

Design Doctorate in Computing: a defence of “doing cool stuff”

Edwin Blake
University of Cape Town
Department of Computer Science
edwin@cs.uct.ac.za

EXTENDED ABSTRACT

This position paper argues that it is time to extend the notion of worthwhile scholarship in Computer Science to embrace Design and to award doctorates of Design.

There has been a concerted effort to place Computer Science on a firm empirical footing as *Experimental Computer Science* (ECS) [1]. The essential method of ECS is to build artefacts and then evaluate them experimentally [2][3]. An examiner of a doctorate in such research tends to look for a unified proposition that is defended by argument. The dissertation is expected to contain a coherent theory or thesis that is defended by means of facts and reasoning. It will have a theoretical insight which is validated by artefacts which play the role of exemplars or testbed. The real contribution is the theoretical insight.

However it does seem artificial to require a proper experimental investigation of the effects of an artefact, when the artefact in itself is the thing of creative interest and passion. It seems that ECS does not pay enough attention to “Design”. In this I am echoing Fred Brooks: “the scientist *builds in order to study*; the engineer *studies in order to build*”[4].

Computer Science derives from at least three disciplines, each with a different epistemology and methods: mathematics, experimental science and design or engineering [5]. As Matti Tedre [6] succinctly puts it: “It is notoriously difficult to conduct research in the intersection of research traditions without making a mess of it”. The question here is how to do good design and get recognition for it. It is apparent that Computer Scientists are simply not accepting the calls of ECS. A repeat [7] (after twelve years) of the Tichy *et al.* [3] survey of ACM publications showed that in “Design and Modelling” papers still lacked empirical validation.

The Scholarship of Computer Science

The question that is raised is where does true scholarship in Computer Science lie? Ernest Boyer argues that academia has come to overvalue the Scholarship of Discovery (meaning Science) and undervalue other forms of scholarship including, amongst others, the Scholarship of Practice [8].

The form of scholarship being argued for here is that of Design. Design research contributions demonstrate the opening up of a

new field to designed solutions; embedded in an enquiry of the context of their use. Doctorates of Design are not yet awarded in Computer Science in South Africa. I think that it is time that we addressed this.

In a design doctorate the emphasis would rightly be on the artefact produced as the sole object of elucidation and investigation. Computer Science is a synthetic discipline and has always been concerned with design: this would be our “Professional Doctorate” based on qualitative research, case studies, contextual enquiry, and the like. The impact of doctoral work in design is to extend the boundaries of what can be solved, and the strategies which are used to look at problems.

Conclusion

In emphasizing design I am not trying to tell if Computer Science is a Science or is not. Instead I am arguing for recognizing what Computer Scientists *do*. We engage in a broad range of activities which include mathematical analysis and rigorous experimental investigation. We should also have a way of recognizing the effectiveness of a new masterfully designed tool. At present we seem unable to give recognition to a brilliant new design, in its own terms, in our doctorates, I think that has to be remedied.

1. REFERENCES

- [1] National Research Council (U.S.) 1994. *Academic Careers for Experimental Computer Scientists and Engineers*. Nat. Academy. www.nap.edu/openbook.php?record_id=2236
- [2] Tichy, W., Lukowicz, P., Prechelt, L., & Heinz, E.A. Experimental evaluation in Computer Science: a quantitative study, *J. Systems & Software* 28 (1) (1995) 9–18.
- [3] Tichy, W. 1998. “Should Computer Scientists Experiment More?”, *IEEE Computer*, 31(5), 32–40. doi.ieeecomputersociety.org/10.1109/2.675631
- [4] Brooks, F. P. 1996. The computer scientist as toolsmith II. *Commun. ACM* 39, 3 (Mar. 1996), 61–68. doi.acm.org/10.1145/227234.227243
- [5] Denning, P J., et al. 1989. Computing as a discipline. *C. ACM* 32, 1, 9–23. doi.acm.org/10.1145/63238.63239
- [6] Tedre, M. 2007. “Know Your Discipline: Teaching the Philosophy of Computer Science” *J. Inf. Tech. Ed.*, 6, 105–122. jite.org/documents/Vol6/JITEv6p105-122Tedre266.pdf
- [7] Wainer, J., Barsottini, C., Lacerda, D., de Marco, L. 2009. Empirical evaluation in Computer Science research published by ACM. *Inf & Soft Tech* 51 (2009) 1081–1085
- [8] Boyer, E. 1990. *Scholarship Reconsidered: Priorities of the Professoriate*. Princeton. eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED326149