Comparison of Face-to-Face and Team-Oriented, Selective Web-Based Training in an European Bank.

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Internet- and Intranet-based training will gain considerable shares of the educational market. Major companies, especially banks, invest in interactive distance learning replacing face-to-face training. Research in this field has shown that the choice of media does not influence learning very much, learning gains are mostly due to a shift of instructional methods, and simple models, such as dual coding, have not been widely supported. In this study a WBT about currency management of a major German bank was examined. The communicational features of the WBT comprise a discussion forum, note taking, and automatic messaging of questions and answers between experts and students. The experimental design compared a face-to-face seminar (n=30) with WBT learning (n=70). The results show that WBT participants learned as much as the seminar participants, but in about 70% of the seminar's study time. Young seminar participants performed better than older ones, while WBT learning did not produce an age effect. Within the WBT the between factor team vs. individual learning and the within factors complete vs. selective learning and learning with vs. without audio-visual media were tested. The results of the study demonstrate that the learners in the bank tend to choose traditional learning strategies and did not profit from co-operative and selective learning strategies, although they tend to appreciate audio-visual media. Experts were not very much engaged in the discussion process. Communicational features, however, were used quite frequently. The users who were experienced in using a CBT and showed high self esteem gained most from WBT learning.

Introduction

Today, many distance learning projects are realised by means of conventional media, such as printed matter and telephone hotlines. There is an emerging consensus that banks must invest in and provide access to a complete range of training programmes for their employees from basic skills to high-end management and technical skills training. Electronic performance support systems (in the form of on-line media and self-directed learning environments) are among the most effective training solution in terms of cost, time and logistics (cf. McGraw, 1994). Therefore, some German banks have already reduced their face-to-face training courses by approximately 30% p.a. and all major banks are now introducing Web-based training (WBT) as a means for cost effective training (Hasebrook, 1999a). During the same period of time, German banks experienced a considerable increase of training costs: Major German banks and bank associations spent between 88% and 136% more money on training in 1996 than in 1989. A closer look at these data reveals a dramatic increase of training costs between 1989 and 1993. Since 1994, there has been a decline of training budgets at the same rate as in other German business sectors: About 75% of all employees participated in training courses, this percentage increased about 10% from 1994 to 1997. At the same time, the educational budgets were reduced by nearly 10% (Ausbilderhandbuch, 1998).
Banks are spending 6% of their personnel budgets for training but 15-30% of their administrative and operational budgets for information and communication technology (ICT). For instance, the largest of German banks, Deutsche Bank, spent US-Dollar 205 million on training and US-Dollar 1.3 billion on ICT. This translates into approximately US-Dollar 2,500 for training and US-Dollar 4,000 for ICT per employee (Moormann, 1999).
Major trends on the educational market are focussing on core competencies and outsourcing of training services, certification of (software) product related skills by the product developers, increase of the importance of international grades and certificates, and growth of the market capitalization of

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training companies. In 1997 Internet- and Intranet-based training accounts for only 2.4% of the total cash flow of the educational market. Johnston & Moretti (1998) estimate the annual increase of the these training technologies to be 140% and 62%, respectively. Internet- and Intranet-based training will represent 39% of the educational market.

Co-operative Learning with Electronic Media

Meta-analyses of computer-based training show that multimedia and online media are not overly effective. Kulik and Kulik (1991) examined 248 research studies about computer-supported learning. 150 studies failed to show any significant effects. The other studies showed only a slight advantage of multimedia over textbooks and lectures: Error rates of simple retention tests were 5% to 15% lower than before (Eta^2=.15), problem solving was hardly enhanced and study time was reduced from 100% to percentages ranging from 80% to 20%, with an average reduction of time to 70% (Eta^2=.35). Considering all studies included into the meta-analysis, multimedia produced only a small effect (Eta^2<.01; Hasebrook, 1995). Clark and Craig (1992) investigated several meta-analysis, including the analyses by Kulik and Kulik (1991; Kulik, Bangert-Downs & Williams, 1983; Kulik, Kulik & Cohen, 1980). They draw the following conclusions: (1) Multiple media are not the factors that influence learning. (2) The measured learning gains are most likely due to instructional methods. (3) The aspects of picture superiority and dual coding have not been supported (cf. Paivio, 1986).

Many other studies have confirmed that multimedia applications enhance learning, only if the individual skills and abilities match the demands of the learning task and the functionality of the multimedia system (e.g. Reynolds & Danserau, 1990; Barba & Armstrong, 1992; Mayer & Sims, 1994). Therefore, it is necessary to teach users strategies and concepts to use multimedia applications. Additionally, it is necessary to adapt the system to individual abilities and the overall learning environment (Larkin & Chabay, 1992; Hasebrook & Gremm, 1999).

Little is known about the effects of co-operative distance learning upon corporate culture, learning behaviour, and communication processes. Several studies compared computer conferencing via e-mail, video-conferencing, telephone conferences and personal communication (Sproull & Kiesler, 1991; Kiesler, 1992). These studies determined that video-conferencing is much more similar to telephoning than to personal communication. As Sproull and Kiesler (1991) discovered, simple e-mail conferences can provide several advantages: Personal communication takes less time but electronic mailing leads to agreements more frequently. Additionally, conferencing by e-mail allows for a more symmetrical participation than personal discussions. Weisband & Atwater (1999), however, reported that self ratings of contributions were more inflated and less accurate in electronic communication than in face-to-face communication. The biases mainly stem from liking or disliking peers in face-to-face groups but not in electronic.

Experts play an important role in online discussions. Ogata & Yano (1998) found out that the presence of an expert led to more direct participation in an online discussion, but also to a higher drop-out rate while peer-to-peer discussions suffered from poor active participation if the participants are not directly invited to join in the discussion by their peers. Bolling & Robinson (1999) compared three different learning groups: (1) individual learning with printed matter, (2) co-operative team learning with printed material and special instructions, and (3) team learning without special instructions using multimedia courseware. Taking into account the prior knowledge of the participants, the authors found co-operative learning to be the most effective training method. Individual and multimedia team learning did not differ significantly. The best performance was observed among participants of the co-operative learning group with high prior knowledge. These and similar findings are in line with recent research results indicating that group cohesion is enhanced when group members are actively managed and master high performance barriers (Tesluk & Mathieu, 1999), Leader-Member-Exchange (LMX) produces higher follower perfomance as compared to transformational leadership irrespective of physical distance (Howell & Hall-Meranda, 1999), and only content goals with a clear skill improvement focus have been found to support performance in training programs (Brett & VandeWalle, 1999).

The Learning Environment

A WBT about currency management was developed by Bank Academy in charge of a major German bank. The WBT is based on the Hyperwave information server and its learning platform GENTLE (Maurer, 1998). This software stores and maintains the user interface (e.g. buttons, frames), the structure (e.g. links, hierarchy of pages) and the actual content (e.g. HTML-pages, images) separately. Thus, all complete WBT pages are composed on demand and may contain individual information, such as notes and user defined links, without interfering with the contents of the WBT delivered to other users.

The study reported here was conducted with this WBT. The WBT consisted of five modules comprising approximately 100 pages each. About one third of the pages contained animations or interactive exercises, such as calculators and interactive telephone orders. Important content areas, such as definitions, examples, exercises, and team instructions, were marked by special icons. Half of participants were automatically pooled in learning teams with five persons each by the system and the other half studied individually. All participants were allowed to take notes and write contributions to the discussion forum. All notes and contribution were typed according to their contents, that is, the user decided whether she or he wants to type in a question, an answer, an agreement, a disagreement or a simple remark. All notes were linked to a particular phrase or page in the WBT. Additionally, different access rights could be attached to each note: Public, learning team (if available), and private. Private notes were marked with gray icons, public and team notes with green icons. All notes containing questions were sent as an email to an expert who decided whether he or she wanted to respond to that question. The notes which had been responded to by an expert were marked with an blue icon. All public notes were automatically copied to the discussion forum with a link in the note enabling the user to access the anchor of the note by clicking on that link.

The notes did not only support the learning process by motivating the users to discuss the subject matter of the WBT. They also provided an useful source of information for the adjustment and improvement of the system, because the user took lots of notes which describe technical or design problems. Furthermore, a background library of encyclopaedias and news services enabled the user to access a vast amount of background information and most recent information without leaving the WBT environment.

Method

Participants

Outlets of the bank all over Germany were asked to nominate trainees of their corporate finance departments for a two-day seminar about currency management. Seventy persons were assigned to the one-day WBT, thirty persons to traditional face-to-face seminars resulting in 64 complete data sets of the WBT users and 30 complete data sets of the seminar participants. Only ten of these 94 persons were female; the mean age was 35.2 years (SD 11.8).

Material and Procedure

The WBT learners used the WBT described above. The WBT was based on the printed material, such as papers and slides, used in the seminar. Additionally, the trainer of the seminar groups served as the subject matter expert of the WBT development.

In the beginning, all subjects filled in a survey about personal data, that is, gender, age, professional experience, prior knowledge, WBT experience and their personal expectations. Furthermore, they responded to 16 multiple-choice questions about currency management. During the course of learning with the WBT the users' inputs were automatically recorded by the system. All WBT participants learned about the WBT features conducting an introductory module which take them about 20 minutes to complete. Each module started with a brief overview and offered a multiple-choice self test. After having finished a module, the WBT offered an evaluation form with questions about the correctness, job-relatedness and user-friendliness of the WBT module, which could be filled-in voluntarily. After

the training, all seminar and WBT participants filled in a second survey about their experiences with the training course and responded to a multiple-choice test with 24 questions: 16 questions were taken from the pre-test, 8 questions were newly introduced. The survey was paper and pencil work, all multiple choice questions were presented at the computer and were rated by an expert team according to the difficulty. Test and survey were filled in anonymously and without being observed in order to avoid social desirability distortion (cf. Richman et al., 1999). It took the participants about 40 minutes to fill-in the survey and respond to the multiple-choice test. The WBT course took about 8.5 hours (SD=1.1) and the seminar about 12 hours of net study time to be finished. All WBT learners took part in a moderated team discussions about their experiences using the WBT. The results of these discussions were recorded by the moderator.

Experimental Design

The first experimental factor was the comparison of the between factor 'seminar vs. WBT learning' with respect to acceptance and performance criteria. Another set of experimental factors were realized by a mixed design within the WBT group. As mentioned above, one half of the WBT group was automatically assigned to a learning team resulting in the between-factor 'team vs. individual learning'. In every second WBT module, the learners were instructed to read the overview and to take the self test prior to the access of the module and then to decide - based on the test results - whether they want to go through all pages or only parts of the module. This instruction resulted in the within-factor 'complete vs. selective learning'. Each module contained several audio and video files and a simple text version of the same content. The system automatically assigned the WBT users to different groups which had access to the audio-visual media in every second module. This resulted in the within-factor 'text vs. av media'. All factors were counterbalanced by a latin square procedure among the subjects. In summary, the experimental setup of the WBT system resulted in a mixed design with the between-factor 'team vs. individual learning' and the within factors 'complete vs. selective learning', and 'text vs. av media'. Additionally, qualitative data were collected by interviews with the participating experts and by team discussions after the training program.

Results

All survey ratings are ranging from 1 ('very good' or 'I totally agree') to 5 ('very poor' or 'I totally disagree'). As the scores of the multiple choice items are differing according to their difficulty, all test scores are expressed as percentage of the maximum score (ranging from 0% to 100%). Due to the variable cell frequencies of the design and some missing data, the General Linear Model (GLM) procedure of the SPSS statistical software package was used to analyze the data. A GLM is comparable to a normal mixed MANOVA.

Comparison of WBT and Seminar

The study time of the WBT and the seminar differed significantly (8.5 vs. 12.0 h; $F[1,92]=319,9$; $p<.001$). The statistical analyses showed main effects of the learning group in the pre-test ($F[1,80]=9,3$; $p<0.01$) and the post-test for the 16 old items ($F[1,80]=5,1$; $p<.05$), but not for the 8 new items ($F[1,80]=1.7$; n.s.): The WBT group started with higher test scores and showed better performance for the items from the pre-test. But there was no significant difference concerning the new items. Taking into account the pre-test scores as a co-variate the main effect of the learning group is reduced to a weak tendency for the post-test results ($F[1,80]=1.7$; $p<.2$) and the co-variate is highly significant ($F[2,90]=29.1$; $p<.001$).

The test results showed no significant differences for female and male participants due to the small number of women, although they did slightly better than men (75.0 vs. 73.3% in the final test). The age of the participants were grouped into four categories: 20 to 35, 36 to 45, 46 to 55, and 56 to 65 years. There is a tendency that young participants performed better in the final test than older ones ($F[194,3]=2,4$; $p<0.1$), but there was no significant difference in the pre-test results. Most importantly, there was an interaction of learning group and age group: Young seminar participants learned more

than older ones, but there was no such difference within the WBT group (F[194,3]=3,2; p<.05). Table 1 summarizes the results of the pre- and post-test as a function of gender and age.

Table 1. Test results in % of the pre-test (16 items) and the post-test (16+8 items) as a function of learning group (seminar vs. WBT), gender and age.

			Gender		Age in years			
		Total n=94	Female n=10	Male n=84	20-35 n=39	36-45 n=29	46-55 n=17	56-65 n=9
WBT n=64	Pre-test	56.7	59.2	55.9	59.8	54.2	51.7	61.1
	Post-test	76.5	75.0	73.3	80.1	68.2	65.3	75.0
Seminar n=30	Pre-test	43.2	*	43.2	52.2	45.1	32.9	11.1
	Post-test	72.9	*	72.9	70.1	70.4	66.1	37.5

* no female participants in the seminar

All learners judged their prior knowledge to be on a medium level (WBT 3.5; seminar 3.6). After the training, the judgement of WBT participants concerning their knowledge was improved, but the judgement of the seminar learners was significantly better (2,7 vs. 1.3; F[1,80])=39.0; p<.001), although their test results were lower than those of the WBT learners. There were no more significant differences in the individual judgements of the WBT and the seminar group. Table 2 summarizes the scores of the individual judgements.

Table 2. Individual judgements and acceptance ratings in the pre- and the post-test as a function of learning group (seminar vs. WBT); scores are ranging from 1 (very good) to 5 (very bad).

		Individual Judgement or Acceptance Rating			
		Prior/Gained Knowledge*	Intranet/ training Experience**	CBT Experience	WBT/Seminar Comparison
WBT	Pre	3.5	3.3	4.7	***
	Post	2.7	3.2	***	2.9
Seminar	Pre	3.6	3.5	4.6	***
	Post	1.3	1.0	***	3.7

***:** **self estimation of prior knowledge and knowledge after the training, respectively**
****:** **judgement of Intranet experience (pre) and training experience (post)**
*****:** **data were collected in the pre- or post-test phase, only**

Factors of WBT Learning

Team vs. Individual Learning

There was no significant difference of the pre- and post-test scores between team and individual learning. There are only two tendencies: Individual learning leads to slightly better acceptance of the WBT than team learning (F[1,57]=1.7; p<.2), and to a better judgement of the knowledge acquired during the training (F[1,57]=2.8; p<.1). In general, two co-variates affect the post-test results, but not the pre-test results: A high judgement of prior knowledge and experiences using a CBT lead to better post-test results (F[1,59]=13.9; p<.001 and F[1,59]=6.2; p<.05, respectively). Experienced users of the corporate Intranet, however, did not show significant better test results.

Complete vs. Selective Learning

Once again, complete and selective learning strategies did not lead to significant differences in test results and acceptance ratings. Therefore, we checked the number of page and function calls as a function of the different learning conditions. In the average, 35 notes were red, seven taken and the forum was accessed 31 times per module. Each user took an average of five notes per module and additionally wrote two messages to the forum. Most of the notes were public. Selective team learners tend to use the note function more frequently than the other learners ($F[1,60]=2.1$; $p<.2$). Complete learners accessed 398 pages of the WBT and selective learners 411, group learning led to 395 pages accesses and individual learning to 412 page accesses. There were no significant differences in the number of function calls and page accesses in all groups. Table 3 summarizes the data for the factors team vs. individual and complete vs. selective learning.

Table 3. Test results in %, acceptance ratings (1 to 5), and system calls per module as a function of learning strategies within the WBT (team vs. individual learning and complete vs. selective learning).

		Test results		System Calls			Acceptance Ratings		
		Pre-Test (16 Items)	Post-Test (24 Items)	Reading Notes	Writing Notes	Access Forum	Prior Knowledge	Knowledge after Training	Recommend WBT*
Team Learning	Complete Learning	53.3	76.6	31	7	31	3.6	2.9	3.2
	Selective Learning	58.5	77.9	43	8	30	3.4	2.7	3.4
Individual Learning	Complete Learning	56.6	75.6	35	8	29	3.6	2.6	3.2
	Selective Learning	59.1	76.2	33	6	31	3.3	2.7	2.7

*: The participants were asked whether they would recommend WBT as a major source of training delivery

Effects of Audio-Visual Media

There is a tendency that learners with audio-visual media did better in the post-test with 24 items than learners without (77.3% vs. 74.7%; $F[1,63]=2.7$; $p<.1$). And there is a tendency for better acceptance of the modules with audio-visual media than those without ($F[1,41]=3.2$; $p<.1$). Table 4 summarizes the test results and acceptance data of the modules with and without audio-visual media.

Table 4. Test results in % and acceptance ratings (1 to 5) as a function of media use (text vs. audio-visual media) in the WBT.

	Test Results		Acceptance Ratings		
	Pre-Test (16 Items)	Post-Test (24 Items)	Correctness	Job-Relatedness	User-Friendliness
Text only	57.7	74.7	2.6	3.3	3.2
Audio-Visual Media	56.3	77.3	2.4	3.1	3.2

There are some interesting additional results concerning the module surveys: Module 3 and 4 contained many calculations as interactive exercises while module 2 and 5 did not. Thus, module 3 and 4 get worse acceptance ratings than module 2 and 5, especially concerning their user friendliness and their job-relatedness ($F[1,41]=5.2$; $p<.05$). Furthermore, only half of the module surveys contained a direct feedback summarizing all user inputs in simple bar charts. These surveys with direct feedback

collected 372 user inputs while the surveys without direct feedback collected only 312 inputs. Thus, it seems to be an easy way to improve compliance to provide direct feedback to the users of surveys.

Expert Participation

The experts received about ten emails per day during the learning phase. The questions ranged from serious questions to complaints, e.g. about the number of calculations which had to be performed by the learners. The experts wrote only 20 answers reviewing the questions they had got via email and via the forum of the WBT. The average length of such an answers was about two to four sentences (40 to 80 words). In professional virtual seminars the input of experts is much higher, e.g. in a virtual seminar at the University of Maryland with 15 session the experts wrote about 8,000 words and the participants about 2,750 words (cf. Bernath & Rubin 1998). However, all experts claimed to give strong support to co-operation and team learning based on electronic discussion forum or email messaging. But, there was no clear organizational procedure that enabled the experts to withdraw from their normal duties and work on the WBT, instead.

Team Interviews and Discussion

In the team sessions after the WBT training positive and negative aspects of the WBT were collected and discussed. All participants indicated on a board whether they considered the WBT to be a very neagtive, negative, neutral, positive or very positive means for training. As in the surveys, the individual judgements summed up to a neutral attitude towards the WBT. Positive aspects discussed by the participants were (1) self paced and self directed learning, (2) free choice and access of Information, (3) direct feedback for tests and inputs, (4) fast and efficient learning, and (5) opportunity for distant communication. Negative aspects were (1) too much and too difficult calculations, (2) too much content not directly targeted to the different departments of the company, (3) difficult handling of the calculation forms, (4) too much overviews and indices, (5) too restricted learning time, and (6) not much input from experts.

Discussion

One of the major conclusions of this study is that success does not come simply by using the latest online techniques: Learning culture of the participants and the experts involved in the WBT clearly did not support the success factors of online learning. Although the participants used navigational and communicational features quite frequently, they did not receive much input from the experts, and they did not pick up new learning strategies, such as team and selective learning. This line of reasoning is supported by strong impact of self esteem (judgement of prior knowledge) and of CBT experience on test results. The age effect indicates that WBT is offering a more equal opportunity for learning than seminars. Additionally, seminar participants considered their learning results to be better than WBT learners, although objectively it was not. A future study will examine a similar WBT environment. But their will be a variable learning time which is not restricted to a single day, clear instructions for the corporate departments how experts should be involved, and the introductory module will not only give a brief overview of the WBT features. The introduction will actively train communicative skills and the selection of information from comprehensive online learning environments (cf. Hasebrook, 1999b). The WBT at least reached the performance of face-to-face seminars within a shorter period of time. Thus, WBT is an effective means of training but additional features, such as expert involvement and new learning strategies, have to be trained and motivated carefully.

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