THE ROLE OF USABILITY TESTING IN AN INTEGRATED APPROACH TO CAT DEPLOYMENT

Experience from the WELKOM Project

Maurice Grinberg and Evgenia Hristova
Central and Eastern European Center for Cognitive Science, New Bulgarian University
21, Montevido street, Sofia, Bulgaria

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Abstract: The main features of an integrated Computer Assisted Training (CAT) system design and deployment methodology, developed in the WELKOM project, are summarized and discussed. The two main dimensions of the methodology – educational efficiency and usability – are presented with a focus on the latter. Selected results from usability and learning style testing during the application of the methodology in the development of three different CAT systems in three different educational contexts (a factory, a SAP training company and an university) are presented and the results are discussed with regard to their impact on the implementation process and to the applicability of the integrated methodology as a whole.

1 PROJECT GOALS

The WELKOM project, financed by the Leonardo program of EC, has as a main goal the development and application of an integrated methodology for deployment of Computer Assisted Training (CAT) systems. The methodology has been developed by integration of various methods used in the field of instructional design, knowledge assessment, and usability research. In the course of the project, the methodology is being applied in the deployment of three CAT systems: two CAT systems in business companies and one in a university. The CAT systems differ in various aspects such as educational content, the purpose of training, the technical solutions. The application of the methodology must lead to *optimized deployment time, better educational achievements* and *decreased training time*.

The main purpose of the Integrated Deployment Methodology (IDM) is to apply various methods in a coherent and complementary way in order to optimize a CAT system in the shortest time. An important research objective of the project is to test and evaluate the methods used and investigate their applicability, efficiency, and usefulness. Here, we report the first results of the application of IDM described in the preceding sections for three CAT systems. These three CAT systems differ in many respects and are a good test bed for IDM. They are developed, used, tested, and improved during the WELKOM project. The three systems differ in their educational goals, educational content, and software implementation. The three CAT systems will be further denoted to as CATS-1, CATS-2, and CATS-3.

CATS-1 was developed in TURBOMECA, which is a French company working in the engines industry and was aimed at training recent recruits occupying various jobs in various departments at the company. The scope of CATS-1 was to provide training in the use of the company intranet information systems. The trainees have diverse backgrounds and are employed for positions at very different levels. CATS-1 is built on the basis of an existing CAT systems already used in the company.

CATS-2 is being developed for a Bulgarian company providing SAP training for accountants and financial managers. The learners are from different companies and typically are highly qualified specialists. CATS-2 has been built up from scratch during the project by one of the partners – ISTAR training. In this case, all the element of IDM could be used and tested and most of the recommendation taken into account.

CATS-3 implements a course in assessment methods for university professors in the New

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Bulgarian University. An open source e-learning environment (Moodle, www.moodle.org) has been used. The open source allows modification of the system in every aspect – it could be modified to suit the particular needs of the users. Such modifications are done in accordance with IDM application results.

2 INTEGRATED CAT DEPLOYMENT METHDOLOGY

The methodology proposed is integrating methods for assuring both – *educational efficiency* and *usability*.

Educational efficiency is generally considered as the most important in training. However, when we consider CAT, the educational efficiency is closely tied to the delivery methods usually based on computer environments, multimedia, web-based platforms etc. The latter give much more options than constraints in training but are related to many usability issues. If the latter are unresolved, the system becomes difficult to use by the trainees. In such a way instead accelerating learning, CAT can be an obstacle to it especially for trainees with no or little experience with computers and internet.

In order to maximize the utility of each method the deployment process is divided in several phases: analysis, design, development, and implementation. Throughout all phases tests for assuring both educational efficiency and usability are performed. The process is iterated and the phases are repeated at least partially until the training goals are met, including the time and effort constraints.

3 USABILTY TESTING

In the framework of the WELKOM project the usability is tested and assured by applying several methods from different perspectives. On one hand, tests are performed from the experts' perspective – in such a way we take advantage from the accumulated knowledge in the domain. On the other hand, tests are performed which give also the users' perspective. In such a way the CAT system is meeting the special requirements, abilities, learning styles and expectations of the learners.

4 USABILITY TESTS DURING THE DESIGN PHASE

In this phase the technical basis of the CAT system is chosen and the initial design is being created. The platforms and their options are compared with the specific course requirements. The comparison is based on the educational content and the trainees' learning styles and preferences.

In order to explore the learners' attitudes and preferences, three questionnaires were used which are presented in the following sections.

The **first** questionnaire is aimed at exploring the trainees' **attitudes towards computers**. Individuals' attitude towards computers is a key component for the understanding of the acceptance of, learning success and satisfaction with CAT systems. The questionnaire used was developed by M. Paprzycki and D. Vidakovic (see Paprzycki et al., 1995). The rationale behind its use is that different target groups could have different attitudes ranging from fear and confusion to pleasure and amusement, or the computer might be perceived just as a tool for doing the job. On the basis of the prevailing attitudes, choices about the system design can be made. For instance, the choices may be between a 'formal' CAT system or one with funny elements or even using a game-like format.

The questionnaire for the attitude to computers was administered during the development of CATS-2. As expected, all of the trainees showed very positive attitudes as all of them were using computers at their work.

Recommendations concerning the CAT system design were focused on functionality and clarification of the actions that could be performed.

The **second** questionnaire used is David Kolb's **Learning Style Inventory (LSI).** This questionnaire provides a framework for identifying students' learning style preferences. The model postulates two modes of getting experience – Concrete Experience (CE) and Abstract Conceptualization (AC) – and two modes of transforming experience – Reflective Observation (RO) and Active Experimentation (AE) (Kolb, 1984; Kolb, 2005; Kolb & Kolb, 2005). On the basis of these two dimensions, four learning styles can be characterized – converging (common sense), dynamic, imaginative, and analytic. Determining trainees' learning styles helps in designing the course format and especially how the material should be presented – e.g. should the material be presented in theoretical lectures or by using case studies and exercises.

LSI was administered to the prospect trainees who were supposed to use CATS-1, CATS-2, and CATS-3. For CATS-2 the predominant modes of learning are abstract conceptualization and active experimentation (see Figure 1). Most of the trainees belong to the converging type. They prefer technical tasks, and are less concerned with people and interpersonal aspects. People with converging style, like to experiment with new ideas and to work with practical applications. These learners like following detailed sequential steps, hands-on activities, trial and error, and being given clear objectives with a logical sequence to activities. They learn through interaction and thus computer-based learning is more effective with them than other methods. Some of the trainees belong to the analytic type. They like abstract ideas and concepts, conceptual models, designing experiments, reading, theories, and structured activities. They enjoy a systematic approach, detailed directions, and computer assisted instructions.

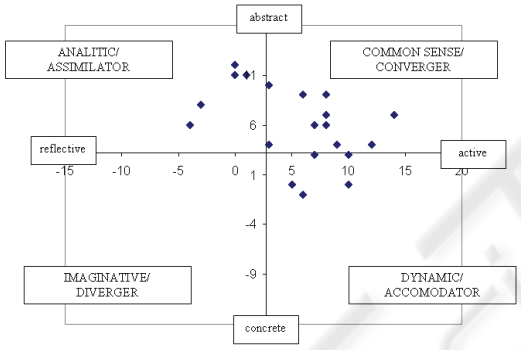

Figure 1: LSI results involving 21 learners using CATS-2.

On the basis of these results the following conclusions and recommendations concerning CATS-2 were made. The training should focus on thinking, not on feeling; clear, logical conceptual schemes without details and examples should be used; the trainees should have the opportunities to solve problems and find solutions; more practical asks should be included in the course.

The **third** questionnaire that was administered is the **VARK questionnaire** assessing learner's preferred mode of learning and learners' preferences for the way they work with information. The four modes considered are visual, auditory, reading, and kinaesthetic. As a result of the test we can determine the preferred mode of information processing of the trainees. Knowing trainees' learning styles contribute to improve learning through improving the information presentation mode. For example, if most of the people prefer auditory presentation of the information, such an option should be provided in the systems (Fleming & Mills, 1992; Fleming, 2001).

The VARK questionnaire was administered for CATS-1, CATS-2, and CATS-3. Results for CATS-2 are presented here. The results show that most of the learners' possess a multimodal style. The distribution is shown in Figure 2.

The main recommendations made were that there should be a lot of practical exercises. The material to be learned should be presented as a text. Auditory presentation of the material is also possible (however, this is not mandatory and if such mode is provided, an option for switching off the auditory presentation of the material should be easily accessible).

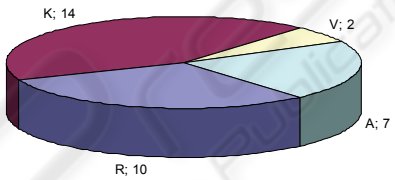

Figure 2: VARK test results for 21 learners using CATS-2. The total number is greater than 21 as some of the learners have more than one strongly manifested style.

5 USABILITY TESTING DURING THE DEVELOPMENT PHASE

In this phase the actual development of the CAT system takes place.

In the IDM three different methods that provide usability information for the *development phase* are proposed: heuristic evaluation, user testing, and eye-tracking recordings.

The **heuristic evaluation** of the system is performed by trained experts. It is based on well-defined and broadly accepted usability guidelines. The aim of evaluation is to ensure that the CAT system is built in a way that conforms to usability standards and that information is presented in a manner that maximizes its educational value As a result of the evaluation, detailed recommendations of the improvements of the system are provided (more detailed description of the heuristic evaluation method can be found in Nielsen, 1994).

The heuristic evaluation done during the WELKOM project is made on the basis of 86 rules divided in several categories. Heuristic evaluations have been used for all three CAT systems. CATS-2 again will be presented here as an illustration. In the beginning, two CAT prototypes were tested.

Separate heuristic evaluations were performed with both prototypes. Problems that were identified were summarized in reports and presented to the developers of the system. After consideration of the severity of the problems on one hand and of the technical possibilities on the other, one of the prototypes was chosen. After that an additional heuristic evaluation of the selected prototype was performed and again the new recommendations were implemented. This was done in several iterations.

The second method proposed is **user testing** (Rubin, 2001; Lewis & Rieman, 1994; Nielsen & Mack, 1994; Kunyavski, 2003; Dumas & Redish, 1999). In this type of study, representatives of the trainees are asked to perform specified tasks with the CAT system. Their actions and comments are recorded and analyzed. It is important to test the CAT system with real users, as neither the designers, nor the usability experts can foresee all the problems that the users could have in a task completion. The difficulties experienced by the users are analyzed and recommendations for the CAT system improvement are given

User testing has been performed so far for CATS-1 and CATS-3. For CATS-1, ten representative tasks were selected (e.g., 'Start the system and log on', 'Start/stop/pause the lesson', 'Take a test', and 'Look at the test results'). The user testing identified many additional problems in comparison with the heuristic evaluation some of which were crucial for the efficient work with the CAT systems.

6 CONCLUSIONS

IDM has been applied so far up to the *implementation phase* in which presently is only CATS-1. This phase is actually the most interesting and intense in terms of tests both for educational efficiency and usability. A very important new element during this phase will be the achievements assessment which will be the basis for evaluating the meeting of goal knowledge level.

Although no full iteration in IDM has been performed so far, it can be said that combining several methods during all the phases of CAT deployment gives a lot of useful complementary information that puts together the efforts of the training stake-holders, the IDM team, the software developers, and the educational content providers. Thus IDM seems to allows not only the building of an optimized CAT system but leads to economy of time and efforts by making the prevention and the solution of problems at the most appropriate moments of the CAT development. Although the use of so many tests might seem quite expensive the authors believe that after the optimization of IDM at the end of the project the final IDM methodology will prove to be very efficient in terms of ROI. This claim, however, is a research question which will be dealt with in the remaining decisive one year of the project.

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REFERENCES

Dumas, J. & Redish, J., (1999), *A Practical Guide to Usability Testing*. Portland, OR: Intellect.

Fleming, N.D. & Mills, C. (1992). *Not Another Inventory, Rather a Catalyst for Reflection*. To Improve the Academy, 11, 137-155.

Fleming N. D. (2001) *Teaching and Learning Styles: VARK Strategies* Honolulu Community College.

Kuniavsky, M. (2003). *Observing the user experience: A practitioner's guide to user research*. Morgan Kaufmann, San Francisco, CA.

Kolb, D. A. (1984). *Experiential Learning: experience as the source of learning and development*. New Jersey, Prentice Hall.

Kolb, D. A. (2005). *The Learning Style Inventory Version 3.1.* Boston, MA Hay Resources Direct.

Kolb, A. Y. & Kolb, D. A. (2005), *The Kolb Learning Style Inventory- Version 3.1. Technical Specifications*. Experience Based Learning Systems, Inc., Case Western Reserve University.

Nielsen, J. & Mack, R.L. (Eds) (1994*). Usability Inspection Methods*, . John Wiley & Sons, New York, NY.

Lewis, C. & Rieman, J. (1994). Testing the design with users. In: *Task-Centered User Interface Design.*Retrieved November, 13, 2006 from http://www.hcibib.org/tcuid/chap-5.html

Paprzycki, M., Vidakovic & Ubermanowicz, S. (1995). Comparing Attitudes Toward Computers of Polish and Americam Prospective Teachers. *Technology and Teacher Education Annual*, AACE, Charlottesville, VA, 45-48

Rubin, J. (2001) Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests. John Wiley & Sons.