Guilty or Not Guilty? Human Factors Structured Methods on Trial

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ABSTRACT

How well do structured human factors methods meet their requirements and so help solve the 'too-little-too-late' contribution of human factors to system design and development? This panel brings together industrial practitioners and academic researchers to put human factors structured methods on trial and to judge their fitness for purpose. Panelists share the same perspective, but their views differ within that perspective. When experts disagree, non-experts learn most.

INTRODUCTION

Everyone knows that human factors (HF) contributions to human-computer interaction (HCI) design are 'too-little-too-late'. 'Too little' because the contributions are expressed as advice, rather than specification. 'Too late' because they occur at the evaluation rather than at the design stage of system development. So, what to do about it? More rapid prototyping, more formalisation of HF inputs, more intensive use of consultants, etc? One approach, following software engineering, is to develop 'structured' HF methods to support contributions to design throughout the development cycle. Such methods claim to solve the 'too-little-too-late' problem because they contribute design specifications (in the form of structured notations), rather than advice; and the contribution is made early in the development cycle, prior to prototyping. To be valid, however, methods must show themselves to be 'structured'. They must demonstrate the coherence, completeness and appropriateness of their scope, processes and notations. The panel will propose and discuss whether and how current HF structured methods meet these requirements. The panel discussion will serve to familiarise the audience with the idea of structured methods; their current state; and how they might progress. These issues lie at the heart of present HCI practice.

Format: the panel will be organised as a 'trial'. The moderator as 'prosecutor' for HCI will expound the 'law' (i.e. requirements) for structured methods (as above). The prosecutor will accuse proponents of 'violating' the law and so guilty of not solving the 'too-little-too-late' problem. The accused panelists will attest to their innocence, by showing their method's compliance with the law (or the extenuating circumstances for non-compliance). Members of the audience will then be asked to witness to the truth of the allegations in the form of questions, comments, etc. The accused will then make a final plea on behalf of their method. The prosecutor - who is also the judge - will sum up and issue guilty or not guilty verdicts. Guilty panelists will be sentenced to differing durations of community service (in which they will be expected to complete the requirements for their method).

PANELISTS' STATEMENTS

Dr Simon Hakiel *is an HCI specialist at IBM UK Laboratories Ltd. He is routinely involved with software development from a usability perspective, and has worked with process engineers to integrate Human Factors deliverables into product development processes. In addition, in his previous position at Plessey Research (UK), he was involved in a number of research projects concerned with the development of HCI methods and techniques in software development, and with their delivery within software development processes.*

I argue for a structured Human Factors (HF) methodology, capable of integrating with a range of product development processes, to apply HF relevant knowledge, methods and techniques to the structured development of software products. Key elements of this position are:

(a) HF identifies and informs a wide variety of issues relating to the design of interactive software products. The effectiveness of HF depends on relating the set of HF deliverables that address these issues to the software development activities to which they contribute.

(b) HF provides a variety of methods for specification of: user requirements, allocations of goals and tasks, task semantics, and human-computer interfaces. Its effectiveness depends on selection of appropriate methods to support different development processes and their constraints.

(c) HF is not a development sub process which delivers a discrete product component. It must be considered as an integral perspective on product development that addresses all influences of user capabilities on product performance.

(d) HF recruits both empirical and analytic approaches to the identification of product solutions. The concept of iterative rapid prototyping is typically applied only to concrete user interfaces, but can be applied to each of the deliverables with which HF is involved.

Since 1987, **Bill Hefley** *has been at Carnegie Mellon University. Prior to joining the University, he contributed to the design of numerous spacecraft command and control*

systems, both ground- and space-based; and of financial and manufacturing systems for manufacturing firms in both heavy manufacturing industries and in the semiconductor industry. Mr. Hefley has been a technical leader of both software and human factors/mission operations analysis groups, and has experience in both commercial and DOD software development environments.

The term "process" has become one of the cornerstones of the evolving discipline of software engineering. Too often, the processes of user interface engineering are omitted from a comprehensive definition of the software engineering process. Rigorous methods and techniques for interface development constituting an engineering discipline must be integrated into the overall system development process. Our engineering processes must look at the user's performance in their work systems. They must allow us to understand and design user's tasks in order to optimize their job performance and provide them access to information in a readily usable formats needed to accomplish their jobs. We must also be concerned with the user's cognitive abilities, and design with an understanding of their cognitive processes in mind. Not only must our design processes address the functional processes within the workplace, but we must consider the characteristics of our users and their abilities.

In previous efforts we have developed from a concept of operations, produced in concert with the users, in stages of iterative refinement to complete definitions of the interactions between the users and the system (including information elements and their graphical design). These definitions drove the software detailed design and took the burden of screen design and designing appropriate interactions (from an operational standpoint) out of the hands of the coder. The customer knew what they'd be getting, the trainers knew what they had to train to, and the users knew what the interactions were going to look like.

Ms. Leela Damodaran *is a Director of the Human Sciences and Advanced Technology Research Institute, and a senior research fellow at the University of Technology of Loughborough. She has been involved in a variety of research, teaching and consultancy activities associated with human and organisational aspects of advanced technology. She is a specialist in the HF (Ergonomics) of information technology. Her interests include IT strategies, job design, planning of technological change and integration of user-centered design principles into structured system design methods (e.g. SSADM).*

Poor performance and high wastage are inherent in the prevailing technocentric approach to the design, development and implementation of advanced technological products and systems. Neglect of the end-user in all but superficial ways still characterises technological 'progress'.

Integrating HF principles into structured methods undoubtedly succeeds in getting user issues onto the agenda. It also ensures resources are allocated to the HF-related worksteps. However, experience suggests that these resources are likely to be squandered in inappropriate activity unless there is adequate support and guidance from HF professionals and informed commitment from all levels of managerial and technical personnel.

The validity of attempting to moderate the adverse consequences of mechanistic and technocentric design methods is the issue here. A 'human-factored' design method, under the control of an IT-focused project manager, who is driven by tight deadlines and stretched resources, is no more likely to deliver a user-centered system than would be the case with classical Tayloristic methods.

Nothing short of 'institutionalising' HF into every aspect of organisational life will actually have the desired significant impact on the quality of IT systems developed.

Kee Yong Lim *was a research scientist at University College London (UK) for a number of years and a contract consultant at the London HCI Centre (UK). He was the lead researcher in a seven person-year project concerned with the development of a structured HF method, and has since been involved with the method's application, extension and dissemination. He is now a lecturer at Nanyang Technological University, Singapore.*

I argue for an explicitly structured HF method that could be integrated with similarly structured Software Engineering (SE) methods. Existing problems of HF input may thus be avoided. In particular, problems associated with the:
(a) incomplete exposition and coverage of the scope and process of HF design. Since usability and functionality concerns are interlinked, the HF method should indicate how user requirements may be 'processed' into a user interface specification;
(b) insufficient allocation of resources for HF design, which may thwart effective input. To solve the problem, the method should specify explicitly the concerns of HF design. The resources required may then be accommodated by the design agenda defined at project planning.
(c) limited and late HF involvement in design evaluation only, e.g. the recruitment of HF consultants solely to trouble-shoot developed designs. To rectify the 'too-little-too-late' input, the method should define the 'when', 'what' and 'how' aspects of HF specification.
(d) poor timing and mapping of HF contributions to the system development context. To resolve the problem, the method should provide a well-defined and complete set of design stages. In particular, the scope, process and notation of each design stage should be specified by the method.

By addressing the above problems, the method could: facilitate the recruitment of other forms of HF inputs (e.g. design techniques and guidelines); ensure timely address of HF and SE design concerns by integrating their structured methods; and provide a basis for developing computer tools to support HF design and inter-disciplinary collaboration.