

An Investigation into Eye Tracking and its Application in Usability Evaluation of Network Management Tools

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ABSTRACT

A variety of network management tools have been developed to represent and analyse the large amount of data generated by network applications. The general increase of information visualisation techniques has also highlighted the need for principles and methodologies for evaluating network management tools. Eye movement data can supplement the data obtained through user testing by providing more specific information about the user's cognitive processes. This paper motivates the adoption of a methodology that combines traditional usability methods and eye tracking methods for the usability evaluation of network management tools.

Keywords — Eye tracking, network management, usability.

I. INTRODUCTION

Data communication networks such as the Internet and large-scale, wide-area networks are rapidly increasing in size and capability. The ability for a network manager to assess the effectiveness of the network infrastructure, is greatly enhanced by visually representing the statistical information associated with network usage and directly associating that information with the network layout. This allows the network manager to plan long range infrastructure management as well as deal with short term and immediate crisis [3]. Several network management tools exist with the above characteristics to aid the network manager.

The availability and ability to generate data on which to make informed decisions has increased and the capability to communicate information has become unrestricted. However, the ability to access and analyse information in order to make informed decisions is on the decline [7]. Given this situation, there is a growing need for usable solutions to facilitate and support the visualisation of data and associated decision-making process.

II. BACKGROUND

A. Network Management

Network management can be described as the monitoring and controlling of a computer network in order to function efficiently and provide value to users. Network management incorporates the security, performance and reliability of a network. The primary goal is to ensure network availability and that the network is functioning properly [4]. Most

organisations use network management tools to monitor and control their networks. These tools are designed to provide automated support for network management functions.

B. Usability

Usability is the ease with which a user can learn to operate, prepare inputs for, and interpret outputs of a system or component. The main aim of usability evaluation is to identify problems that avoid or interfere with users' tasks, causing stress or reducing performance. Assessing the role of visual attention with conventional usability methods like click analysis, questionnaires or simply asking users what they paid attention to, is simply not enough when dealing with network management tools. As technology has advanced in recent years, eye tracking has become a promising tool in order to answer questions relating to where the user's visual attention is on the screen.

C. Eye tracking

Eye tracking has been used for many years in psychology, focusing on recording eye movements while reading. Using conventional usability methods such as formal usability testing in a usability laboratory may cause the behaviour of the user to be biased. Eye tracking could be a helpful method in usability testing for the proper assessment of the relevant psychological processes which cannot be measured by means of think-aloud protocols or questionnaires. Eye movement information can compliment the information obtained through user testing by providing more specific information about the user's cognitive processes [1].

III. FOCUS OF RESEARCH

Traditional usability methodologies exist as well as several eye tracking methodologies. The question arises if these methodologies can be combined for the evaluation of network management tools. Established guidelines exist for the effective design of graphical information, as well as theoretical proposals for how visual information is processed. Conventional techniques can be used to establish the relative usability of graphical information, but eye tracking can add new and interesting insights [5].

The goal of this project is to investigate the limitations of traditional usability testing when evaluating the graphical reports produced by network management tools and to show how eye tracking can assist with the usability evaluation of graphical output. This project will include a comparison of conventional usability methods as compared with methods using eye tracking to evaluate such network management

graphical reports.

Conventional self report measurements, like thinking aloud protocols or questionnaires, produce biased or even wrong data which are not analytical for behaviour [6]. Using conventional usability methods is simply not enough when evaluating network management tools.

Eye movements are thought to provide an indication of the amount of cognitive processing a display (interface) requires and hence how easy it is to process [8]. This leads to the potential use of eye tracking to contribute towards the assessment of the usability of network management tools. A methodology needs to be adapted which employs eye tracking together with suitable usability evaluation techniques for the evaluation of network management tools. The focus of this project will revolve around the methodology being used in a case study approach to design an experiment to show the possible added value of using eye tracking, together with conventional usability techniques, when evaluating network management tools.

A. Case Study

An example of a typical customer network management tool is Insite Manager, used by the University of Port Elizabeth. Insite is a real-time, online IT systems management service. Insite can identify and analyse IT systems; so they can be resolved before they impact business [2]. This tool allows employees to respond to network alerts as quickly as possible, and to sort the problem out before it can affect the network users. InSite monitors the following aspects of networks: performance; configuration; fault management; and reporting. Figure 1 illustrates a typical Insite network traffic report using bar and line graphs.



Figure 1: Insite network traffic report

The case study will aid in answering the following research questions:

- What conventional usability techniques should be used for the evaluation of network management tools?
- Will eye tracking give an added value to usability evaluation data when evaluating network management tools?
- In a case study approach, how should an experiment be designed, implemented and analysed to show the added value of using eye tracking when evaluating network management tools?

IV. CONCLUSIONS AND FUTURE WORK

Recently, there has been an increase in the use of network management tools by network managers to effectively manage large networks. The need to make informed and quick decisions has increased, yet the ability to assess and analyse information has declined. This is as a result of the use of sophisticated information visualisation techniques in such network management tools. Traditional usability evaluation methods have been employed to evaluate these graphical reports. With the increased use of information visualisation techniques, a need has arisen to combine other evaluation techniques with traditional usability evaluation methods. This study proposes that by adding eye tracking evaluation to traditional usability evaluation methods, value will be added to the evaluation of network management tools. Not only will such a combined method offer the opportunity to measure user actions, but to also record eye movements which are critically important when dealing with network management.

Work towards adapting a methodology which employs eye tracking together with suitable usability evaluation techniques for the evaluation of network management tools is presently conducted. This will be followed by evaluating the network management tool, Insite Manager. The University of Port Elizabeth is equipped with a fully functional usability laboratory with the recent addition of a SMI IView-X eye tracker. The case study on Insite Manager will be conducted in the usability laboratory with the usability evaluation results being recorded and analysed. Finally recommended changes will be made to the proposed usability evaluation methods.

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