

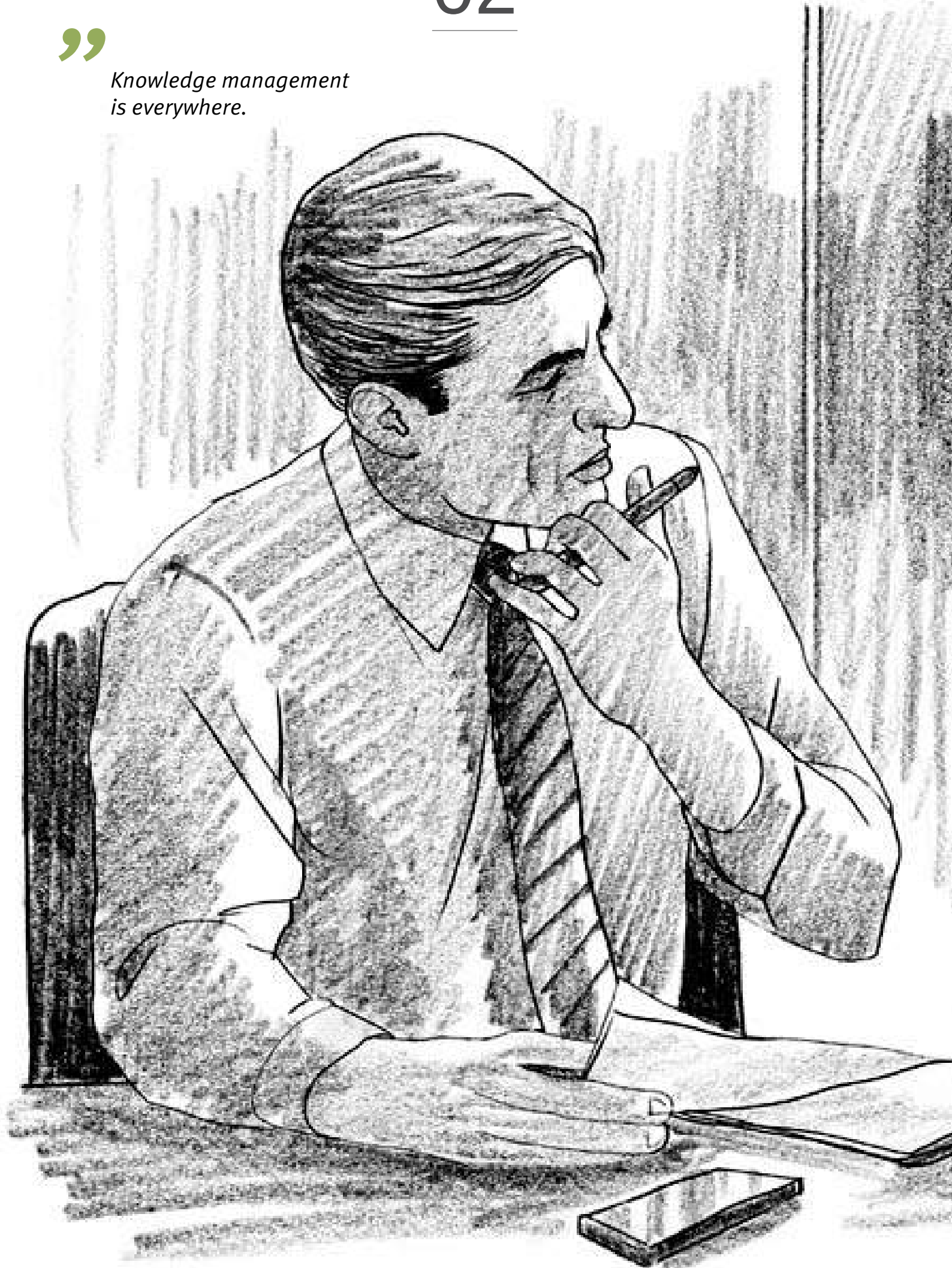
SOFTWARE FOR KNOWLEDGE MANAGEMENT

Comparison of Wikis, Knowledge Databases, Groupware and Search Engines





*Knowledge management
is everywhere.*



MANAGEMENT SUMMARY



Virtually every organization practices knowledge management - some strategically, others just intuitively. The “Software for Knowledge Management” report offers assistance and guidance and explains which tools are suitable for which purposes. The **“Knowledge Management Trends 2014-2023: What practitioners use and visionaries expect”**⁴ study presents and explains a wide range of knowledge management methods. Several organizational and human resource-oriented methods are listed alongside technology-intensive tools.

In the same way that knowledge management concepts catch on sometimes dynamically, sometimes strategically in organizations, so it is with software tools: some organizations plan and make up their minds analytically with long-term strategic focus, however the majority focus on results that can be achieved in a short period of time either on a situation by situation basis or simply arbitrarily. Today the damage done by software decisions that initially seemed pragmatic or by improper restrictions is becoming clear in many places. Software applications that have grown unchecked and in a decentralized fashion cannot be consolidated, authorization concepts are absent, searches only deliver results from a fraction of the body of knowledge, automation and

data cleansing mechanisms cannot be retrofitted and require laborious manual modification.

Today, making a start on knowledge management is considerably easier thanks to more clearly defined software categories and mature applications.

This report is a complement to the above-mentioned study and focuses on “software tools for knowledge management”. The technology-intensive methods derived from the study can be summed up in four clusters in this report: *enterprise wikis, structured knowledge databases, groupware/collaboration management and enterprise search.*

An analysis of the methods shows that it is almost no longer possible to retain knowledge in the organizational loop without information technology. IT must be seen as an essential tool, and without tools the knowledge manager is at best a visionary. Knowledge management systems should not be understood as additional software programs, but as an integral part of a tool box that exists to support staff to the greatest possible effect. Even if the methods have become very software-oriented, people and employees still remain the focus. Practicality is therefore the first priority.

	Enterprise Wiki	Structured Knowledge Database	Collaboration Management, Groupware	Enterprise Search
Focus	Linking texts	Structuring, workflows	Interaction, exchange of documents	Document search
Common areas of use	Glossary, lexicon	Handbook lessons learned, FAQs	Forums, e-learning, document administration	Big data, thesaurus, company Google
Typical cost range in € 000's	3-10	8-35	20-80	50-150
Capturing knowledge				
Storing knowledge				
Applying knowledge				
Evaluating knowledge				
Developing knowledge				
Distributing knowledge				

Selected comparison criteria for knowledge management software

In the case of small and medium-sized enterprises (SMEs) in particular, the potential of a strategic knowledge management system geared towards the competitive advantages offered by knowledge is often not fully exploited. High investment costs, time and organizational outlay may be reasons for this. A lack of knowledge about the systems available on the market and the selection criteria to be considered have been identified as further significant obstacles.

The tables in this report enable requirements to be surveyed in a structured fashion, and the preliminary choice of a certain software system category to be substantiated. If, for example, a medium-sized enterprise wishes first and foremost to combine its quality management with modern knowledge management, and to capture, store and develop knowledge, the table recommends a structured database. The investment costs are clear, processes can generally be easily defined and roles assigned. Social network features such as blogs or profiles are also mostly possible.

If, in contrast, a DAX company wishes to analyze and visualize its many areas of knowledge, and to evaluate and distribute knowledge, then it is worth purchasing an enterprise search solution. These search engines are not designed for documenting knowledge, but instead for distributing what exists and making it available to as many users as possible. Well-visualized data queries support marketing, as well as innovation management. None of the other systems can better manage the large and very diverse information quantities - nowadays known as „big data“ - but such a solution is also likely to be more expensive than other solutions. €50,000 to €150,000 is the likely range.

In contrast to this is the purchase of an enterprise wiki, which, thanks to open source, is also very cheaply available. Admittedly, a wiki is really only on a par with a search engine in a few categories. For those who only have a little money to spend, and who wish to equip a small team that is enthusiastic about technology, and in particular wish to capture and store knowledge, different wikis

should be compared and contrasted. The **“Spoilt for Choice – Wiki Software for Knowledge Management in Organisations”**¹⁹ study should be of use in this respect.

However, the moment of glory of the enterprise wiki has passed, as many cannot keep pace with the requirements of social interaction as seen on social media platforms. If, for example, a culture of “liking”, “tweeting”, “plussing”, “pinning” and “posting” is at the forefront of collaboration, then collaboration management systems help to support this.

These systems are very diverse and fare very well when it comes to capturing and storing knowledge, as well as utilizing and distributing it.

Irrespective of the choice of tool, it should be remembered that every use case is unique and a long-term commitment needs to be well thought through. In this report, additional advantages of the respective systems are compared and contrasted in various tables which help support this important choice.



The software provides maximum benefit, the users benefit from maximised opportunities.

1 THE ROLE OF IT IN KNOWLEDGE MANAGEMENT



Knowledge management concepts with integrated IT support may indeed be in demand in all sectors of industry, but are often linked with high costs. Alongside organizational measures they also require expenditure on suitable hardware and software as well as on adapting and administering the whole knowledge management infrastructure. This is why there are often no knowledge management solutions established in small and medium-sized enterprises with 10 to 250 employees (SMEs). There is not enough money, time or specialized workers. The same applies to networks of companies, so-called virtual organizations, in which, as a rule, small and medium-sized companies attempt to jointly provide their services to their customers.

Cross-company cooperations are unavoidable today²⁰, yet knowledge management has limits in these organizations².

Comprehensive strategies are typically only developed for international groups such as Airbus, Evonik or Tyco Electronics.

The **“Knowledge Management Trends 2014-2023”**¹ study presents a comprehensive overview of the practices, methods and tools of knowledge management. If they are sorted according to the scope of IT support they require, for at least 50 per cent of the methods, intensive IT use is a prerequisite. This report should be taken as a basis in this regard.

For greater understanding, the methods with the strongest IT focus were grouped together in four software categories, which are explained in the following sections:

- Wikis,
- Groupware / collaboration management systems,

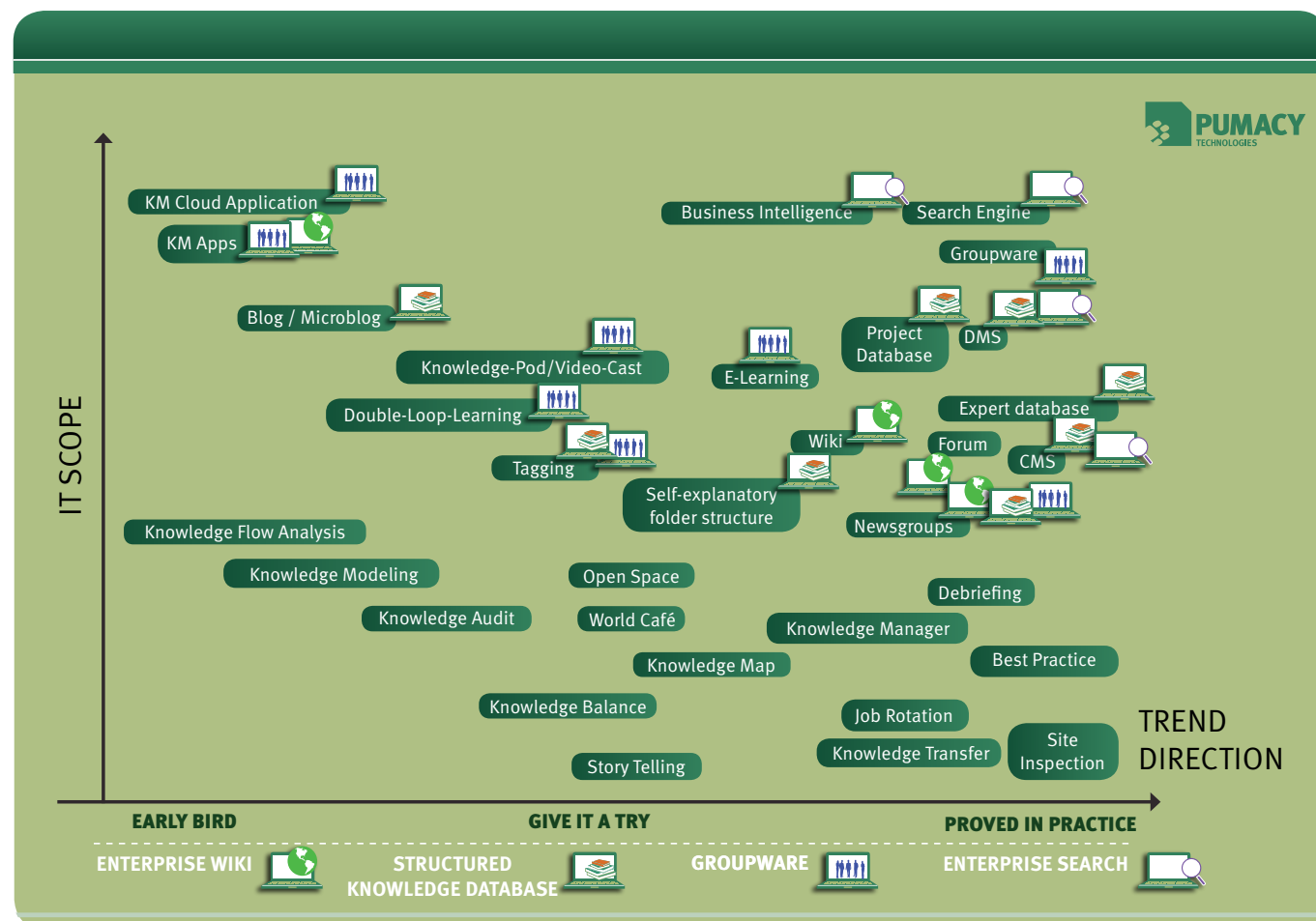


Figure 1: An IT comparison of methods in the Trends in Knowledge Management study

- Structured knowledge databases and
- Enterprise search engines.

To simplify cross-locational and cross-company cooperation, in many organizations there is often only one file storage system available³. For knowledge-intensive work this is insufficient. Social networks, blogs, e-learning platforms, expert databases, apps, search engines and much more also play a central role in the management of knowledge and experience. IT can, however, always only work to the extent that the employees are prepared to work with it. Practicality is therefore the highest priority.

On average, the number of IT-supported processes increases significantly with the number of employees. Figure 2 shows this, taking cloud computing

as an example. Whilst employees in smaller companies are often able to exchange their knowledge in person and informally, higher numbers of workers, spread-out locations, and complex products and processes usually demand more technology in knowledge management.

IT is always only a tool, never the solution. Costs arise, therefore, not only for setting up and maintaining the IT infrastructure, but also for introducing it to staff, possible training courses, in-house communication and motivation. Every software provider who promises something different is disregarding the experiences of users over what now amounts to around 20 years of introducing, using and, of course, also replacing knowledge management software.

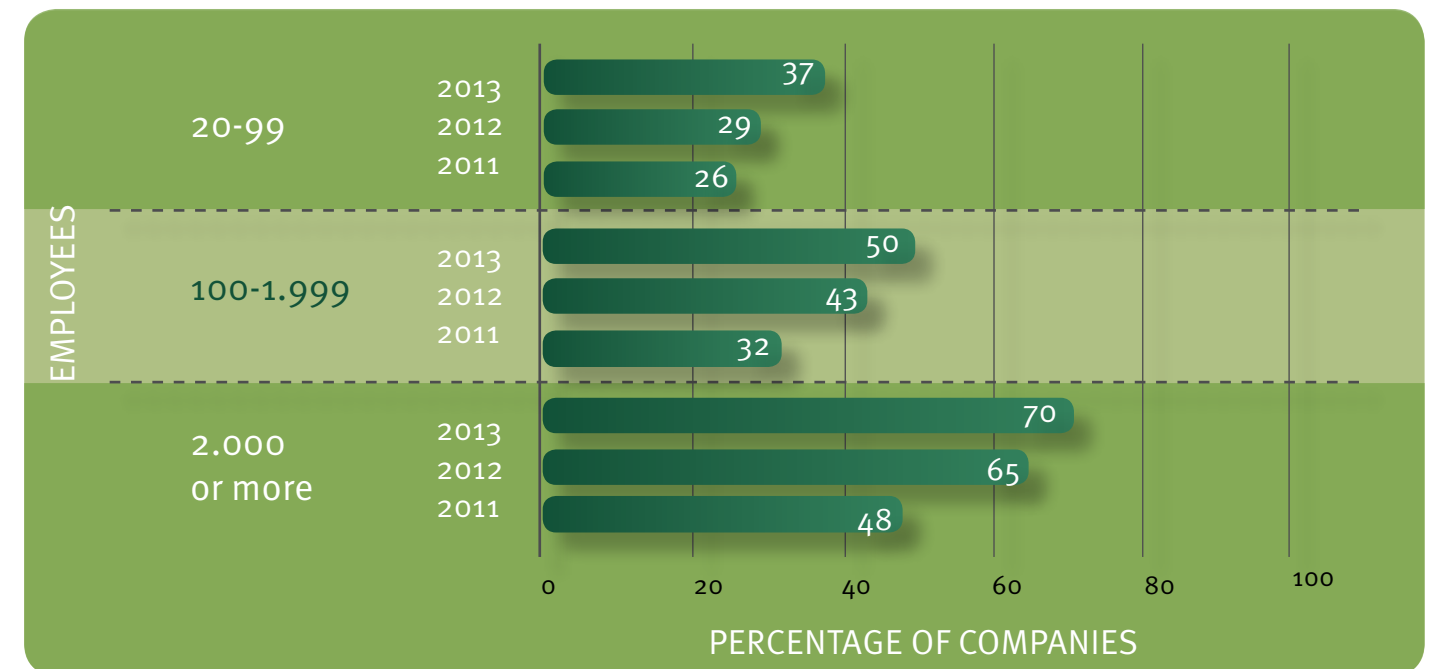
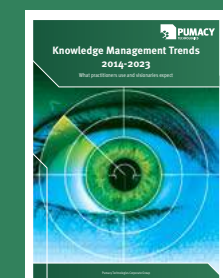


Figure 2: Use of cloud computing according to company size. Source: Cloud Monitor 2014 KPMG / Bitkom Research²¹

FURTHER INFORMATION AND LINKS:

- A comprehensive list of all practices, tools and methods can be found in *“Knowledge Management Trends study”*¹ www.pumacy.de/en/publications/studies/knowledge-management-trend-study/



2 SOFTWARE FOR KNOWLEDGE MANAGEMENT

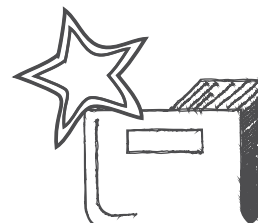


The most common software tools for supporting knowledge management are enterprise wikis, groupware / collaboration management systems, structured knowledge databases and enterprise search engines; typical usage criteria are shown in Figure 3.

Over and above this there are solutions that combine knowledge management software with various social media tools, such as the SharePoint add-on, Sitrion ²⁷.

	Enterprise Wiki	Structured Knowledge Database	Collaboration Management, Groupware	Enterprise Search
Focus	Linking texts	Structuring, workflows	Interaction, exchange of documents	Document search
Which main users are targeted?	Small/medium-sized organizational units	All company sizes, knowledge-intensive work	Medium/large companies, focus on cooperation	Large companies with several data sources
Common areas of use	Glossary, lexicon	Handbook lessons learned, FAQs	Forums, e-learning, document administration	Big data, thesaurus, company Google
Typical cost range in € 000's	3-10	8-35	20-80	50-150
Proportion of companies using¹⁸	Wikis 26%	Cooperation on documents 43%	Social networks 53%	Indexing 18%
System examples	Confluence, Mediawiki, Drupalwiki	KMmaster	MS Sharepoint, IBM Connections	Exalead, Cloudview, IBM/Vivisimo, Velocity, X1

Figure 3: Knowledge management tool usage criteria



ENTERPRISE WIKI

This special type of wiki focuses on the needs of companies and organizations. Enterprise wikis are sometimes also called corporate wikis. Internet communities show that knowledge management software programs can also be used in virtual organizations ⁶. Virtual organizations thus benefit from the experience of internet communities in respect of the cross-organizational and cross-cultural

exchange of knowledge ⁷. Due to the limited financial resources, they often use open source wiki solutions. Many SMEs also use wikis for their knowledge management ⁸, some of them even commercial solutions such as Confluence by Atlassian ⁹. Although both SMEs and large companies use wikis, the low entry barriers make them especially suitable tools for small organizational units.

FURTHER INFORMATION AND LINKS:

- A comparison of various wikis for organizations can be found in the "Spoilt for Choice – Wiki Software for Knowledge Management in Organisations" ¹⁹
- A comprehensive list of almost every wiki system: www.wikimatrix.org

Kriterien	Wiki	BlueSpice	Confluence	DrupalWiki	ForWiki	TikiWiki	Twiki	SharePoint 2013
a. Development Status Mature	+	+	+	+	+	+	+	+
b. Commercial Support	+	+	+	+	+	+	+	+
c. Commercial Support ≥2	+	+	+	+	+	+	+	+
d. Page permissions	+	+	+	+	+	+	+	+
e. Access Control Lists	+	+	+	+	+	+	+	+
f. Plugins	+	+	+	+	+	+	+	+
g. Sprache	+	+	+	+	+	+	+	+
h. Operating Systems	+	+	+	+	+	+	+	+
i. LDAP	+	+	+	+	+	+	+	+
j. Active Directory	+	+	+	+	+	+	+	+
k. Search	+	+	+	+	+	+	+	+
l. Export	+	+	+	+	+	+	+	+
m. WYSIWYG-Editor	+	+	+	+	+	+	+	+
n. Page Templates	+	+	+	+	+	+	+	+

Wikis für Organisationen - Wikis & Kriterien

STRUCTURED DATABASE

Compared with wikis, structured knowledge databases focus more strongly on the arrangement and classification of knowledge. For example, templates for articles, specified workflows and role concepts are provided in order to better control the process of creating contributions. These structures

and the prescribed processes are important ways of optimizing the quality of the managed knowledge ¹¹. As the focus lies on knowledge-intensive work, structured knowledge databases are suitable for all company sizes and sectors.

FURTHER INFORMATION AND LINKS:

- Knowledge databases are specially designed for knowledge management <https://www.kmmaster.de/en/function> ¹⁰
- Lessons Learned im globalen Einsatz - Ein Wissensmanagement-Werkzeug bei TE Automotive. (Lessons learned in global use - a knowledge management tool at TE Automotive) ²²



COLLABORATION MANAGEMENT / GROUPWARE SYSTEMS

The third group of knowledge management solutions are the collaboration management / groupware systems, for example Microsoft SharePoint^{4,12}. Here the focus lies on cooperation, in that they allow the communication and exchange of documents in geographically distributed teams. Groupware solutions are already frequently used in medium-sized and large companies. They are used

by working groups to manage the data and files for their joint work. For this reason, in many cases it is also possible to manage knowledge with these systems. Nowadays, knowledge management is no longer solely focused on in-company knowledge, but includes external sources such as social media platforms and open innovation communities.

FURTHER INFORMATION AND LINKS:

- *aperto - Ein Rahmenwerk zur Auswahl, Einführung und Optimierung von Corporate Social Software (aperto - a framework for the selection, introduction and optimization of corporate social software)*²³
www.soziotech.org/schriften/band2
- *SharePoint is not the same thing as knowledge management, but can easily be configured for it* www.pumacy.de/en/software-tools/sharepoint
- *Social enterprise networking with Sitrion*²⁷
www.pumacy.de/en/software-tools/sitrion



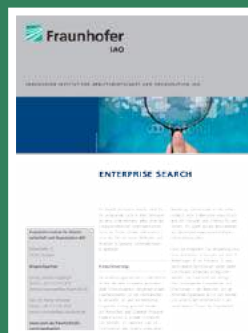
ENTERPRISE SEARCH

The fourth group of applications analyzed in this article is the enterprise search engines¹³. These tools for company-wide searching make use of dedicated, generally in-house information sources and thus offer a central point of access to this information. A few enterprise search systems even go one step further, such as Exalead CloudView by Dassault Systèmes¹⁴. With this system, it is possible to create so-called search-based applications¹⁵ for certain purposes, to enable searching on a context-specific basis. Very large data inventories

from a variety of different sources can be processed in this way. The use of enterprise search engines has only been found in larger companies to date due to the high cost of the software systems. But a lot is changing in this market: enterprise search systems based on no-cost tools such as Hadoop or Lucene are gradually catching on in practice. Nevertheless, as a rule they still require extensive implementation work.

FURTHER INFORMATION AND LINKS:

- *Market study on providers and tools 2013, Fraunhofer IAO.*²⁵
www.swm.iao.fraunhofer.de/de/Publikationen/es2013.html
- *Enterprise search can be combined with big data*
www.pumacy.de/en/software-tools/exalead-cloudview
- *BITKOM Leitfaden: Big-Data-Technologien. Wissen für Entscheider. (Big data technologies. Knowledge for decision-makers.) 2014*²⁶
- *Enterprise Search. Varonis Research Paper.*²⁴



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*The composition,
not the components,
makes a technology
the best of its kind.*



3 COMPARISON OF SYSTEM IMPLEMENTATIONS



These four approaches to IT-supported knowledge management were analyzed according to a multitude of criteria covering different use cases, and assessed as system categories without reference to specific individual solutions.

First and foremost the study looked at how the tools stack up in terms of implementation effort, cost and adaptability.

	Enterprise Wiki	Structured Knowledge Database	Collaboration Management, Groupware	Enterprise Search
Quicker access to knowledge management				
Low cost in terms of procurement and operation				
Training requirements				
Flexibility and adaptability				

Figure 4: Comparison of different knowledge management tools

SPEEDY IMPLEMENTATION

SMEs and networks of companies often have barely enough resources to undertake time-consuming system implementations and adjustments. From a technical point of view, therefore, **wikis** provide a suitable solution, as they can be used immediately after installation and a few basic configuration adjustments. From an organizational point of view, however, structuring should be undertaken and some usage rules developed. Many companies today are trying to make up for the sins of the past when there was a real proliferation of departmental wikis.

Structured knowledge databases and knowledge management add-ons for **groupware solutions** generally require more adjustments before they can be used productively. For example, templates must be created for the items of knowledge, and roles and workflows need to be defined. Exceptions are systems with templates from best practices for ad

hoc use. However, this does not necessarily mean that implementing the system will take longer or be more complex: Structured knowledge databases in particular come with a multitude of templates, workflows and transferable application concepts due to their specialization.

Due to the required integration of knowledge sources, **enterprise search engines** have the longest implementation phase as far as IT is concerned. If you also wish, over and above full text searching in released documents, to connect internal databases, external resources and even social networks to the search engines, then there will quickly be a high degree of need for modification. The individual legal issues ranging from access authorizations and operational guidelines to compliance with the individual rights to privacy cannot be neglected here. In contrast, available information sources are used so that there is no need for time-consuming

knowledge capturing and the users benefit very quickly - with a steep success curve - from the use of the search engine once the system has been integrated.

COSTS

When selecting an IT system, in most cases the costs are critical. Nevertheless, in 2013, 58% of companies indicated that they would increase their investment in Web 2.0 technologies¹⁸.

The popular open source **wikis** increased the pressure on knowledge management system prices. For this reason, most commercial solutions for wikis and **structured knowledge databases** are considerably lower than for other software solutions.

Groupware solutions tend to be more expensive than the special knowledge management systems. Nevertheless, due to their larger range of functions for cooperation in a company they can justify higher prices. In contrast, the range of efficient

enterprise search solutions is still relatively small. The available commercial products generally have significantly higher licensing costs than the aforementioned systems and require additional system modifications.

In particular with regard to free software, at this point we should mention the implementation costs, which are often not inconsiderable, and the serious acceptance problems that can arise after a "simple and inexpensive" system introduction. In many situations, the total costs are thus considerably higher than those associated with the introduction of a commercial solution; consequential costs due to an inadequately planned or misguided introduction are not taken into account.

For organizations that balk at a high investment right from the beginning, there are now, as an alternative, thoroughly interesting leasing models (especially in the cloud environment) in addition to all of the above-mentioned software categories.

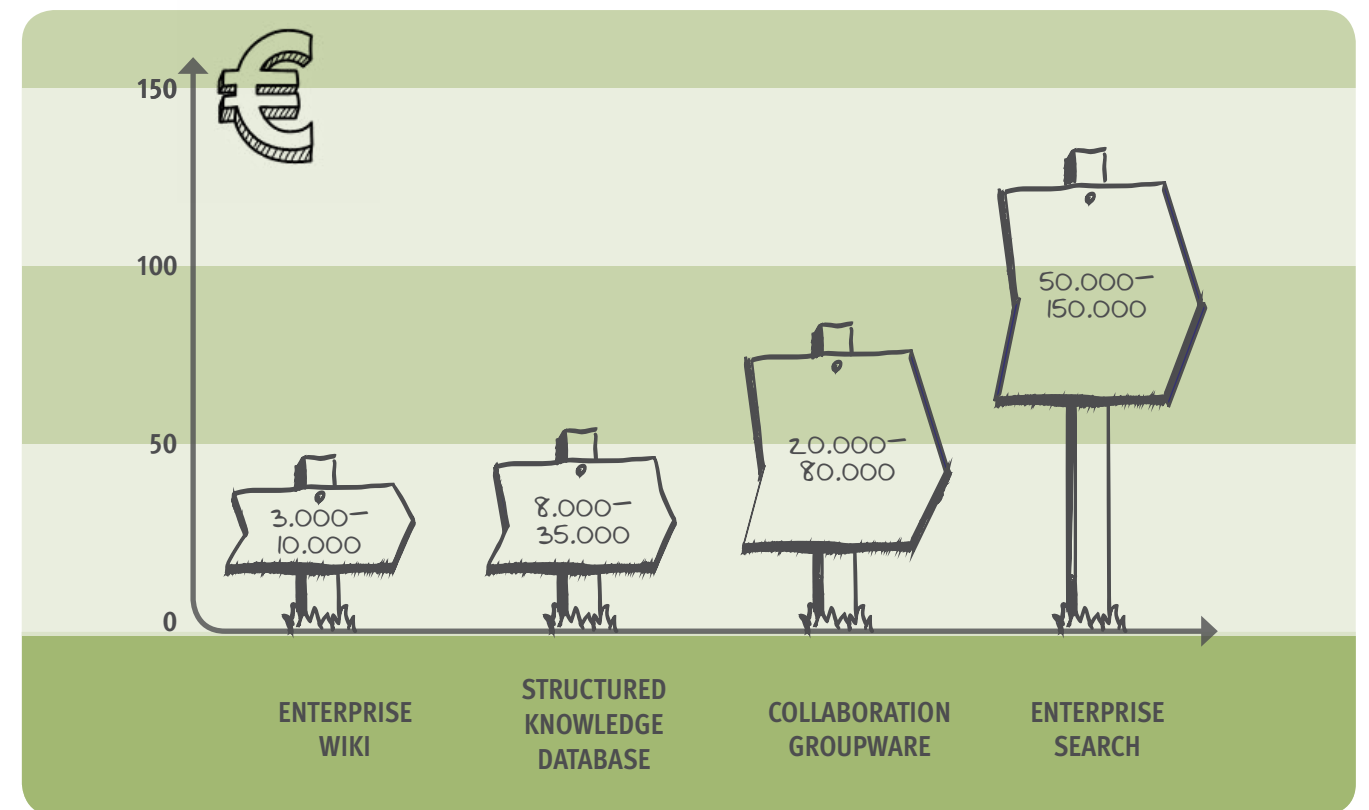


Figure 5: Typical cost range for implementation

TRAINING REQUIREMENTS

New software not only streamlines processes, saves time and lowers costs, but must also be maintained and applied. To do this, there is generally a need for training. An offering in which a software program is described as being introducible without any initial training is simply not serious. To set up a user profile no training is needed but at least an orientation phase. Documentation or a handbook, a collection of FAQs or a workshop on lessons learned are generally helpful.

As **wikis** and **knowledge databases** are commonly selected for a specific purpose, it is worthwhile combining their introduction with training. The development of a lessons learned database can, for example, be linked to a workshop such as “how to write lessons learned”.

This is quite different with **groupware** and **enterprise search**, which are generally used to support specific tasks. In order to enable a very broad application within the entire organization, the majority of organizations dispense with training courses, but instead support the user directly in practical use by means of video tutorials or FAQs.

FLEXIBILITY AND ADAPTABILITY

Wherever possible, software programs should adapt to the organization, rather than the organization adapting to the software. For this reason it is worth taking a look at a system’s flexibility. In order to grow with an organization, the software program should be scalable. In this way, as a successful model it can be transferred to other organizational units or fields of application. A support service that takes care of urgent inquiries and long-term development is also a plus. Interfaces to other systems can also be relevant to the decision.

Wikis often do not have a large number of interfaces and integration functions. In the case of open source software, moreover, attention should be paid to whether or not the system is being further developed. In addition to the size and activity of the developer community, the available offers of commercial support give an indication of the development potential of the software.

Knowledge databases are also generally - as a result of their specific focus on knowledge management aspects - limited in terms of their flexibility. The general range of functions may be a long way from being as comprehensive as with a collaboration environment such as SharePoint, however pre-configured application environments are available for the essential knowledge management tasks. Over and above this, the individual wishes of the users are often listened to by the providers of specialist software programs and these have an influence on future developments.

In contrast, **collaboration and groupware solutions** are usually based on comprehensive interfaces, which - accompanied by the corresponding development effort - enable far-reaching system modifications. Updates, support and multilingualism are all in place.

In particular **search engines** are especially tailored to working with as many different systems as possible. Flexibility and adaptability are the fundamental aspect of the software approach.

4 COMPARISON OF AREAS OF APPLICATION IN KNOWLEDGE MANAGEMENT

In order to do justice to the specific needs of knowledge management, it must be possible to measure a software program in terms of its areas of application. For this reason, the software solutions

were analyzed in respect of the six following categories: *capturing, storing, applying, evaluating, developing and distributing knowledge*.

	Enterprise Wiki	Structured Knowledge Database	Collaboration Management, Groupware	Enterprise Search
Capturing knowledge				
Storing knowledge				
Applying knowledge				
Evaluating knowledge				
Developing knowledge				
Distributing knowledge				

Figure 6: Evaluation of knowledge management software by fields of application

SHARING AND COMMUNICATING KNOWLEDGE

With Web 2.0 and Enterprise 2.0, communication between people came more sharply into focus. This is an opportunity for knowledge management, as the exchange of knowledge is improved by new technical solutions.

In this respect, **wikis, knowledge databases** and **groupware** are all equally well positioned. They all support the collaborative creation of knowledge contributions and group discussions and commenting upon articles possible. **Search engines** pursue a different approach and are therefore not directly comparable in this aspect. They can only make use of the Web 2.0 trend indirectly, by integrating social media activities (e.g. weblogs, microblogs) and making them useful for company-wide searching.

STRUCTURING OF KNOWLEDGE

A structuring of the knowledge is indispensable. After all, it supports the subsequent retrieval of information. However, it also means additional effort in terms of work. As a rule, **wikis and groupware solutions** offer indexing. However, the effectiveness of this category is limited and the structuring of articles in terms of content needs to be carried out by the users.

In this respect, **structured knowledge databases** have advantages. They offer not only indexing, but simultaneously often also offer adaptable templates for organizing articles in terms of content. The classification function is generally significantly better developed; for example complex classification hierarchies through to taxonomies or ontologies are possible. The **enterprise search engines** offer the greatest support in this area, as they automatically undertake the structuring of knowledge.

They can create their own indexes and undertake the clustering of terms on the basis of ontologies. They thus relieve the user of the time-consuming task of indexing. Admittedly it should be added that this cannot under any circumstances be done without checking and revision. Indeed, enterprise searches are always more efficient, but as of the present day are still a long way from replacing humans in terms of their anticipatory structuring capability.

KNOWLEDGE BUILDING PROCESSES

The active participation of group members is an important challenge when using technical knowledge management solutions. One approach is offered by defined work processes, known as workflows. In this way people can be invited to add to articles, or reviews can be specified for quality enhancement. At the same time, role concepts define responsibilities and rights in these workflows.

The majority of **wikis** have no workflow support, whilst just a few can boast this important function in the business context. In the case of the **structured knowledge databases** and the knowledge management add-ons for **groupware** servers this tends to be more the rule. The **search engines** alone cannot be assessed in this area, as in their case no knowledge contributions are made.

However, suitable application functions from specific search results can process data, generate knowledge from it and thus initiate further activities.

FINDING KNOWLEDGE

Ultimately, the most important task of knowledge management solutions is to supply knowledge for reuse. For this reason they need to support the everyday search for knowledge. As standard, the majority of systems analyzed offer a full text search on the basis of all information in the system.

Additional benefits could be achieved by linking to additional internal and external data sources, as enabled by **enterprise search engines** and some **knowledge databases**. Over and above this, these two system types offer greater search quality due to their structured knowledge base / their ontology-based keyword indices.

Dealing with large data volumes (big data) has become a challenge, and not only for large companies. In order to analyze and above all visualize knowledge too, high-performance search engines are needed that continuously check the data inventories with corresponding interfaces. Search based applications can also process semi-structured and unstructured data using semantic technology. Neither knowledge databases nor groupware solutions are able to do this.

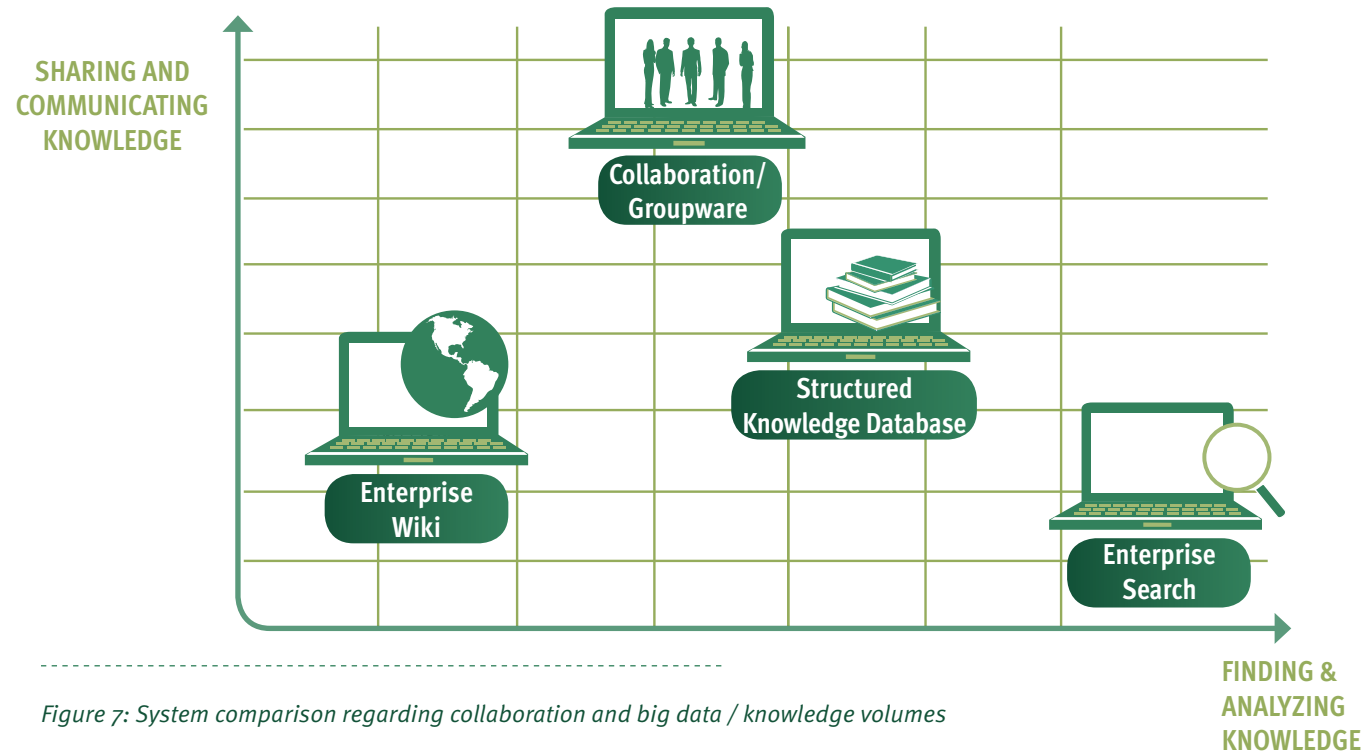


Figure 7: System comparison regarding collaboration and big data / knowledge volumes

5 CONCLUSION

The four approaches to technology-supported knowledge management examined and presented have their advantages and disadvantages, and the selection of the most suitable system depends on the specific purpose.

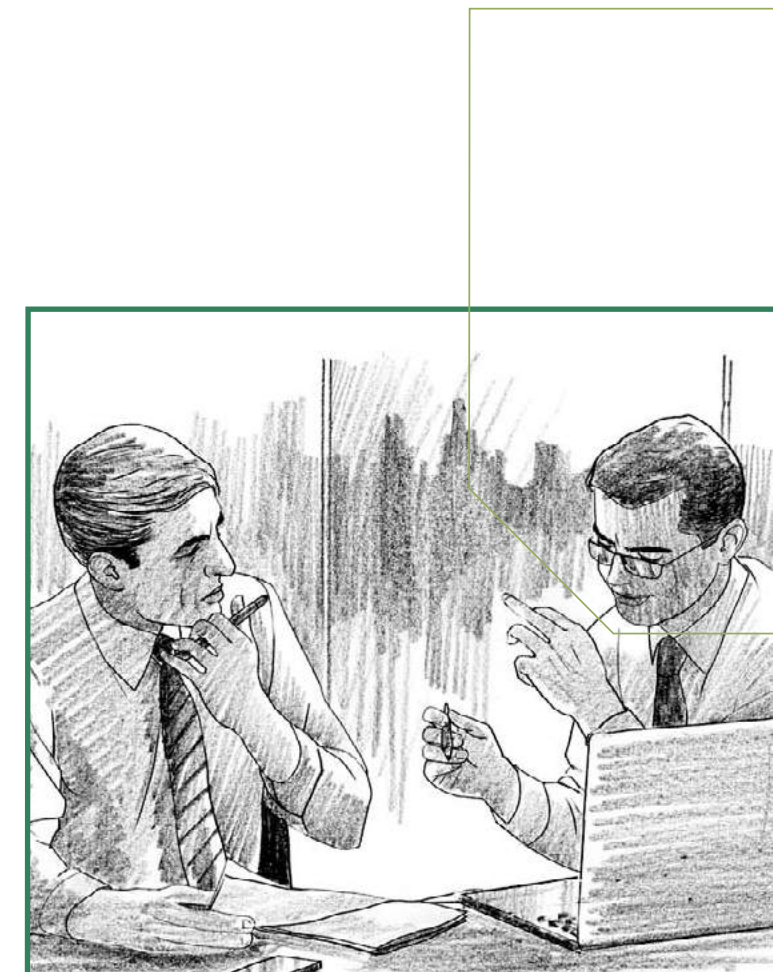
Wikis are suitable for small working groups without formal hierarchies. They can be introduced quickly and they make uncomplicated methods of working possible. In the form of enterprise wikis they can, in combination with sensible planning and introduction work, also be of interest to larger companies. Structured knowledge data-bases offer more control in the creation and reuse of knowledge. For example, they support workflows and role concepts and structured templates, and improve the quality of the knowledge base. If cooperation and communication are a high priority, a collaboration management / groupware solution is highly suitable.

In addition to knowledge management, they offer many functions to enable cooperation across companies and locations. Enterprise search engines have great potential for making existing knowledge sources easier to search. This applies equally to SMEs and virtual organizations, although the high costs of licenses and the modifications required still hinder their widespread use in the area.

Overall, it must be stated that the effectiveness of the information-related systems and their adaptation to the specific requirements of knowledge management continue to grow. For this reason, knowledge management software will contribute to a further expansion and more fundamental implementation of knowledge management in companies of all sizes.



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PUMACY TECHNOLOGIES AG**

**Dr. Toralf Kahlert (Hg.)
Dr. Lars Langenberg (Hg.)**

Daphne Gross (Autor)
Christian Kind (Autor)
Dirk Langenberg (Autor)

CREDITS

Pumacy Technologies AG
Bartningallee 27
D-10557 Berlin, Germany

email: info@pumacy.de
Web: www.pumacy.de

Tel: +49 30 2216128-0
Fax: +49 30 2216128-9



Company headquarters
Bemburg, AG Stendal Commercial Register No. 16527

Board
Dr. Toralf Kahlert (Chair),
Dr. Lars Langenberg

Supervisory Board Chair
Prof. Dr. Udo W. Pohl

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