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# Using E-Learning Technologies and E-Learning Programs to Support Knowledge Management in Multinational Companies

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## Abstract

The purpose of this paper is to determine whether and how e-learning technologies and e-learning programs should be used in order to support knowledge management in multinational companies. These questions are important for two reasons. Firstly, so far only a few papers discuss the relationship between knowledge management and e-learning. Secondly, e-learning initiatives in multinational companies are of limited success. The paper relates requirements of different types of knowledge with the characteristics of e-learning technologies and e-learning programs. Based on this, the paper shows how multinational companies should use e-learning technologies and e-learning programs. Different roles of corporate headquarters are discussed in this context.

**Key words:** e-learning, multinational companies, e-learning technologies, knowledge management

## 1 Introduction

Knowledge is widely distributed within multinational companies (Tsoukas, 1996). An opportunity for corporate headquarters to create a "parenting advantage" (Goold/Campbell/Alexander, 1994) is to support the knowledge flow between different product/regional business units (Markides/Williamson, 1996; Liebeskind, 1996). When knowledge is used several times, economies of knowledge can be realized. The ongoing globalization and consequently the intensified competition (e.g. Welge/Holtbrügge, 1998) among multinational companies further enforce the pressure to realize economies of knowledge and therefore the pressure to realize knowledge flows. For this reason, corporate headquarters strive for opportunities to achieve efficient knowledge transfer within the company across product units and regions. The literature offers various concepts that discuss this problem (Krogh/Venzin, 1995; Probst/Raub/Romhardt, 1997; Schneider, 1996; Schumann/Schwaninger, 1999; Güldenbergh, 2001). So far, only little attention is paid to the question how e-learning technologies and e-learning programs can be used to support knowledge management. Mostly popular-scientific literature discusses this question (e.g. Bruns/Gajewski, 2000; Magnus, 2001; Seufert/Back/Häusler, 2001).

In general, it can be suspected that e-learning technologies and e-learning programs are able to support knowledge transfer. However, recent studies show that e-learning initiatives are of limited success (Mueller, 2001). On the one hand, the reason could be that firms have not used the potential that is offered by e-learning technologies and e-learning programs. On the other hand, the reason could also be that e-learning technologies and e-learning programs are not able to support knowledge management. This raises the question *whether and how* e-learning technologies and e-learning programs should be used in multinational companies in order to support knowledge transfer and knowledge management (Nonaka, 1991; Nonaka/Takeuchi, 1995; Davenport/Prusak, 1998; Lehner, 2000). The paper tries to come up with an answer for this question. For the case that e-learning technologies and e-learning programs are able to support knowledge management, I assume that the successful and efficient use of e-learning technologies and e-learning programs is dependent upon contextual factors (see for this approach Kieser, 1999) rather than on technology and content.

Based on this preliminary assumption, the paper takes two steps. The first step relates the requirements of different types of knowledge for knowledge management and the characteristics of different e-learning technologies and e-learning programs. Thus, I try to demonstrate the dependence of the manageable variable 'e-learning technologies' and 'e-learning programs' upon the contextual variable 'type of knowledge'. Based on this, the second step shows how multinational companies' headquarters can make use of e-learning technologies and e-learning programs to encourage and support knowledge transfer between

different product/regional units. Thus, the paper argues a second dependence, namely between the characteristics of knowledge transfer in multinational companies on the one hand and the role of corporate headquarters when using e-learning technologies and e-learning programs on the other hand.

## **2 Relationship between e-learning and knowledge management**

### **2.1 Types of knowledge and requirements of knowledge management**

Knowledge about facts, relationships, abilities, routines etc. (see for different definitions and summaries Scheuble, 1998; Wagner, 2000; Güldenbergh, 2001) is created, acquired and used in order to determine actions. WITTMANN uses the term information as objective-oriented knowledge (Wittmann, 1959). Knowledge can be differentiated by using the dimensions explicitness and context specificity (Wagner, 2000). The reason for using these dimensions is that they describe characteristics that determine - as we will see - the appropriateness of e-learning technologies and e-learning programs. The explicitness of knowledge influences the type of knowledge flow that this paper discusses with regard to electronic media. The context specificity describes how the use of knowledge is restricted to a certain context. This is of importance for this paper because multinational companies typically combine activities in different contexts under a shared umbrella.

Along the dimension of explicitness, knowledge can be differentiated into explicit and tacit knowledge (Grant, 1996; Polanyi, 1962; Polanyi, 1967). In reality, knowledge typically contains aspects of both. Therefore, this dichotomy is used only as a simplification and should be understood as a continuum. Explicit knowledge contains knowledge about facts and relationships ("knowing what"), whereas implicit knowledge contains knowledge about abilities and routines ("knowing how"). GRANT points out: "The critical distinction between the two lies in transferability and the mechanism for transfer across individuals, across space, and across time" (Grant, 1996). Explicit knowledge can easily be communicated and is highly transferable. Examples for explicit knowledge are revenue data of an Internet book store in 2000 and Porter's Five Forces-Model (Porter, 1992). In contrast, tacit knowledge is stored in people and groups of people and is transferred by its use (Nelson/Winter, 1982). The transfer of tacit knowledge is slow and requires joint experience of individuals (socialization). Therefore, to make tacit knowledge explicit is very costly. Examples for tacit knowledge are knowledge about negotiation processes with suppliers and knowledge about project management skills.

With regard to context specificity, knowledge can be business specific or non-business specific. Business specific knowledge is, as HAYEK points out, "knowledge of the particular

circumstances of time and place" (Hayek, 1945) in a specific industry (for example the "rules of competition" in the Internet book market); specific, because those "rules" differ across industries. In contrast, non-business specific knowledge contains knowledge that is relevant widely independent of industries and specific circumstances, for example the functionality of a database program.

Knowledge management contains the planning and the implementation of all measures to create, save, transfer and use knowledge that is potentially valuable for individuals and groups within the organization (Grover/Davenport, 2001). The characteristics of the four distinguished types of knowledge entail certain requirements for knowledge management.

On the one hand, the types of knowledge influence the way which is used to save and to transfer knowledge. On the other hand, the types of knowledge determine the addressor of knowledge management measures. If knowledge is tacit, it can almost only be transferred by joint activities of the information sender and the information receiver. Therefore, the transfer of tacit knowledge that is „stored“ in the acting people themselves requires an open communication environment in terms of the content and the mode of communication. Predefined content and restricted modes of communication (formalized approach) would not be compatible with the characteristics of tacit knowledge. If knowledge is business specific, a certain match between the sender and the receiver of information is necessary. The reasons are that business specific knowledge can only be acquired from certain information senders and that business specific knowledge is valuable only for certain information receivers. The importance of the fit between information sender and receiver increases with the business specificity of knowledge. Consequently, the four types of knowledge entail the following requirements (see figure 1):

- In the case of explicit, business specific knowledge (e.g. the understanding of the industry structure of the Internet book market), the knowledge transfer can be formalized, but a careful match between information sender and information receiver based on the business specific background is necessary.
- To transfer explicit, non-business specific knowledge (e.g. the functionality of a database and a database system that is used in different divisions of a multinational company), a formalized approach is possible. However, no specific match between information sender and information receiver is necessary.
- In the case of tacit, business specific knowledge (e.g. knowledge about negotiation processes with suppliers in order to integrate suppliers on an e-business-based value chain), the knowledge transfer requires joint activities of information sender and

information receiver as well as a certain match between them. A formalized approach does not fit in such a situation.

- This is also the case when knowledge is tacit and non-business specific (e.g. project management skills for the formulation and implementation of e-business strategies). In this case, however, no specific match between information sender and receiver is necessary.

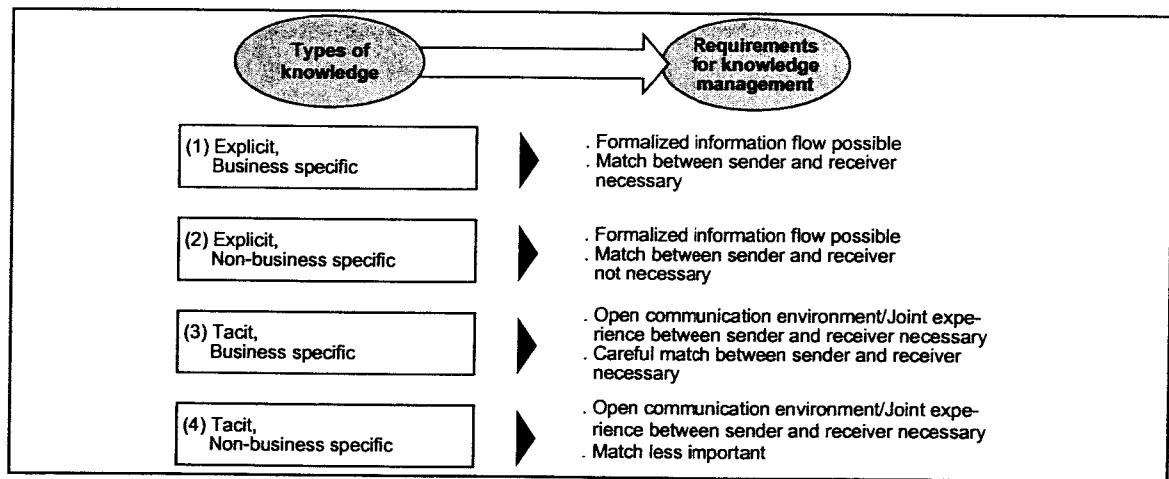


Figure 1: Types of knowledge and requirements for knowledge management

## 2.2 Characteristics of e-learning technologies and e-learning programs

### 2.2.1 E-learning technologies

Learning takes place when an individual's knowledge base at a certain point in time ( $t_0$ ) is transformed into a richer knowledge base at a later point in time ( $t_1$ ) [see for a summary Gldenbergh, 2001]. Two general modes for learning can be distinguished. First, an individual can learn independently through *self-study*. Second, learning can also be directly or indirectly supported by another person. This is the case of *instruction*. In both cases, the individual's learning process is embedded in a social environment and in other individuals' learning processes (*collaboration*) [Simon, 1991; Dodgson, 1993; Miller, 1996]. E-learning takes place, if self study, instruction and collaboration use multimedia, networked technologies (e-learning technologies).

E-learning technologies vary along two dimensions (Hutzschenreuter, 2000): the **type of communication** which can either be one-way (unidirectional), where information is only sent out without interaction, or two/multiple-way (bi-/multidirectional), where two or more people interchange information during the learning process (Astleitner/Leutner, 1998). The second

differentiating factor is the **temporal dimension**: usage is either synchronous or asynchronous (see Figure 2). There are four resulting types of e-learning technologies.

- (1) Asynchronous one-way communication is enabled by a number of technologies. For example, *Real Audio* enables the recording and playing of audio files through the Internet. *Streaming Video* permits to play video recordings with sound, while they are downloaded from the Internet. *Screen Cams* allow the instructor to record the work of different software applications while she is working on it (e.g. Excel© Spreadsheets). In addition, it is possible to record spoken explanations. Participants can then access and work with those recorded presentations as often as they like. *Drawing Boards*, which are similar to the chalkboard in a traditional seminar room, allow instructors to develop and record a drawing on an electronic screen together with spoken comments. Participants can work with drawing boards as they do with screen cams. *Hypertext documents* provide the possibility to insert electronic links in linearly structured documents. These links point from predefined terms to other documents (e.g. related exercises or definitions of specific terms) and can also connect to documents that are located on the Internet and can therefore be updated quickly and easily.
- (2) Synchronous, one-way communication takes place primarily through *Live-Video lectures*. This makes it possible for an instructor to broadcast a lecture live through the Internet without providing any means for interaction between students and professors.
- (3) Asynchronous, bi-/multiple-way communication is also enabled by various technologies. *Electronic Bulletin Boards* present discussion platforms for specific topics such as answers to practice exams or homework assignments, which are made publicly available through the Internet. *E-mail messages* provide the possibility to distribute messages and documents to one person or many people (Greenlaw, 1999).
- (4) Synchronous, two-/multiple-way communication can be achieved in numerous ways. *Interactive video seminar* makes it possible to broadcast a live discussion between seminar participants and the instructor through the Internet. Using *web cams* it is possible to record the participants during the discussion. It should be pointed out that the use of this type of technology still requires considerable bandwidth and is therefore not suitable for learning environments with slow network connection. Consequently, the penetration of this technology is currently very low. *Internet Relay Chat (IRC)* facilitates the exchange of written messages between two or more people in real time. For example, IRC can be the basis for an online office hour. *ICQ (I-seeq-you)-Software* allows members of a group to find out instantly which other members are currently online. *Application Sharing*

*Software* provides the possibility to work on a software application (e.g. an Excel® Spreadsheet or a Word® document) simultaneously from different locations.

		Temporal Dimension	
		synchronous	asynchronous
Type of Communication	one-way	. Live-Video Lecture	. Real Audio/Video . Screen Cams . Drawing Boards . Hypertext
	two-/multiple way	. Live-Video-Seminar . Internet Relay Chat . ICQ-Software . Application Sharing Software . Shared Whiteboards	. Electronic Bulletin Board . E-Mail . Mailing Lists . Mailbox-Netze

Figure 2: Typology of Internet-based learning and communication technologies

### 2.2.2 E-learning programs

E-learning programs make different use of e-learning technologies. Regarding the intensity of the use of e-learning technologies, three types of programs can be distinguished: (1) full e-based programs that exclusively incorporate e-learning technologies to deliver information, (2) semi e-based programs that combine traditional ways to transfer knowledge with e-learning technologies (blended learning), and (3) offline programs, where e-learning technologies only support the preparation and the follow-up process of the knowledge transfer (Hutzschenreuter, 2000). Concerning offline programs, we identify a continuum that allows to relate e-learning programs (in a narrower sense full e-based and semi-e-based programs) and traditional learning formats. Thus, we can show under which circumstances *traditional formats rather than e-learning formats should be used*. Further characteristics of the three types of e-learning programs are:

- In the case of full e-based programs, participants physically meet neither each other nor the information sender.



- In contrast, it is possible to use offline programs to create an open communication environment. Bi-directional communication becomes possible by using formats such as workshops.
- Semi e-based programs are able to combine both approaches. They combine online and offline parts to deliver information and to support communication among participants as well as between the instructor and the participants. Information sender and participants know each other personally. The e-based component of semi e-based programs faces the same constraints as full e-based programs. Their offline component offers the same opportunities to communicate as offline programs do.

### **2.3 Matching types of knowledge and e-learning as part of knowledge management**

Depending on their characteristics, e-learning technologies and programs support the knowledge flow in different ways. To support the flow of tacit knowledge, an open communication environment must be created. Offline programs generally and semi e-based programs partly fulfill this requirement. Therefore, full e-based programs are inappropriate to support the flow of tacit knowledge. In order to support the increased flow of business specific knowledge, a certain match between sender and receiver of information is required. On that basis, I can delineate the relationship between the four types of knowledge and e-learning programs and technologies.

As offline programs make use of an open communication environment, they are able to support the flow of any type of knowledge. In terms of richness of knowledge flow and therefore in terms of the potential quality, they are better than the other two alternatives. Furthermore, offline programs are very costly and only a small number of participants can be reached. Using full e-based programs costs much less compared to offline programs, and in addition to that, a very high number of participants can be reached (Evans/Wurster, 1997) (except in the case of synchronous, multiple-way communication). Therefore, it is more efficient to use full e-based programs if a sufficient level of richness of information flow can be ensured. Offline programs should only be used if there is a need to use them because of the nature of the knowledge that should be transferred.

The flow of explicit, business specific knowledge will most efficiently be supported by using full e-based programs, which incorporate synchronous and asynchronous communication technologies. By using multiple-way asynchronous and synchronous technologies, the necessary match between sender and receiver can be made possible. In the case of explicit, non-business specific knowledge, full e-based programs should be used with asynchronous

one-way forms of communication. If the knowledge is tacit and business specific, only offline programs will mostly fit the needs. Tacit, non-business specific or business specific knowledge can only be transferred by using offline programs.

Beyond these separated cases, it is also possible that knowledge is a combination of tacit and explicit as well as business specific and non-business specific knowledge. In this very frequent case, it is useful to combine offline and online components. This means to use semi e-based programs that incorporate e-learning technologies on an asynchronous/synchronous, one-/two-way mode of communication. This combination offers the advantages of an open communication environment and allows to make use of the advantages of multimedia communication (see figure 3). As our argumentation shows, one should (if possible) strive to support the transfer of the different knowledge components with the most effective technology and program types.

E-learning Type of knowledge	Type of E-learning program	Type of E-learning technologies
(1) explicit, business specific	full e-based	asynchronous, synchronous multiple-way
(2) explicit, non-business specific	full e-based	asynchronous, one-way
(3) tacit, business specific/non-business specific	offline	asynchronous as follow-up
(4) combination of tacit/explicit, business specific/non-business specific	semi e-based	synchronous, asynchronous multiple-way/one-way

Figure 3: Matching types of knowledge and e-learning technologies and programs

As the argumentation shows, the type of knowledge determines the requirements for the relationship between information sender and information receiver as well as the requirements for the infrastructure of the knowledge transfer. Furthermore, it shows that e-learning technologies and e-learning programs create certain opportunities to support knowledge management. However, e-learning faces certain constraints that occasionally prevent organizations to employ e-learning solutions. Consequently, organizations must carefully plan the use of e-learning technologies and e-learning programs in order to avoid negative results similar to those mentioned in the introduction of this paper.

### 3 Implications for multinational diversified companies

#### 3.1 Characteristics of multinational diversified companies and the role of corporate headquarters

Multinational, diversified companies are active in various regional and different product markets (e.g. Galbraith/Kay, 1986; Ghoshal/Bartlett, 1988; Macharzina, 1992; Glaum, 1995; Macharzina, 1995). For this paper we additionally assume that their regional/product business units are profit centers. Multinational, diversified companies are more complex than single-product and regionally-focused companies. Physical barriers (e.g. distance, time) and lingual/cultural barriers (e.g. different languages, cultures, use of knowledge, etc.) are higher between business units from different regions (Bendt, 2000).

In the case of incorporating networked multimedia communication technologies, these barriers influence the transfer of knowledge in two ways (Kogut/Zander, 1993). On the one hand, the explicitness of knowledge is relatively low and, therefore, the need for open communication environments in order to transfer knowledge between regionally different business units is relatively high. Consequently, lingual/cultural barriers limit the potential usability of e-learning technologies and e-learning programs in addition to the factors discussed in the previous chapter. On the other hand, higher physical barriers increase the need for e-learning technologies and e-learning programs because of their significantly lower variable communication costs in comparison to traditional formats.

Knowledge management on the corporate level tries (1) to acquire knowledge from the company's business units as well as from outside and to provide business units with this knowledge (*vertical approach*) and (2) to encourage the direct knowledge transfer between business units (*horizontal approach*) (Hedlund, 1994; Markides/Williamson, 1996). The corporate headquarters fulfill these tasks. This raises the question how corporate headquarters of multinational companies should use e-learning technologies and e-learning programs to support knowledge management (see Gupta/Govindarajan, 1994; Ellis, 2000 for other questions in regard to knowledge management in multinational companies).

In general, corporate headquarters can play two different roles (Hedlund, 1994; Morner, 1997; Wagner, 2000). On the one hand, corporate headquarters can act as *intermediary agents* between demanding and supplying business units. On the other hand, corporate headquarters can *actively* transfer knowledge that they acquire. The type of knowledge determines what role corporate headquarters play and, therefore, how e-learning is used. From an economic perspective, corporate headquarters should use e-learning in such a way that the value created is higher than the additional costs incurred. Furthermore, the net benefit should be higher than for externally available solutions. Corporate headquarters should therefore focus on the

advantages that they can create because of their specific role within the organization (Goold/Campbell/Alexander, 1994). Implications for the four types of knowledge are:

- (1) In the case of the transfer of explicit, non-business specific knowledge corporate headquarters should directly provide knowledge based on full e-based programs that make use of asynchronous, one-way mode of communication. A transfer from certain business units is not necessary because the knowledge is not specific. In this case, corporate headquarters produce *e-learning modules* that are independently used by business units. These modules are usually parts of full e-based programs.
- (2) In the case of the transfer of explicit, business specific knowledge corporate headquarters should act as intermediary agents. Their role is to provide and maintain a formalized e-learning technology infrastructure that can be used to transfer knowledge from a knowledge possessor within or outside the company to a demanding business unit. This infrastructure usually materializes in the form of a *knowledge platform*. The knowledge platform contains e-learning modules that are created by some business units and provides these contents to other interested business units.
- (3) If knowledge is a combination of explicit and tacit as well as business specific and non-business specific knowledge corporate headquarters should actively provide knowledge. The reason is that the tacit, non-business specific knowledge components require a representation based on didactical issues. In this case corporate headquarters should acquire knowledge from within or outside the organization and act as knowledge suppliers that provide *semi e-based programs*. This system requires specialization so that corporate headquarters can realize or contract more efficiently than each business unit separately.
- (4) In the case of tacit knowledge, the use of e-learning is very limited (offline programs). Therefore, we do not consider this case.

The next paragraphs explain how corporate headquarters should deal with these types of e-learning (see figure 4). For each type, three questions are answered: (1) What is the general approach of this type of e-learning? (2) What is its value proposition as opposed to current solutions? (3) What role do the headquarters play for controlling and enabling the use of these types of e-learning?

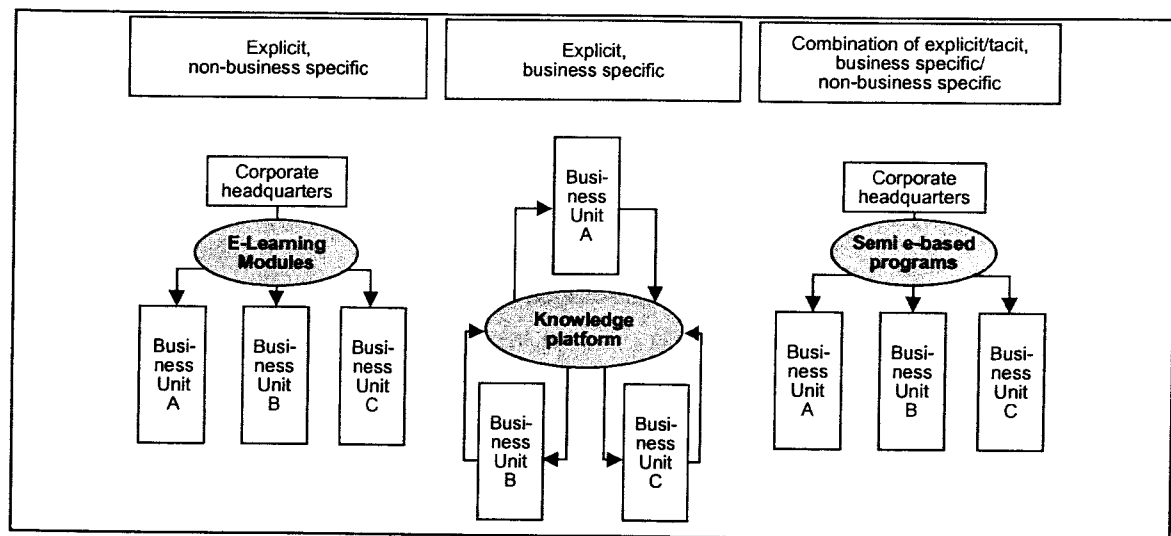


Figure 4: Roles of the corporate headquarters in regard to knowledge management based on e-learning

### 3.2 Offering e-learning modules for transferring explicit, non-business specific knowledge

E-learning modules are separated, stand-alone components that deliver knowledge on a specific topic such as financial management or marketing. They are used independently. For corporate headquarters, two objectives are important: to focus on the needs of their business units and to realize economies of scale by standardizing e-learning modules. Corporate headquarters can achieve both objectives by mass customization (e.g. Piller/Schoder, 1999; Piller, 2000; Reichmann/Piller, 2000; Runte, 2000; Strauß/Schoder, 2000) of e-learning modules: economies of scale by standardizing and focus on individual learning needs of business units by customizing e-learning modules. The languages and the employed technologies should be standardized, because these elements are the core of each e-learning module.

Customization is based on the dimensions along which learning processes differ. These dimensions are: previous knowledge, learning objectives, preferences for different media types and devices, preferences for different points in time for the learning process, the speed of learning, preferences for different levels of instructed interaction, the need for supplementary interaction and the need for collaboration (Hutzschenreuter, 2002). With respect to differing previous knowledge and learning objectives, corporate headquarters can offer different versions of a learning module that vary by focus and depth (e.g. financial management for beginners, advanced financial management). A customization regarding

preferences for different points in time for the learning process and the speed of learning is possible through the stand-alone character of learning modules. Preferences for different media types and devices can be served by varying the packaging of the content into different media. In addition, the intensity of interaction and collaboration can vary by offering switchable interactive sequences.

Due to the independent use of the e-learning model, the instructor easily loses control over the learning process. Therefore, an important problem of e-learning modules is how learners can be motivated and how a certain level of continuity of the learning process can be reached. To solve this problem that often leads to failure, corporate headquarters can try to track the learning process (e.g. by employing session-Ids) and to intervene in case of low learning success. Software products such as 'Learning Experience Server' by Click2Learn offer such solutions (see <http://www.click2learn.com>).

### **3.3 Operating a knowledge platform for transferring explicit, business specific knowledge**

A knowledge platform is a multimedia technology that hosts information (1) that is from distributed sources (information senders) and (2) that can be used by distributed information receivers. The corporate headquarters' objective concerning operating a knowledge platform is to make existing knowledge from the business units available for other business units. Organizations such as *Siemens* and *Deutsche Telekom* use databases about competitors or technologies as knowledge platforms. Knowledge platforms are a mix of e-learning programs and pure information sources, as their intended level of instruction is typically rather low. However, knowledge platforms are important as e-learning components, because they can realize instruction by employing push technologies such as e-mail or SMS. By creating a knowledge platform, corporate headquarters define systems of formats for packaging knowledge and systems of rules how knowledge is supplied and retrieved. Organizations such as AT&T, USWEST and Merrill Lynch maintain e-learning based knowledge platforms (Rosenberg, 2001).

The success of a knowledge platform depends on whether the platform adds value for the user. This depends on whether incentives for knowledge suppliers exist to supply knowledge. Therefore, corporate headquarters have to create incentives for business units to supply the knowledge valuable to other business units. In regard to this, corporate headquarters have two alternatives. On the one hand, corporate headquarters can employ an approach that encourages the supply of knowledge on demand (demand-induced information flow). On the other hand, the corporate headquarters predefine the content of the knowledge platform

without concrete demand (supply-oriented approach). In the former case, the knowledge platform would have categories in which access to experts is made possible. Corporate headquarters have to ensure that the right experts are identified and that the connection to the experts works efficiently. *McKinsey* has a very successful system that makes knowledge from different "industry practices" available on demand. In the latter case, the knowledge platform is the expert system itself. AT&T and Merrill Lynch employ such an approach.

In both cases, corporate headquarters have to create an efficient incentive system for supplying and retrieving knowledge and have to manage the quality of the knowledge. An efficient incentive system would price the knowledge and compensate the information sender based on the knowledge's value for the information receiver. The problem is that knowledge is hard to make contractable due to the fact that it is hard to specify. If knowledge is specified it would not be demanded, because the demanding unit would already possess it. Therefore, it is also hard to measure the value. Consequently, corporate headquarters need indicators that can be used for determining an incentive system. One alternative that is also employed by some organizations is a twofold price system. The demanding business unit pays a fixed subscriber fee and variable prices based on site or topic downloads. This approach does not directly price knowledge, but access ("access model"). The compensation of the information sender could be determined in analogy.

Corporate headquarters can manage the quality by so-called rating systems, in which users value the quality of contributions or contributing authors. *Ebay*, *Amazon* and *Ciao* use similar systems for other purposes. Positive ratings would make good quality transparent and could lead to higher compensation. In case of negative ratings, corporate headquarters should not employ sanctions due to the negative effects on the motivation of (potential) information senders.

In addition, corporate headquarters have to build reputation without which the knowledge platform will not be used. The reason is that knowledge is a good that requires trust in the supplier. The creation of reputation is determined by the design of the system as a whole as well as by the effectiveness of the quality management. Further research has to clarify how exactly such systems can be designed and how exactly corporate headquarters can build reputation.

### 3.4 Offering semi e-based programs for transferring combinations of explicit and tacit as well as business and non-business specific knowledge

Corporate headquarters directly offer semi e-based programs that contain online and offline components (see figure 5). In regard to online components, the same issues are valid as discussed for e-learning modules. The success of semi e-based programs is mainly determined by the possibility to encourage different (regional) business units to exchange information within an open communication environment by the ability to reduce barriers between the information sender and the information receiver (Kogut/Zander, 1993; Gupta/Govindarajan, 2000). Barriers exist in regard to the supply of knowledge and - which is very relevant in the case of tacit, non-business specific knowledge - in regard to the abilities of information receivers to capture knowledge (Szulanski, 1996). The corporate headquarters' objective in this context is to stimulate not only the supply, but also the acquisition of knowledge. *Siemens*, for example, uses semi e-based programs in the context of the transformation of the company.

Crucial for the success is that the users know and trust each other and share values and experiences. These are preconditions for an exchange via multi-directional communication technologies. The offline components help to create these preconditions. Therefore, the offline components' focus at the beginning is rather on creating social relationships and reducing language barriers than on transferring content. As the program proceeds, the offline components' objective moves to the transfer of tacit knowledge.

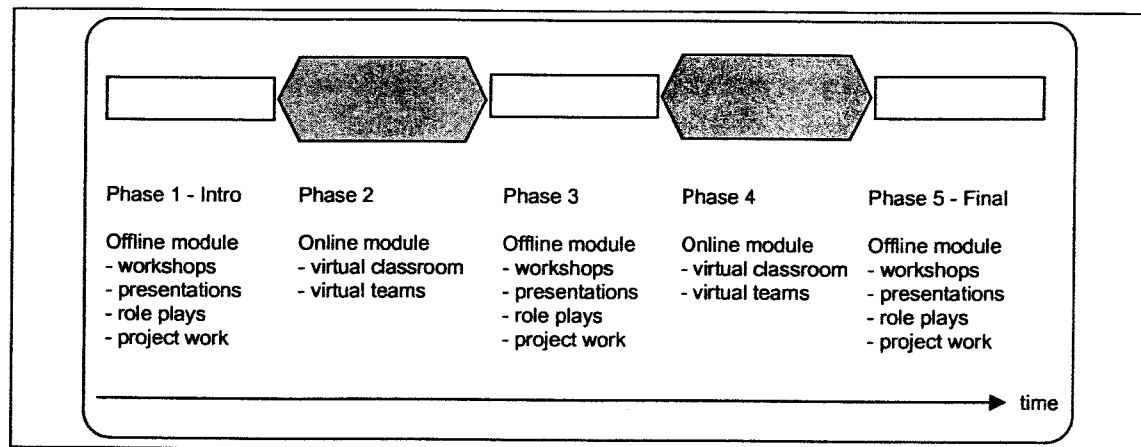


Figure 5: Example for a combination of online and offline components



#### 4 Summary

The paper deals with the question whether and how multinational diversified companies should use e-learning technologies and e-learning programs in order to support knowledge management. These questions are relevant because of two reasons. Firstly, the literature on international management does not discuss the use of e-learning for knowledge management. Secondly, the e-learning initiatives of multinational diversified companies are of limited success.

The primary reason for limited overall success of e-learning initiatives can probably be found in the fact that they try to transfer all kinds of knowledge. Tacit knowledge needs offline programs and therefore e-learning technologies are not applicable to convey this kind of knowledge. In contrast, full e-based programs are able to support the transfer of explicit knowledge. In case of a combination of explicit and tacit knowledge, semi e-based programs should be used. A second reason for failure of e-learning initiatives most likely lies in the ineffective use of e-learning technologies. Therefore, the paper shows in which cases e-learning technologies that are based on one- or two-way communication or on synchronous and asynchronous communication should be used.

Corporate headquarters can establish e-learning solutions and act as an active supplier of e-learning modules (in the case of non-business specific knowledge) or as an intermediary agent (in the case of business specific knowledge). In both cases, mainly e-learning technologies that are based on an asynchronous/one-and two-way mode of communication should be used. In the case of a combination of the different types of knowledge, e-learning technologies that are based on a synchronous mode of communication could also be used.

In summary, the paper shows that a differentiated use of e-learning technologies and e-learning programs is necessary in order to avoid failure of e-learning initiatives. Consequently, the crucial question for the companies is the design of e-learning rather than to question the use e-learning as a whole.

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