Heuristic Standards for Universal Design in the Face of Technological Diversity

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I. Introduction

Heuristic standards provide a valuable toolkit with which to evaluate the accessibility of modern information society technologies (IST). But can we apply the same heuristic, generic standards to all types of technological platforms, in the face of their growing diversity e.g. websites, social websites, blogs, virtual reality applications, ambient intelligence, etc. [1]? Conversely, would it be wiser to expect that different technologies might require different, if overlapping, standards? Can we really expect to design the interface of a modern cell phone on the same basis as for a table computer? Most impartial observers would probably say "no".

How can we introduce a systematic and thorough approach to the diverse technologies that are seen or predicted to be seen? Work in our laboratory has explored two useful questions. First, how do computer literate users perceive the different technologies? Second, how can different heuristic standards be developed where needed?

II. Study One

The first question was considered by Adams, Smith-Atakan and Granić [2], who developed two expectations about the cognitive models of computer literate users. The first expectation was that computer literate users would simply view all technological variants as members of the generic group "technologies" with no sub-groups at all. The second expectation was, perhaps more strongly, that technologies would fall into distinct categories as reflected in the research literature, such as "mobile", "traditional", "ambient", etc. A sample of sixteen PhD students in computing science were asked to inspect a list of different types of technology and to classify them into groups by similarity as they thought fit. They could use as many or as few categories and members per category as they wished. This sample group was chosen as they were likely to be up to date and aware of current technologies.

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The results based on measuring the degree of association between technologies ($p<0.05$) showed that neither of the above views could be supported. The different technologies are best portrayed as members of an associationistic network, in which the similarity between different technologies is represented by their distance in the network. All items were included in at least one association. Most items are included in only a few associations which combine to produce a network of associations, a result that is remarkably consistent with well established theories of human semantic memory. This result takes this research in a new direction.

Technologies used:

1. Software applications / PCs
2. Web sites
3. Wearable systems
4. Personal e.g. a personal diary
5. Group/team based technology e.g. collaborative, group project management system
6. Information management systems
7. Command and control systems
8. A mobile system e.g. a navigational system
9. An anthropomorphic system
10. Self-reflective systems
11. Dialog systems
12. Mobile phone based functions
13. Life critical systems
14. Entertainment systems
15. Creative systems e.g. creating art
16. Large scale displays
17. Information kiosks
18. Virtual reality systems

III. Study Two

This study replicated the findings of study one and sought to explore how heuristic accessibility standards could be applied to different technological variants, even when seen as part of a semantic network. The method used was to ask forty participants (IT undergraduates) to designate a small number of accessibility criteria to each technology variant. The results demonstrate that these, admittedly computer literate, users were very comfortable in assigning different criteria to different technologies. Current work is exploring the extent that different technologies share heuristic standards as a function of the perceived similarity of the technologies.

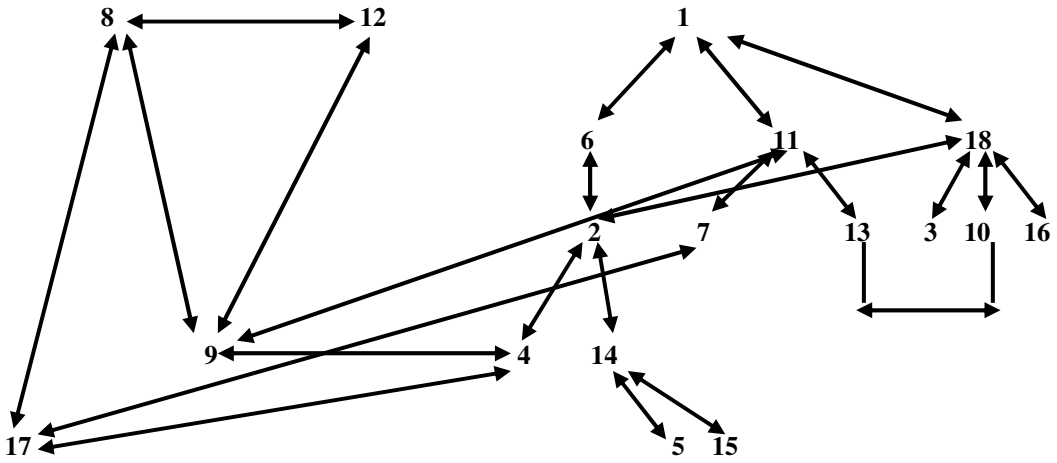

FIGURE ONE: Significant associations between items ($p < 0.05$)

IV. Conclusions

This work has set out to explore the question of different accessibility, heuristic standards for different technologies and how to develop such standards in the face of technological diversity. The conclusion is that technologies cannot be seen as only members of a single category (as we expected) and also do not fall into sub-groups (contrary to our expectations). Instead, technological variants are seen by our samples of computer literate users as forming semantic networks, the more dissimilar they are, the further away they are in the network. This result is remarkably consistent with well established theories of human semantic memory [3][4]. This is an important result for five reasons. First, it demonstrates how we can represent user knowledge of emerging technological platforms. Second, it reveals that this representation is more complex than might have been envisioned on purely simple practical grounds. Third, it makes a link between (a) practical concerns about the implications of how we envisage technologies and (b) substantial cognitive science theories of semantic memory. Fourth, it takes this research in a new direction. Fifth, we have been able to use this semantic network approach to technological variants to generate a new generation of heuristic accessibility standards. Further work is underway, using larger and more diverse samples of users and technologies [5][6].

References

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