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Increasing the Usability of Medical Technology

Methodological Considerations for Evaluation

ERIK LILJEGREN

Akademisk avhandling som för avläggande av teknologie doktorsexamen vid Chalmers tekniska högskola försvaras vid offentlig disputation den 5 mars 2004, klockan 10.00 i sal Vasa B, Vera Sandbergs Allé 8, Göteborg.

Avhandlingen försvaras på svenska.
Fakultetsopponent är Tomas Berns PhD,
ERGOLAB AB i Stockholm.

Människa-tekniksystem
Produkt- och produktionsutveckling
CHALMERS TEKNISKA HÖGSKOLA
412 96 Göteborg
Telefon 031-772 1000

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ERIK LILJEGREN
Department of Product and Production Development
Division of Human Factors Engineering
Chalmers University of Technology

ABSTRACT

Usability is an increasingly important aspect of modern medical equipment. The first purpose of this thesis work is to investigate how hospitals can evaluate the usability of new equipment when it is purchased. The second purpose is to suggest methods that can be used to take human capacity and limitations into account in the design.

Hierarchical task analysis, cognitive walkthrough, usability tests, and user questionnaires have been used for usability evaluation for two purchasing situations. The methods are complementary, and provide an evaluation of all three aspects of ISO usability. It was possible to rank the systems tested, and in both purchases, the system ranked as having highest usability was purchased. Thus, the usability evaluation resulted in new equipment with increased usability compared with previous equipment.

There is today no standard or systematic way to evaluate usability when hospitals purchase new equipment. Hence, a new framework for future usability evaluations is proposed. This suggests suitable methods based on three resource levels. The first resource level includes hierarchical task analysis and cognitive walkthrough. A procedure is suggested to make the results from these methods thorough, valid and reliable. The second and third levels also include user questionnaires and usability tests. A new questionnaire design is proposed. Alternative usability test designs are suggested depending on number of devices to be evaluated. A new set-up for clinical usability trials is also proposed.

Two new methods, suitable for interface design, have been developed for use as part of a Human Factors Approach for design. Enhanced Cognitive Walkthrough, an extension to cognitive walkthrough, offers a more thorough analysis of existing systems. Hierarchical Task Analysis with Interaction is a useful aid when function structures are designed and no physical prototype exists.

Keywords: usability evaluation, medical equipment, hierarchical task analysis, cognitive walkthrough, usability tests, user questionnaires, evaluation framework