Information Reuse and Design Expertise

Thomas C. Ormerod (T.ORMEROD@LANCASTER.AC.UK)
Department of Psychology, Fylde College
Lancaster University, Lancaster LA1 4YW UK
Louise Maskill (L.MASKILL@DERBY.AC.UK)
Linden J. Ball (L.J.BALL@DERBY.AC.UK)
Division of Psychology, University of Derby
Mickleover, Derby DE3 5GX UK

The Notion of Design Reuse

At first sight, the idea of using previous design information in developing a solution to a current problem seems to be at odds with the designer's goal of creating a novel and innovative solution. This apparent conflict creates a dilemma for expert designers—on the one hand they want to be innovative, but on the other hand the design process is heavily constrained by cost and time, making reuse of previous information an attractive proposition. There is clear evidence that previous design concepts do get reused in industrial and commercial contexts (e.g., Gero, 1990; Maiden & Sutcliffe, 1992; Visser, 1996), but little is currently known about the nature and efficacy of design reuse in innovative and creative design tasks, or the strategies by which designers set about reusing information. It is possible that design reuse is suboptimal because of other cognitive strategies such as satisficing (cf. Simon, 1981).

Ethnography in the Design Environment

We have chosen to use ethnographic observation to study information reuse since its non-interventionist nature affords considerable advantages when studying complex and collaborative processes in real-world, innovative design environments (cf. Bucciarelli, 1988). We have made data-collection visits to three end-user companies which differ markedly in terms of their organizational goals and constraints whilst at the same time still requiring innovative solutions to design problems within short time scales.

Results

Our data (conversation and meeting transcripts as well as field notes) reveal long sequences of design activity which are based around the reuse of previous design information. Whilst design reuse is clearly a widespread practice among expert designers, the exact nature of the reuse depends on the stage of the design process as well as on organizational factors and corporate attitudes towards information storage and retrieval.

In this latter respect, one of the primary aspects of our ethnographic data analysis has been the production of a reuse coding scheme to classify instances of reuse behavior and represent their role in the overall design process. Our scheme includes an expansion of MacLean, Young, Bellotti and Moran's (1991) 'Questions, Options and Criteria' (QOC) framework for capturing design rationale within four orthogonal dimensions and four non-orthogonal data classes. The dimensions are: Focus (i.e., the QOC scheme plus a meta-design focus); Scope (e.g., company or project type); Process (e.g., evaluation or generation activity); and Stage (e.g., requirements specification or conceptual design).

Discussion

In application, this coding scheme has enabled the identification of a clear and consistent set of 'reuse classes'. The coding scheme is itself a major research outcome in that the coding categories form an approximate mapping to the reuse classes that we are currently establishing in a computer-based reuse indexing system. This system (DESPERADO) is based around object-oriented programming techniques and interface agents (e.g., Bird, 1993), and will support guided encoding (of reuse information), guided prompting (to seek out existing information where appropriate), a browsing facility, and session logging. Whilst most existing reuse systems are based around an 'artefact' model of reuse, a novel aspect of DESPERADO is its grounding within an 'episode' model. The system aims to encourage innovation whilst also supporting reuse, and will be evaluated in the workplace by our end-user companies.

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