

## INTERNATIONAL PERSPECTIVES ON THE PORTABILITY OF EDUCATIONAL SOFTWARE

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## ABSTRACT

This paper describes research carried out at the University of Twente, aimed at the development and testing of a so-called portability model. As we are convinced that the "degree" of the portability of educational resources is a main factor in destining their global scope of use, we would like to be able to "reason" about it in educational software development and research projects. A model, indicating the main factors involved in portability and the establishment of a metric seem important preconditions to be fulfilled in this respect. The paper describes our research approach. Co-operation with East China Normal University in Shanghai and the availability of an extensive "authoring environment" (the EDUC-system), to be redesigned for use in China, will enable us to test this model in real-life.

## INTRODUCTION

"Portability" relates to the feasibility of using an educational resource away from the setting in which it was developed with or without adaptation. Portability is considered to be a major constraint on the growth, spread, and use of educational instrumentation, particularly educational software and authoring environments.

The term "portability" is most often used to refer to the transferability of electronic media among different operating systems or hardware environments. While this aspect is clearly a factor in portability, both theoretical and practical experience suggests that portability should be viewed from a broader perspective of which hardware-related aspects are only a part. Social, cultural, and pedagogical issues also have a strong influence on the eventual portability of a software product. Constraints imposed by local implementation realities, by organizational, legal, financial, political, and distributional issues also significantly limit the potential portability of a software product. Psycho-social considerations are also important--as an example, concern about the implications of "implanting" foreign learning resources into the different educational environments of less-developed countries is well known.

Thus a model to describe and predict the portability of an educational software product should systematically consider all of these different categories of factors that influence portability. The interrelations of the factors must also be considered, as well as the extent to which factors can be manipulated by the software developer or adapter. Finally, the cost implications of these manipulations must also be considered. What follows is a brief description of such a model, in preliminary form, and of procedures underway for initial testing of the model.

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## OUTLINE OF RESEARCH APPROACH

The portability model under development at the University of Twente takes as a starting point a four-category organization of factors that affect the portability of an educational software product. These factors include:

## Social Factors:

- Language
- Cultural assumptions and references
- Psychological issues such as those related to ownership
- Political and institutional issues, such as those related to local control and profit

## Pedagogical Factors:

- Content and curriculum relevance
- Didactic strategy
- "Tone and style" of instructional exchanges
- Learning environments in which software will be used

## Technical Factors:

- Hardware and operating system compatibility
- Other technical aspects of the distribution and usage environment

## Other Factors:

- Copyright and legal issues
- Issues related to pricing and profit
- Previewing, maintenance, and support
- Distribution network

We consider the interrelationship of these factors at each stage of a seven-stage adaptation process. These stages are:

- Preliminary needs assessment
- Analysis of existing software product
- Redesign or adaptation specification
- Re-production or adaptation
- System testing
- Field evaluation
- Distribution

Within each stage we are developing a procedure to generate a "portability index" for a software product. This procedure involves addressing the following questions:

1. Which factors command the greatest attention during a particular stage?
2. To what extent can the developer manipulate each of the pertinent factors in the stage?
3. Which factors are capable of stopping the overall adaptation process during the stage? What are critical "lower levels" of these factors?
4. What decisions made during a certain stage will critically constrain portability and adaptation at later stages?
5. And, based on scores obtained through responses to these questions, what is the value of the "portability index" for the software product at this stage?

This process will allow us to generate portability index values not only for each stage of adaptation but also for the overall adaptation process. Procedures, both theoretical and empirical, are under development for the generation of the scores that will serve as input to the portability index and for the broad interpretation of these scores. For example, we hope to be able to use the index methodology to predict an overall portability index value for a product and to classify this overall value as "not recommended for adaptation," "only recommended if considerable attention given to certain critical factors," or "feasible for adaptation" relative to the particular characteristics of situation in which the software would be used.

We propose also to use the model and the portability index to help in the appraisal of the cost of an adaptation process. Iterative applications of the approach may allow a more manageable procedure for comparative cost and time analysis of different adaptation possibilities than is currently available to the decision maker who is considering various options for an adaptation project. Also, we are exploring a variety of software support environments to assist in the generation of the portability index for a software product, ranging from a simple spreadsheet to sophisticated decision analysis systems.

#### TESTING THE MODEL

We intend to partially develop and test the model based upon a co-operative research-project between the University of Twente and East China Normal University in Shanghai, China. This research aims at redesigning an already available "authoring environment" for Computer Based Learning, the EDUC-system, for use in China. As the EDUC-system is an extensive system, that supports all five phases of the life of a courseware product (specification, design, implementation, use and evaluation), we will be able to trace portability issues concerning all life stages of courseware. Furthermore, as the architecture of courseware products developed using EDUC is of a functional-modular nature (we separate instructional content from interaction modes between learner and content, which again we separate from teaching and learning strategies to be employed), we expect to be able to trace portability issues concerning various functional product parts. It is our intention to redesign EDUC for use in China, which implies strong differences in social and pedagogical factors as well. Technical factors will be encountered too, as EDUC is intended to be used in networked multi-media laboratories, while it now basically is a product for stand-alone use. Thus we think that this co-operative project will furnish us with the means to elaborate our model and test fair parts of it.