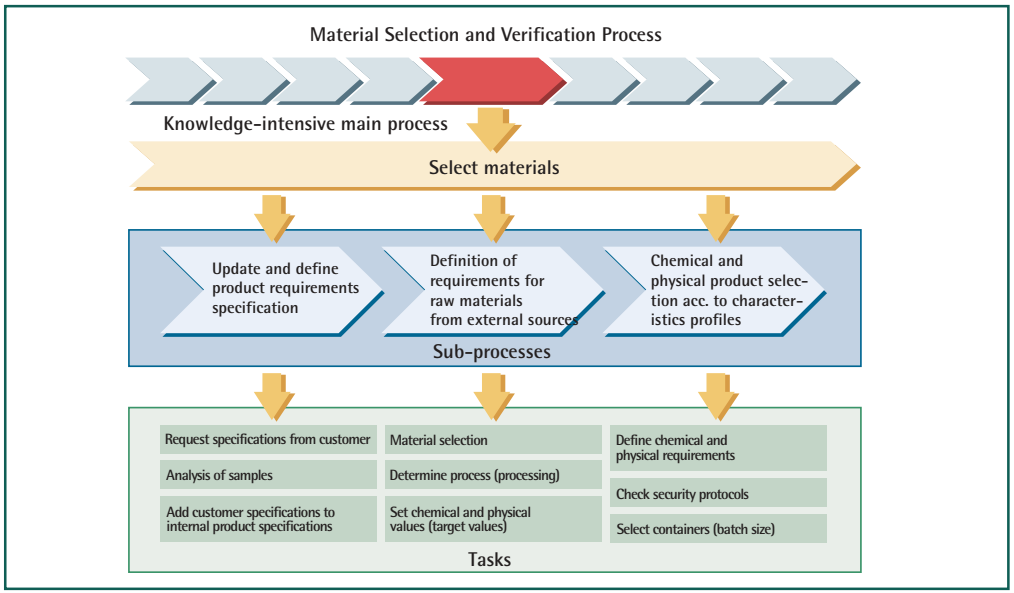


Fig. 72: Example of process segments in industry

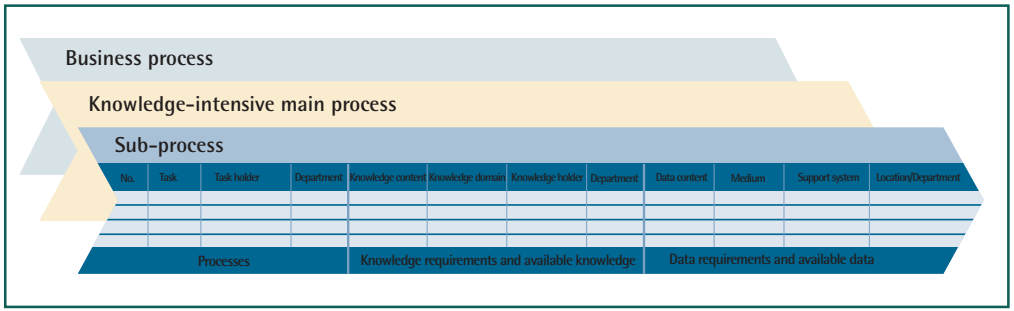


Fig. 73: Analysis grid for evaluating business processes

Analysis Phase

The pilot project begins with a kick-off meeting. At the end of this meeting, the following points should be clear:

- The expectations of everyone involved with the project and the project goals
- The project plan, the required resources and the milestones.

In the analysis phase (see Fig. 71), selected processes are analysed with a view to the goals set. In this way, the introduction of knowledge management does not simply become the end in itself: It ties in directly with the company's business activities and processes.

This requires a detailed **representation and segmentation of the processes involved** (see Fig. 72). The existing process organisation handbook or, if no such document is available, a description of the processes planned in the quality management system are good points of reference here.

The following questions should be considered in the **detailed analysis:**

- Which sub-processes are particularly knowledge intensive and/or complex?
- Are there any areas in which knowledge transfer is known to be problematic?
- Which areas of the process are essential for value creation?
- Which knowledge forms the basis of the skills and expertise in this division?

The **analysis** grid proposed in Figure 73 can be used in most companies, regardless of their structure (e.g. primarily by function or as a process organisation). This grid establishes an overview of existing knowledge domains, tasks, task holders, knowledge holders and any support systems used. Three central questions play a key role in the analysis phase:

1. **Action level:** Which knowledge is required for process X?
2. **Knowledge level:** Who has this knowledge?
3. **Data level:** Which support systems and data are used?

The best way of establishing an overview is by conducting interviews with the task and knowledge holders concerned. This ensures that only relevant data is collected. Furthermore, the level of detail should be kept to the minimum required to draw up a qualified overview and to avoid too much concentration on unnecessary details. The following **results** can be drawn from the overview:

- A clear picture of the tasks and knowledge holders involved in each individual process
- A reconstruction of the knowledge base and key knowledge domains
- An overview of any tools or support systems used
- A list of weaknesses.

In the final stage of the analysis phase, the results should be presented to all those involved in or affected by the knowledge management activities. Subsequent steps and measures should then be defined.

Management Summary

A process oriented representation of business activities is an excellent point of reference in the analysis phase. The analysis should focus on knowledge-intensive value-creation processes. The results of the analysis phase should provide specific ideas for subsequent knowledge management measures.

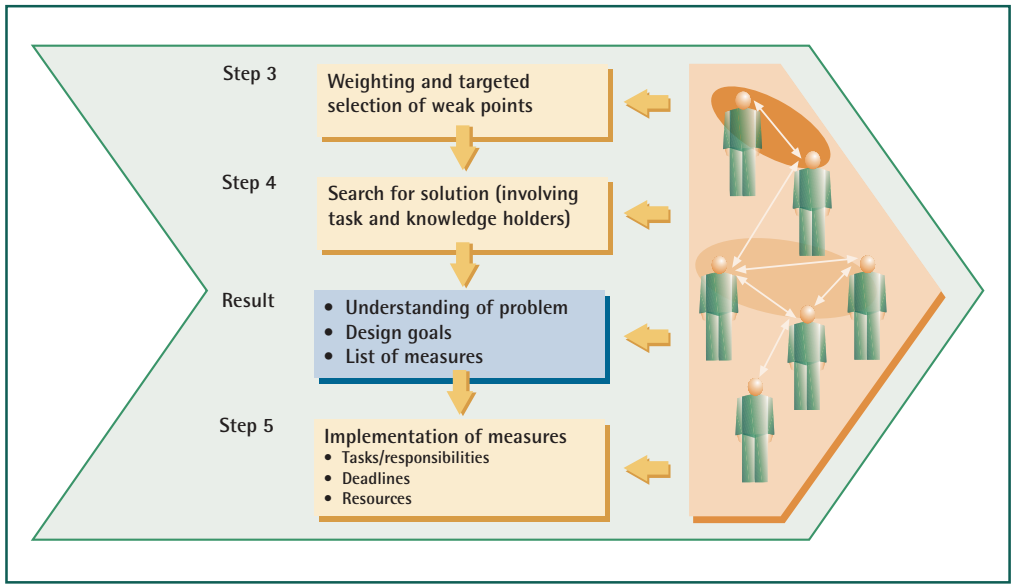


Fig. 74: Steps involved in the design phase

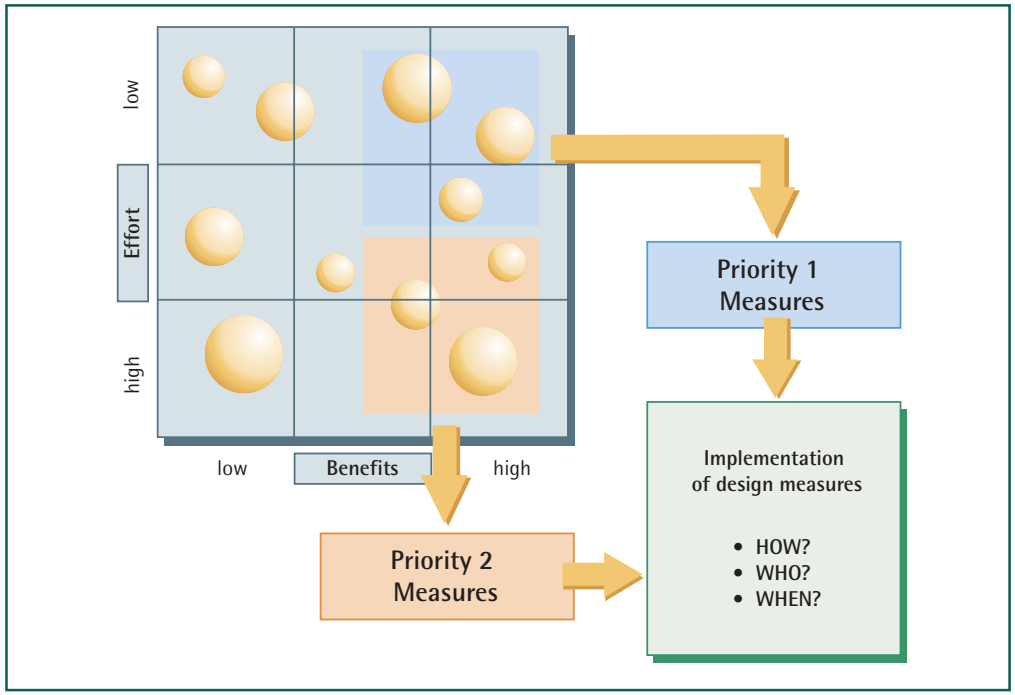


Fig. 75: Selecting design measures

Design Phase

In the subsequent design phase, the results obtained in the analysis phase can be turned into specific measures (see Fig. 74). If the weaknesses outnumber the possibilities open to the project team and its defined framework, a joint decision must be made by everyone involved in the project on the areas that are most relevant or urgent. This should take into consideration the work they will involve and the potential benefits they offer (see Fig. 75).

This weighted **list of measures** forms the basis for the implementation schedule. In the implementation phase, it is also extremely important to involve everyone concerned with or affected by the project in the identification of any possible solutions, as this will increase acceptance of any solutions proposed. This identification process can be seen as a creative, team-based knowledge generation phase. The project should aim to produce "noticeable" improvements as quickly as possible.

To ensure that this is achieved, a **timeframe** should be established and a **person nominated as responsible** for each measure. The members of the project team should profit most from these activities and receive some form of response or recognition for their efforts. Possible benefits include an increase in personal satisfaction or an improvement in their working situation. Design measures can be grouped into three main categories:

- Human
- Organisation/culture
- Support systems/tools

It is unfortunately common in knowledge management that the only measures ultimately introduced are on a support system level. For this reason, it should once again be noted that whilst tools and software can provide excellent support on a data level, knowledge management activities should under no circumstances only be limited to measures of this kind.

Support for and acceptance of knowledge management activities – and the extent to which they can ultimately be extended and institutionalised through subsequent projects – will depend very much on the success of any pilot projects. Experience shows that the following success factors and barriers must be considered in any knowledge management initiatives:

Success factors

- Management must fully support the project (role models)
- Obvious benefits both for staff and the company
- Focus on pilot activities in manageable areas
- Motivated project team and rapid, noticeable improvements
- Sound project management and clear goals.

Barriers

- Lack of time/motivation
- Power barriers/authoritarian style of management
- Lack of basic understanding of the concept of knowledge management.

Management Summary

Priority should be given in the initial stages to measures that can be implemented quickly and easily, yet which yield high returns. Sound project management helps achieve the goals set. The acceptance and success of a pilot project forms the basis for subsequent knowledge management measures.

HUMAN RESOURCES

- Can potential knowledge holders be contacted easily?
- How can existing contextual knowledge be assessed in knowledge transfer processes?
- Is it likely that some people will deliberately hold back knowledge ("knowledge is power")?
- Are the knowledge holders in the company under too much pressure?
- Are knowledge holders frequently asked the same questions?
- Where are the knowledge gaps, e.g. among young or new members of staff?
- Are there any personal barriers to knowledge transfer (e.g. animosities, likes or dislikes)?

ORGANISATION

- How is knowledge transferred (in meetings, by phone, etc.)?
- How efficient and effective is knowledge transfer?
- How effective is the knowledge transfer framework?
- Are there any Communities of Practice in the organisation?
- Do organisational structures support knowledge transfer?
- What effect does location have on knowledge transfer?
- What could be done to make knowledge transfer more effective and efficient?
- Have any organisational barriers to knowledge transfer been encountered?

TECHNOLOGY

- Which information and communication technologies are used for knowledge transfer?
- Is there a (computer) network that works well? Is there an Intranet?
- Are the information and communication systems user-friendly?
- Is company data updated regularly?
- Are staff happy with existing IT systems?
- Are there any other barriers to knowledge transfer?

CULTURE

- Is it standard practice to share information?
- Is there a climate of openness and trust in the organisation?
- Do management act as role models in knowledge transfer and sharing?
- How do knowledge holders react to requests for help?
- Are cooperation and knowledge sharing activities rewarded and promoted?
- What is done to promote informal knowledge exchange in the organisation?
- Are there any cultural barriers in the organisation?

Fig. 76: Questionnaire for analysing knowledge transfer

Lessons Learned in Implementation

A knowledge-oriented analysis should be carried out at the beginning of any knowledge management initiatives and should provide information on how ready an organisation is for knowledge management. This **degree of maturity** can be with respect to organisational culture, existing management systems or technological requirements. If the degree of maturity is too low, knowledge management projects will quickly be abused to resolve deficits in other areas and knowledge management itself then becomes little more than a "pretext". A qualitative indication of the degree of maturity is, for example, the way quality management requirements (e.g. employee suggestion schemes) are implemented.

In most cases, the lasting effects of a successful knowledge management project (see Fig. 65) will not be immediately apparent. As a result, it is important to generate some quick and visible results, to ensure that employees do not come to see knowledge management simply as an end in itself. These "quick wins" should address some of the more urgent issues and provide direct benefits for the people concerned. One possible example is the setting up of a "virtual library" (i.e. administration of books and periodicals via the Intranet). Communicating these results is also essential to any implementation efforts, confirming the importance of project marketing as a critical success factor in knowledge management projects.

Knowledge management projects must also pay particular attention to the actual **people** involved. They should not be given the impression that what they did in the past was inefficient and that knowledge management has come along to change all that. The use of buzzwords and jargon like "the knowledge manager" or even the term "knowledge management" itself can often cause real problems if they are communicated or interpreted wrongly. Passive resistance can have a seriously detrimental effect on the success of any long-term knowledge management initiatives. The goal should not be to turn all employees into knowledge management experts. In general, employees are rarely interested in theoretical management models; they want to see solutions that will resolve their problems.

The long-lasting success of knowledge management requires an evolutionary **change process** with an undefined beginning and end. There is no such thing as "out-of-the-box" knowledge management, and the operative implementation should take the form of **pilot projects.** Figure 65 illustrates the introduction of knowledge management over a period of several years using pilot projects in various different areas.

Management Summary

The successful introduction of knowledge management will involve many individual stages, from knowledge-oriented situational analysis through "quick wins" to pilot project implementation.

Glossary

Action level

All the actions required to complete an organisation's tasks or business activities.

Available knowledge

The knowledge represented by the knowledge holders in an organisation. Corresponds to the organisational knowledge base.

Business process

Interaction between means (employees, machines, materials, etc) and activities with the goal of turning the input into an output that meets customer requirements. Business processes begin with the receipt of a customer order and end with delivery and are a combination of routine and knowledge-intensive processes.

Core competence

The ability of an organisation to solve specific problems. Core competences are the result of the unique combination of knowledge and resources in an organisation and represent its competitive advantage.

Collective knowledge

Knowledge that is only relevant in a specific environment (e.g. a company or club).

Collective knowledge management

The actors form a group; the focus is on personal goals.

Context, contextual knowledge

Prior knowledge of a particular knowledge domain.

Corporate culture

The values, traditions, rituals, myths, standards and beliefs that provide the members of an organisation with purpose and guidelines for their behaviour.

Cost-benefits analysis

Method of including qualitative criteria in decision-making processes. Relevant criteria are determined and weighted, and possible alternatives assessed. The "result" of the assessment is multiplied by the "weighting" of the criterion to determine its utility and demonstrate the merits of a particular alternative.

Customer capital

Relationships to customers, suppliers, owners and staff as well as alliances and networks with research institutes, public organisations, etc.

Data level

All systems (e.g. databases, documentation, etc.) capable of incorporating, storing, transferring, processing and exchanging data.

Declarative knowledge

Knowledge of facts (issues, processes, etc.) and objects (people, things, etc.). Also described as "knowing something" or "know what".

Experience

In general terms, experience refers both to experiential knowledge and the process of experiential learning.

Experiential knowledge

A subset of human knowledge strongly linked to people and situations.

Experiential learning

The process of creating experiential knowledge from experiencing a situation.

Explicit knowledge

Knowledge a person is aware of and can articulate.

Function

The individual effects of the object to be described. The function is described using a noun and an infinitive verb.

Human capital

The expertise and motivation of employees and their ability to learn.

Individual knowledge

An individual person's knowledge that can also be separated from a specific context but remains at the disposal of that particular person.

Individual knowledge management

Centres on an individual employee but has a focus on corporate goals.

Innovation services

Specific potential of a particular supplier to support corporate innovation processes.

Intellectual capital

Intangible assets not included in traditional financial statements, yet of considerable value to a company. Intellectual capital is made up of human, structural and customer capital.

Intellectual capital report

Instrument used in the representation, assessment and steering of an organisation's intangible assets (employees, structures, relationships, etc.).

Knowledge

Knowledge is created through an individual process of changing cognitive structures and enables people to act. Knowledge is intrinsically linked to people.

Knowledge creation

Internal expansion of available knowledge by utilising the creative potential of employees.

Knowledge domain

Knowledge related to a specific area of interest or subject matter and formed by a particular group of people.

knowledge-intensive process

A process that is difficult to standardise and requires significant effort to document.

Knowledge level

The knowledge needed to carry out the actions required by a particular task. Also described as the organisational "memory".

Knowledge logistics

The management of knowledge requirements, available knowledge and knowledge transfer.

Knowledge management

Not the "managing of knowledge", but the establishing of a relevant framework to support and promote the application of available knowledge in value creating processes. Can also be described as the management of the organisational knowledge base.

Knowledge requirements

The sum of the knowledge required to carry out business activities or implement corporate strategy.

Knowledge transfer

Satisfying knowledge requirements through available knowledge. Knowledge can be considered to have been transferred when the receiver reaches the same basic level of understanding of the knowledge as the sender.

Knowledge workers

Knowledge workers are (formally) trained experts who (primarily) develop, apply and share knowledge in value creating processes in the course of their professional activities.

Organisational learning

Organisational learning is based on individual learning processes and leads to a change in the organisational structure and/or culture with the aim of guaranteeing survival in a dynamic environment.

Organisational knowledge management

Knowledge management realised by and for a group of employees with a focus on corporate goals.

Organisational knowledge base

The knowledge created and/or developed either individually or collectively by all employees in the course of their work. Data does not form part of the organisational knowledge base.

Outsourcing

Using external sources to expand the knowledge available to an organisation or improve its ability to act.

Personal knowledge management

Knowledge management with a focus on the individual employee and his/her personal goals.

Procedural knowledge

Describes the way cognitive processes and actions are carried out. Also described as "ability" or "know how".

Reflection

Deliberate consideration of the purpose and success of one's own actions or the observed actions of others.

Stakeholders

Groups of people (e.g. employees, customers, suppliers, top management) with a stake in the organisation (e.g. an employee's entitlement to a fair salary).

Structural capital

The infrastructure and processes that allow the organisation to operate productively (e.g. information and communication systems, administrative processes, laboratory equipment, office furniture).

Tacit knowledge

Knowledge a person is unaware of and therefore either cannot record or articulate, or can only record or articulate indirectly using special observation or interview techniques.

Threat potential

A non-dimensional indicator of the extent to which an unresolved problem could jeopardise company survival. Can be quantified by carrying out a cost-benefits analysis of similar procedures.

Transfer of experience

A special form of knowledge transfer. Aims to avoid unnecessary repetition of learning processes through "trial and error".

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