The Cognitive Dimensions Questionnaire: Adapting for Non-Expert Users (Work-in-Progress)

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Abstract

The Cognitive Dimensions Framework provides an accessible route to understanding the properties of information structures which may facilitate or hinder their usage. In this paper we report on the adaptation of the Cognitive Dimensions Questionnaire to assist with the evaluation of *The POS Store*, a software system. Although a Cognitive Dimensions Questionnaire has previously been developed to facilitate use of the framework, and has been used in the evaluation of a number of systems, it was felt that the user group in question would be more likely to provide meaningful data on *The POS Store* if it were adapted to aim it towards the specific system under evaluation. We outline the motivation for the changes, together with a summary of changes made, and discuss the potential implications of adapting the questionnaire in this way.

1. Introduction

The Cognitive Dimensions Framework (Green 1989, Green & Petre 1996, Green & Blackwell 1998) provides an informative discussion tool which may be used to explore the usability of information artefacts. It is a 'broad brush' tool which is intended to highlight factors which make learning and doing difficult. Whilst the original aim was to provide a discussion tool which would highlight the usability trade-offs encountered in the design of programming environments, the framework has been used to inform the design of, and to evaluate a wide range of information artefacts. These have included theorem provers (Kadoda et al. (1999)), music notation (Blackwell et al. (2000)), temporal logic (Kutar et al. (2001)) and class libraries (Clarke and Becker (2003)).

Initially the Cognitive Dimensions framework was used by experts – either designers or HCI experts, who would have an understanding of the framework and the concepts which the dimensions represent. However, Kadoda (1999) moved a stage beyond this, developing a questionnaire which was completed by theorem prover users. This was an interesting useful development which expanded the scope of the framework, highlighting that it might be possible for end users to become more involved where the framework is used in evaluation. However, this particular work used a subset of the dimensions, which may have unintended consequences and cause trade-offs to be overlooked (Kutar 2000). Blackwell and Green (2000) released a questionnaire which addressed this problem, being a standardised questionnaire which included all of the dimensions, was independent of the activity being carried out and was intended to be accessible to users rather than experts. The intention was to provide a tool which would let the uses do the work, presented comprehensively so that users provide feedback under every dimension that appears relevant to them, thus avoiding the influence of 'experts' on the results.

2. The Cognitive Dimensions Questionnaire

There were two primary aims which drove the design of the questionnaire; clarity and generality. In the authors' own words, clarity meant "Our aim in the questionnaire has therefore been to describe

CDs in very simple terms, such that they can be understood by an intelligent user who has a thoughtful attitude toward his or her work and tools". Generality means that no assumptions were made about the type of system under consideration, or the activity in which the user is engaged. Further the questionnaire would "identify the nature of the user's work in a way that allows sensible evaluation of the responses by system evaluators". The questionnaire was extensively piloted with a wide variety of systems and with users whose experience ranged from computer science experts through to musicians with little or no computing experience. An evaluation of the questionnaire (translated into Finnish) was carried out by Tukiainen (2001) which indicated that the questionnaire was usable for University teachers and students, but they recommended that it would be enhanced were the example adapted to reflect the system under evaluation.

The questionnaire has been used widely in its original format. For example, Dagit et al. (2006) used it in their work examining how the 'who, when, and how circumstances' influence the effective use of the Cognitive Dimensions framework and Hartmann et al (2007) have used it in the evaluation of the design tool Exemplar. Interestingly, it has also been used by schoolchildren in the evaluation of Agentsheets, a software tool that enables non-programmers to create simulations with agents, interactive games, virtual worlds, training tools, information gathering and personalizing agents' behaviour (Bilotta et al. (2009)). However, it is recognised that the questionnaire in its current form may be too abstract for all users (Green et al (2006)) and we share the feeling that non-expert users, with little knowledge of computing terms, might struggle to use the questionnaire effectively.

The work described in this paper intends to address this particular problem. Motivated by a desire to use the Cognitive Dimensions Framework with a group of non-expert users, but cautious of making adaptations to the questionnaire that might have a negative impact upon its effectiveness, we have embarked upon a study which attempts to investigate the impact of adapting the questionnaire.

3. The POS Store

The POS Store is an online e-commerce system, developed to help retail brands distribute their in-store display materials (also known as POS – Point Of Sale) to retailers and stores. The software allows users to customise and personalise their items whilst applying brand constraints, resulting in strong coherence between brand designs and localised messages.

The system caters for two types of users:

1 Retailers and store managers – Infrequent users who may not be familiar with the system concepts or computers in general. The software must be easy to understand and follow existing e-commerce paradigms.

2 Sales reps and brand managers – Frequent and expert users who understand the POS and in-store placement, however they may not have a technical understanding of the process.

By using the system, brands can reduce the amount of wasted POS through appropriate ordering and placement. In addition, usage can be monitored through key metrics to indicate items and messages which are particularly effective and can be rolled out across their store networks.

4. Questionnaire Adaptations

The Cognitive Dimensions Questionnaire optimised for users has many characteristics which we wished to preserve. Our primary aim was to adapt the language to increase accessibility to our user group, and to incorporate examples which may be more relevant to our end users.

The changes may be summarised as follows (they will be presented in more detail at the workshop).

- *Introduction and Section 1 – Background Information* edited to reflect specific use of *The POS Store*

- *Section 2 – Definitions* edited and reduced
- *Section 3 – Parts of your system* renamed to 'How you use *The POS Store*'. Components relating to product, notation, helper devices, redefinition devices removed. Remainder reworded to reflect the use of *The POS Store* to create 'things' (i.e. promotional materials such as POS, mugs, caps) rather than 'descriptions'
- *Section 4 – Questions about the main notation* edited to become less abstract. This has involved the use of terms such as 'materials' rather than 'notation'. The question relating to abstraction has been removed; whilst abstractions are available and used within *The POS Store*, they can only be manipulated by administrators of the system, and the questionnaire will be completed only by end users who are producing POS materials.

For ease of completion the questionnaire will be administered via Surveymonkey.

5. Discussion

The aim of the work presented here is not simply to evaluate *The POS Store*, rather we use this as a vehicle to examine the effect of adapting the questionnaire. We would like to invite discussion on the best way to investigate this effect. Proposals under consideration are

1 To conduct the evaluation of The POS Store using the amended questionnaire and to examine this against a detailed evaluation of The POS Store by experts, which examines both the dimensions themselves and the trade-offs between each pair of dimensions. Clearly expert users and less experienced end users may identify different issues.

2 To conduct the evaluation of The POS Store using two versions of the questionnaire – the first the unamended questionnaire and the second the amended one. This may be constrained by the commercial environment.

6. Conclusions

We have discussed the background and some limitations of the Cognitive Dimensions Questionnaire and presented some preliminary work investigating the use of an adapted rather than a standardised questionnaire. It is clear that there is an inherent tension between the creation of a standardised version which has been designed to be applicable to all systems, but which necessarily uses abstract language, and a questionnaire developed for the particular system being evaluated but where that adaptation may be inadvertently influencing the results. Once results are available they will be presented back to the PPIG community at future workshops for further discussion. Should the adapted questionnaire be successful it is envisaged that guidance for adaptation of the questionnaire could be provided.

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