

# TECHNOLOGY OPTIONS TO SUPPORT THE IMPLEMENTATION OF KNOWLEDGE MANAGEMENT

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**Abstract:** Company is more aware that knowledge management is one of the important factors because it gives competitive advantages for them. Knowledge is intellectual asset that is owned by individual or company. Knowledge becomes very useful if it is documented or stored, organized, shared to others and can be understood and applied. Knowledge Management System (KMS) is made to manage knowledge. KMS does identifying process, capturing, organizing and disseminating knowledge. Technology is one of three model of KM that supports the implementation of KM. This time there are various options of technology that support the KM implementation for companies. In this research, there are various options or types of technology that can be used to support the implementation of knowledge management.

**Keywords:** Knowledge Management; Knowledge Management System; Technology Word

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## INTRODUCTION

Currently the technology greatly affects the organization, social and personal. In organization, for example technology is thing that widely used and implemented to support business process. The rapid development of technology gives many alternatives or technology options for the company. Developing technology is technology, which is better than the previous technology. Technology is very helpful and eases from all aspect.

Company realizes that knowledge management (KM) is one of the important factors that support the improvement of the company. Currently various companies both in small or big scale have applied KM. Various business fields are done by business people or company, it is in production, trading, travelling, education field, etc.

Company has knowledge that has to be managed so it can be documented, categorized and shared to others. Due to that, the company builds the Knowledge Management System (KMS). Technology that supports in KM implementation is needed to build KMS. Technology facilitates in interaction, distribution, searching and knowledge storage [1]. With the help of technology, the process in managing the knowledge will be easier. For big company, longstanding business and company in various places or regional, technology is an excellent option to help in applying KM. In this research, it is more about discussion to various type of up to date technology that can support the KM application.

## METHOD

To apply technology KM, it needs knowledge about the up to date technology that support the company in building KM, what ability and suitability towards the needs. The application of technology is a decision that basic considerations to look at various aspects, especially the feedback that can be accepted after the technology has been applied. In this research, the writer will use literature studies about technology KM that has been applied, with classification of its function and ability, by collecting reference from books, scientific works and online sources.

## RESULTS AND DISCUSSION

### Knowledge Management

Knowledge is intellectual asset that is owned individual or company. Knowledge that owned by individual often becomes tacit knowledge; owned by him/herself. Meanwhile if it is shared with others, it will give useful benefit. Knowledge is knowledge from the past experience, knowledge along with the time and sometimes it is hard to be told or documented. Knowledge is information interpretation process (like data) and past experience into one set relation or information that has meaning and can be understood and applied by someone [1].

KMS is needed to manage knowledge. By managing knowledge well makes it does not disappear and can be given to others. A good KM is making knowledge becomes readable and understood by

others and become lesson or comparison for others to do something. By knowledge anyone does not need to waste time to do the same things, so they can focus on how to improve value from knowledge so eventually it becomes new knowledge again.

KMS is identifying process, capturing, organizing and distributing intellectual assets. KMS provides technical support to record and communicate knowledge easily, readable and access able by all organization stakeholder [1]. KMS is modern information technology usage (such as internet, intranet, extranet, Lotus-Notes, Software filters, Agents, Data Warehouses) that is systematized, improving and accelerating in managing the intra-knowledge or inter-knowledge from the company [2].

Some views about KMS, according to Ref. [3] suggested that technical view from KMS that is shown in picture below, it consists of 3 components: technology, function and knowledge. In KMS includes

process of collecting, organizing and distributing or sharing knowledge to everyone in the institution.

### Technology

Technology is development of media or tool that can be used more efficiently for processing and controlling problems. According to Ref. [4], technology includes hardware, software, database, networks and other electronics. From year to year, the discovery of new technology keeps emerging. In this era, technology has become part of human's life. As well for the business people, where the application of technology gives useful function to support business process. The efficiency need of time and costs cause business people have to apply the information system in working environment.

Knowledge management is the entire process of creating, organizing, locating, distributing and sharing knowledge to achieve the project's goals. In table 1, there is category of KM technology including its components [5].

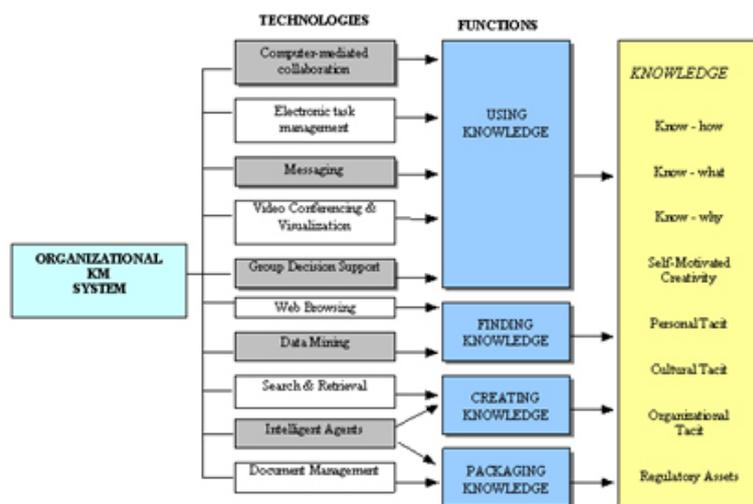


Fig. 1: The Technical Perspective of a Knowledge Management System [3]

Technology that develops rapidly becomes unavoidable phenomenon in this life, along with the improvement of knowledge. Each innovation is created to give positive benefit for human life, give much easiness and share new ways in doing human activities. Using information technology for competitive excellence [6] on computer field refers to information usage to get leverage in market, superior conceptualresources-data and information.

According to Ref. [1], technology that supports the implementation of knowledge management consists of 4 large areas, which are: (1) Business Process Management: Process that is needed to support the implementation of business in organization. All business units in organization

are related one to another using system, so the employee can access accurate information that is useful for building his/her knowledge. Technical component: organizational processes, organizational records, contributor knowledge, related knowledge system, policies, access, procedures. (2) Content Management: This relates with indexing, organizing and storing resource. In this case, resource relates with organization intellectual content. Technical component: metadata, indexes, quality control. (3) Web Content Management: This focuses on how to build an effective website framework that gives easy access to user. Technical component: Server management, file sharing, portal development, browser management, user identification, security,

system upgrades. (4) Knowledge Application Management: To make sure that user is provided with application package and specialist tools to make and use knowledge.

According to Ref. [7] in their writing, they make prediction based on surveys about list of

tools and technology that will be used to manage knowledge on the next 5 years since 2002, when the writings were published. Each is given certain value with scale 1-5 based on the usage level, 5=Very useful, 4=Useful, 3=Of some use, 2=Of little use and 1 =Of no use.

Table 1:Category and Type of Knowledge Management

No	Technology	Component
1	Hardware Technology	Investment in information technology (e.g. network, intranet)
2	Software and Database	<ul style="list-style-type: none"> <li>• Knowledge based systems (KBS)</li> <li>• Collaborative hypermedia for documentation of discussions</li> <li>• Learned lesson databases</li> <li>• Data warehouses</li> <li>• Databases for classifications, codification and categorization in information</li> <li>• Storage of e-mail threads to create a repository of best practices</li> <li>• Corporate memory databases also known as knowledge archives</li> <li>• Corporate yellow pages</li> <li>• Employee home pages on an intranet</li> </ul>
3	Collaboration Tools	<ul style="list-style-type: none"> <li>• Electronic meeting systems</li> <li>• Video-conferencing</li> <li>• GroupWare</li> <li>• Electronic bulletin boards</li> </ul>
4	Intelligent Tools	<ul style="list-style-type: none"> <li>• Decision support tools using neural network</li> <li>• Virtual reality</li> <li>• Genetic algorithms</li> <li>• Intelligent agents</li> <li>• Internet search engines</li> <li>• Knowledge mapping</li> </ul>

Table 2: Future Usefulness of Technologies and Techniques for KM

Technologies and Techniques	Mean Values
Internet/Intranet/e-mail	4.6
IT-based database	4.4
Telephone	4.2
Face-to-face meetings	4.2
Coaching and mentoring	4.1
Interaction with supply chain	4.1
Formal on-the-job training	3.8
Formal education and training	3.8
Cross-functional teamwork	3.8
Informal networks	3.7
Brainstorming sessions	3.6
Documents and reports	3.6
Project Summaries	3.5
Knowledge-based Expert systems	3.3
Work manuals	3.2
Video-conferencing	3.2
Job rotation	3.1
Decision support systems	3.1
Bulletin boards	2.8
Help desks	2.8
Quality circles	2.7
Knowledge Maps	2.6
Communities of Practice	2.5
Groupware	2.5
Storytelling	2.0

From the survey, it is shown that internet, intranet and e-mail are the common used technology. When the view of the current condition is true, the needs of internet has become the main needs, starting from interests of the individual to the organization or company. Internet becomes very easy communication tool and can be done anywhere.

### Selection Technology

Selecting technology that will support the implementation of KM is an important job, how to determine technology that is suitable with the needs. Selecting the suitable technology is based on the company's needs. Currently there are many offered technologies that can support the implementation of KM, but all of that depend on the company's decision, how they analyze and design the knowledge management system. Selecting the right technology will give many advantages in cost, time and the company's goals. However, the opposite will happen if the selection of technology is wrong or improper usage.

According to Ref. [1], one of the ways to clarify the needs of KMS is accepting view from internal. The internal view means user directly involved to analyze the needs of knowledge and system. This analysis can be helped by using audit of the employee's knowledge, interview, questioner, or analysis of working assignment and role.

There are two ways to select the used technology: (1) Developing the technology using professional IT that works in the company in developing the KMS of the company. (2) Or choosing a vendor, it means using service from other parties or IT Consultant to develop KMS. Vendor will usually offer finished package system.

Here are knowledge architecture views, a framework to decide the technology role in supporting knowledge management process.

Table 3: Framework to Decide the Role of Technology in KM

	Passive (information)	Active (knowledge)
Person to person	Computer conferencing Expert networks	Meeting support Video-conferencing
Person to computer	Document Mgmt Info Retrieval Knowledge bases	Expert Systems Decision Support
Computer-Computer	Data Mining	Neural Networks Intelligent Agents

Ref. [8] from Trend Monitor International develop functional scheme as follow:

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- A. MIND: Assimilation and Interpretation
    - a. Mapping, b. Summarization, c. Significant pattern discovery, d. Decision support
  - B. COLLABORATION: Network and Communication
    - a. Conversing, b. Workflow, c. Information sharing, d. Resource sharing e. Groupware
  - C. CONTENT: Gathering and Retrieval
    - a. Preparation, b. Classifying, c. Searching, d. Filtering, e. Indexing
  - D. MEDIA: Storage and Form
    - a. Numeric databases, b. Textbases, c. Imagebases, d. Multimedia
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Fig. 2: develop functional scheme

Fig. 2 is the component or functional grouping that helps user or company in choosing the right technology. Company selects certain people that can analyze the suitable technology with the needs.

### Technology That Supports Knowledge Management

KMS is developed using three types of technology: communication, collaboration, storage and retrieval. So the technology that the built KMS, inside has ability in communicating, exchange information from one with others, that allows the collaboration and the existence of information system that able to process and do data storage.

### Communication Technologies

It gives easiness for user to access knowledge and to communicate with others especially with experts in certain fields. User has many technologies in communicating, such as email, internet, intranet and website that provide ability in communication. It has been not constraint for company that has branch in several places, regions or even countries. They can communicate each other easily in a very short time. They can send or accept content or knowledge from each other.

### Collaboration Technologies

Group can work together in the same time or in different time, in the same place or in different places. Technology enables the organization to make virtual space so someone can work online from anywhere and anytime like it is shown as follow:

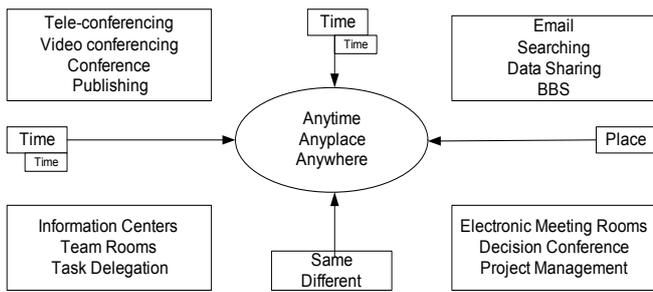


Fig. 3: The Collaboration Computing Technology[9]

Technology provides media for personal or group, which enables collaboration among each other in a certain forum, where they can communicate through intranet or internet, one of the examples is Lotus Notes.

### IBM Lotus Notes

Lotus Notes is a collaborative application that is developed and sold by IBM Software Group. Lotus Notes is a desktop client that integrates for business that has features as email, calendar and application in IBM Lotus Domino server. Lotus Notes is not a usual email application like Microsoft Outlook and Mozilla Thunderbird. Lotus Notes provides application that function to access, store and serve information through user interface, with strong security level and replicate. Lotus Notes has document management system that enables the document or file storage.

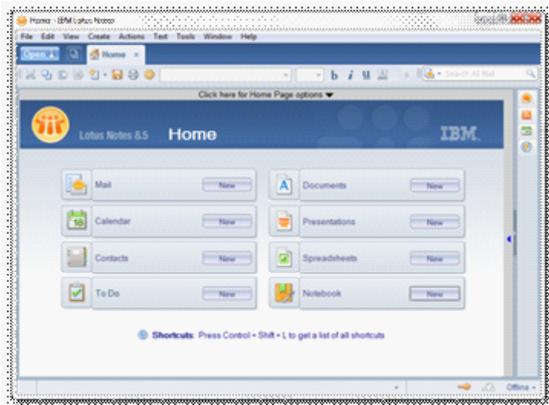


Fig. 4: Features in Lotus Notes [10]

### Storage and Retrieval Technologies

Database management system (DBMS) functions to store and manage knowledge. For example MSSQL, Oracle, MySQL, DB2, Firebird, Foxpro, Paradox 7, etc.

### Artificial Intelligence

Artificial intelligence (AI) method can help in identifying expertise and knowledge automatically,

interface through natural language processing and smart searching. AI method is used in knowledge management system to do various functions, help and improve knowledge search including scanning email, document and database and help building knowledge about individual and group profile. It is able to predict the future based on the previous knowledge.

### Intelligent Agents

Software system learns how user works and provides help for their daily job. For example, when user needs information by entering keyword, so passive agents can match the desired information and active agent searches the outside information that relates as reference for user.

### Document Management System

With help from information technology that is known as document management system (DMS), paper documents are converted in digital form then kept in disc or other digital storages. Next is search process, discovery, display, printing, and even distribution of documents can be done virtually through computer network. DMS is helpful in effective and efficient the business process. The main advantage is the user can find the needed information quickly, so it helps the process faster, well and cheap.

A sample case of PT Bank Mandiri (Persero) Tbk uses Microsoft ® SharePoint ® Portal Server ® 2007 as tools to distribute information and document management. SharePoint is a platform of document management system with web basis created by Microsoft Corporation. PT. Bank Mandiri Tbk is the largest bank in Indonesia that has 926 branches throughout Indonesia. One of the challenges is finding the effective way, efficient and on-time in distributing information to each manager, head of division, head of branch, manager of branch, and others in regions. At first most of the information were distributed using internal magazine named Mandiri Magazine that published once in two weeks. However, the magazine needs few days to reach the readers. Mandiri magazine functioned as market material and company news publication, information about new mechanism that had to be known by the company. By using SharePoint Portal Server 2007 had replaced the traditional way that used hard copy. Important information can be obtained by the Mandiri employee on-time with accessing portal in short time because document is stored in digital form.

### Knowledge Repository

Knowledge in information context is critical business assets. The faced frequent problem is how to obtain, store and make the information into useful knowledge. The company, which has not managed the knowledge well, the information is still unstructured information, stored in file, message,

memo, report and proposal that is made in different form and in many places, it will become problem for the company. Data or information usually kept by each user or employee in each computer. One of the frequent happened problems is when the employee out, the data or information does not well deliver to his/her replacement, so the new employee usually starts from zero. Then the data loss because the broken hard disc, no backup data because there is no concern to do backup, these lead problems and disadvantages for the company.

By KMS, the explicit knowledge is stored or documented into repository. Repository can also be said as database that stores and manages data specifically. The example of repository is database management system (DBMS) based relational model, such as MSSQL (Microsoft Corporation), MySQL (MySQL), DB2 (IBM), Oracle (Oracle Corporation), Informix (Informix Corporation), Ingres (ASK Group Inc), Sybase (Sybase Inc), etc.

### Extensible Markup Language

Extensible markup language (XML) is structured data storage media. XML has standardization of data structure, so the data can be processed or read by various system types or applications without problem with the program type. XML is very suitable for the company, which has many and separated system types, with XML there is no difficulty for each application to access data. XML is similar with HTML syntax, each tag can be defined by the user, and each tag represents each field or column in relational database. XML is specially made for structuring and transporting information, for example the stored information in XML:

```
<student>
<lecturer_id>D4767</lecturer_id>
<full_name>HarkatChristianZamasi</full_name>
<major>Information System</major>
<email>harkatchrist@gmail.com</email>
</student>
```

### Infrastructure

#### Intranet and Internet

Internet is a global system from all computer networks that are connected one another using standard Internet Protocol Suite (TCP/IP) to serve billion users all over the world. Internet eases user to access information anywhere and anytime. It has been undeniable that all needs about communication through internet become the main needs. Almost all fields from personal, education, business, organization and others use internet as communication tool. Internet gives easiness to access and cheap cost, which makes it as the main choice. Intranet is local network that connects among computers in one corporate environment. This network is only used by the company to do communication. When the

company implements Knowledge Management System, the internet becomes basic infrastructure for company to user. In this case is the employees store and search the already existed knowledge. Distance has become no problem in accessing information or knowledge.

### Knowledge Server

Knowledge server contains KM Software, including knowledge repository and providing access to knowledge, information and other data. The examples of knowledge server are Hummingbird Knowledge Server, the Intraspect Software Knowledge Server, the Hyperwave Information Server, the Sequoia Software XML Portal Server, and Autonomy's Intelligent Data Operating Layer (IDOL) Server.

### Hummingbird Knowledge Server

Fulcrum Knowledge Server is a knowledge product in Hummingbird server. Fulcrum Knowledge Server is tools that helps user to use all information. It has ability to leverage knowledge assets owned by the company to create business solution and give competitive advantages. Fulcrum Knowledge Server provides quick search information tools in thousand data folders without limits of the location, where the user accesses it.

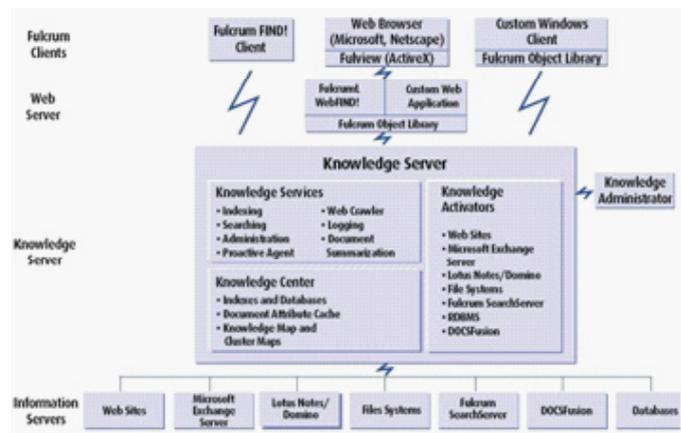


Fig. 5: Fulcrum Knowledge Server Architecture [11]

#### Components:

- Fulcrum Knowledge Server: Indexing, searching, logging, web crawling services.
- Fulcrum WebFIND! Client, Fulcrum FIND search applications for end-users.
- Knowledge Administrator: local/remote administration from any Windows NT platform.
- Fulcrum Solo: index and search the contents of local hard drives, and removable media, as well as personal Exchange folders (.pst and .ost).

- Fulcrum FulView ActiveX control for high fidelity document viewing including search term highlighting.
- Options:
  - o Knowledge Activators:
    - o File Systems (Windows NT, Novell, UNIX servers).
    - o Web sites, MS Exchange, Lotus Notes.
    - o Domino, RDBMS.
    - o Fulcrum SearchServer, DOCSFusion.
- Knowledge Builder Toolkit: for custom client and administration applications, with Fulcrum Object Library.

### The Security of Information Technology

Security becomes an important concern for companies in implementing KM. In applying KM, the security of data has to be special and serious attention because knowledge is intellectual asset owned by the company and to make sure the knowledge is being accessed by the right person.

When KMS is being accessed through internet, the biggest challenge is the data security. Several security requirements are: (1) Authentication: The stored Knowledge is added categorization or determination the level of access because no all knowledge can be accessed by all users. Each user has account, which is username and password that are needed by system to identify the user before accessing the knowledge. (2) Privacy: To make sure that knowledge is accessed by the right people. Knowledge that fell in the irresponsible hand would be fatal for the company because knowledge is the secret of the company. When it is known by the competitors, it will be a big problem. (3) Integrity: When user gets knowledge, make sure that information is true. Currently there are many security issues, various technic of hacker or cracker to infiltrate through network to steal or disrupt transmitted data packets. Some technics to protect the security data that has currently been used are encryption method, secure socket layer, firewall, malware controls, virtual private network.

### Encryption

The process of making a message that cannot be read except by them who have the key to decrypt the message. The key is random codes that cannot be predicted by others, which consists of combination of letters, symbols and numbers.

### Secure Sockets Layer (SSL)

Data security protocol is used to maintain the delivery of data between the web server and the internet user, which SSL has usually installed on the web browser. Website that uses SSL can be seen when it accesses in address bar it shown 'https'. Web server tells the user if the web uses digital certificate that has

been validated using SSL. The browser of the user will randomize the session key with the public key, the point is that the information is being accessed can only be accessed by the user and cannot be read by other users.

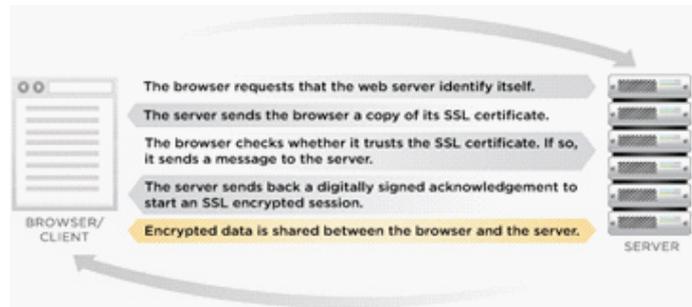


Fig. 6: Secure Sockets Layer (SSL): How It Works[12]

### Firewall

System has ability to control access between two networks. Usually it is used to set the access policy between the company's intranet network and other intranet networks or with internet. Firewall allows or blocks traffic that passes in the network.

### Virtual Private Network (VPN)

Virtual Private Network (VPN) is private network or not for public access to connect between remote-site safely. It needs certain applications, even though using common medium, the traffic among remote-site cannot be tapped easily. It is also impossible for other parties to smuggle traffic that not supposed to be in remote-site. VPN is an expansion of an organization network to connect remote user through public network through internet. VPN is a private network (commonly for agency or certain groups) in internet network (public), as if this private network is accessing local network but using public network.

### CONCLUSION

From various technologies above, it is explained that technology gives many options that are ready to use to support the implementation of knowledge management. Knowledge that is stored in repository using database, then user can access it easily. Knowledge management can be accessed anywhere and anytime by anyone in short time, by user that has been given authority. Currently communication through the internet has not been problem. Internet gives easiness for user, it is fast and the cost is relative not too expensive. The selection of the right technology becomes important factor to a succeeded technology that can support the usage implementation.

So the conclusion of this research is technology, which is one of three models in knowledge management. It is clearly a lot of technology options that can support in the implementation of knowledge management. With the options, it makes companies to have wide knowledge and able to decide the right technology that is suitable with the company's needs and surely gives return value that makes the company success. The successful implementation of KM will give great advantages for the company's progress.

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