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2017

Document Version:

Publisher's PDF, also known as Version of record

[Link to publication](#)

Citation for published version (APA):

Widell Blomé, M., Holmberg, N., & Lundberg, R. (2017). *Improving the digital work environment: Designing new interfaces for product specifications using eye movement measurements*. 85. Abstract from Annual Conference of Nordic Ergonomics and Human Factors Society (NES2017), Lund, Sweden.

https://www.lth.se/fileadmin/nes2017/user_upload/NES2017_PROCEEDINGS_FINAL_Skyddad.pdf

Total number of authors:

3

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Improving the digital work environment: Designing new interfaces for product specifications using eye movement measurements

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Background and purpose: Electronic product specifications, as used by the manufacturing industries, provide a ubiquitous example of digital documents containing complex information that also require high levels of comprehension. Previous research on digital work environments suggests that the combination of complex informational content and inefficient interaction affordances exposes IT-workers to considerable levels of cognitive load, which may contribute to comprehension loss and mental fatigue. New interfaces for electronic product specifications using physiological measurements to evaluate readers' document interaction and comprehension is being developed within an on-going collaboration between the human and design sciences, and representatives of Swedish industry.

Design/methodology/approach: This project started out by conducting surveys about how users interacted with current specifications in PDF format, and how producers of specifications would like to use visualizations to facilitate interaction. Based on the interaction problems revealed, a new web-based specification format of was developed organized as a set of interlinked web pages. Ten participants were required to solve a number of interactive tasks using both versions (i.e. a within-subjects design). The users' visual interaction was recorded using eye-tracking equipment. The effects of the web-based format were evaluated by defining a number of interaction measures: eye movements, efficacy of navigation, and task performance.

Results: The results indicated that several attentional indicators of cognitive load were reduced by the intervention (fixation duration, pupil size and saccade count). Similarly, critical indicators of effective navigation were affected positively (task duration). Reading comprehension was similar across document formats. Furthermore, users considered the web-based specification as a more flexible mode of interaction.

Discussion and practical implications: The results of the present research show that several interaction outcome measures can be significantly improved by providing users with a web-based product specification format that allows for more flexible modes of interaction and navigation compared to traditional PDF format. Thus, eye movement measurements can provide data for evaluating the visual interface and guide new iterations in the design process. This research provides an evidence-based interdisciplinary approach of improving the cognitive ergonomics in digital work environments.

Keywords: Eye-tracking, interaction design, IT-work, product specifications, visual interaction.