Guest editorial

Integrating organizational and cognitive approaches towards computer-based systems

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There are two strong psychological research traditions concerned with improving our understanding of computer-based systems, one predominantly focused on organizational issues, the other on cognitive matters. The former incorporates a number of interconnected research topics, including socio-technical systems theory, labour process theory, the study of job demands and job design, and the more general literature examining the links between technology and organizational structures and processes. The latter has a more individualistic focus on research and development into the nature and quality of the interface and the interaction between human and computer. Unfortunately these two traditions have operated almost independently of one another. Indeed, Clegg (1994) has argued that the organizational and cognitive approaches in this area are differentiated in a number of ways, including: the issues they address; the levels of analysis; the research styles and methods in use; the underlying research paradigms; the application domains; and the outputs.

Nevertheless, there are some signs that the different communities can work more closely together. This special issue explores opportunities for integrating organizational and cognitive approaches to our understanding of the development and use of computer-based systems in organizations. The goals are to improve our understanding of practical situations and to develop our conceptual and methodological tools.

This special issue comprises seven papers. All the authors are applied psychologists concerned with developing a better understanding of the ways in which new computer-based systems are developed, implemented, used, evaluated and managed in organizations. They work in Germany, the Netherlands, the UK, and the USA. Their common focus is on the human and organizational aspects of new computer-based systems, though some also have a keen interest in more technical matters. Their concerns include human computer interaction, work organization and job design, organizational structures and processes, the management of change, the role of end users, and so on. All have a theoretical interest accompanied by a very applied and practical focus.

Gardner, Chmiel and Wall report a laboratory study of fault diagnosis on a simulated robotics production line. Their argument is that field studies within organizational psychology and organizational behaviour more generally, have widely demonstrated that job designs which give operators greater responsibility and control, for example over computer-based equipment, result in increased levels of performance. But such studies do not demonstrate why this is the case. Their experiment offers a cognitive understanding and appreciation of what may be happening in such situations, drawing on ideas concerned with implicit learning. In this instance, the impact of an organizational choice of working practices requires a cognitive analysis. Furthermore, a cognitive appreciation of how people learn in such complex systems holds implications for how organizations manage the practice of training.

Sonnentag also describes a laboratory study, in this case, of 35 software designers working individually on a standardized design task. Her emphasis is on trying to uncover some of the cognitive strategies and activities that designers undertake when approaching a design task. She argues that the strategies adopted by the designers proved to be influenced by their normal work situation, in particular the amount of control they have over their work. Sonnentag provides an argument that cognitive behaviours are influenced by organizational practices and arrangements.

Heinbokel, Sonnentag, Frese, Stolte and Brodbeck describe

a longitudinal field study of 29 commercial software development projects examining user participation in development teams and the orientations towards users held by the developers. They argue that the practice of user participitation and a positive orientation on the part of developers towards users can lead to problems with the processes and the outcomes of system development. One implications is that an understanding of the cognitions and behaviours of both users and developers is a prerequisite for a better understanding of the practice of user participation.

Clegg, Waterson and Axtell investigate three case studies of software development. They argue that system develop-ment teams are knowledge-intensive work organizations working flexibly in the face of high levels of uncertainty. They claim that work organizations help shape the roles of the actors, which thereby influence both their actions and their cognitions. In addition, the design of the work organization is influenced by the cognitions of the key actors. They make the scientific claim that it is not possible to understand the practice, outcomes and derivations of work organization without recourse to both organizational and cognitive explanations, which themselves are dynami-cally intertwined.

Van Offenbeek and Koopman also investigate system development practices developing a contingency model linking types of risk faced during development with the nature of their control. They test their model in ten episodes of software development derived from seven case studies. They argue that such a contingency approach helps integrate different levels of analysis such that organizational variables help illustrate the context within which software development takes place, whilst cognitive social constructs can promote our understanding of interaction practices at the operational level.

Carroll draws on his experience of design representation issues throughout the system development process. He demonstrates how a cognitive approach to scenario-based analysis and design can be extended to include an organizational perspective on social causes and effects. His general position is that the integration of cognitive and organizational approaches 'is more than just a timely idea; it is essential to an adequate analytical framework for understanding human–computer interaction' (p. 266). As someone with a predominantly cognitive orientation he reports the agoratrophic tendency of scenario-based analysis and design, a growth towards the social. His argument is that scenario-based methods provide one potential means of examining and integrating cognitive and organizational concerns.

Strube is also concerned with the development of a practical methodology for accommodating work in this area and he recounts experiences of a number of European collaborative projects, all concerned with the development of knowledge-based systems. He is interested in the notion of situated knowledge, a perspective that acknowledges the embeddedness of expertise and knowledge in interactions and in the workplace. He describes a socio-cognitive perspective that respects such embeddedness, and offers a set of methodological guidelines for the development of knowledge-based systems that are consistent with a socio-technical approach to design.

Collectively then, what claims can we make of this collection of papers?

First, no single set of ideas emerges as a potential means of integrating the disparate work represented in these pages. We are not concerned by this: indeed we might be sceptical if such an opportunity apparently presented itself. The notion of a single 'best way forward' should perhaps be treated with critical concern. We believe divergence is appropriate. At this time, ideas, issues and concerns need to emerge 'bottom up', based on the detailed experiences of people working within the field, anxious to improve their own and others' understanding of real world phenomena.

Second, we can find support for the arguments that organizational arrangements affect cognitions, and that cognitions influence organizational practices. It would perhaps be surprising to argue otherwise. Furthermore, the papers provide some insights into the nature of some of these interrelationships. Thus it may be useful for these issues to be regarded as intrinsically and dynamically interlinked. We think these papers demonstrate that the separation of the organizational and the cognitive reflects more on the development and practice of academia than it does on the nature of the 'real world'.

Third, we are convinced that this is a timely issue for consideration within the field of system development and use. But its significance is not restricted to this domain. The potential integration of organizational and cognitive under-standing pertains to many other areas of enquiry.

And finally, if the need for such integration is demon-strated, as we believe it is, the major questions are now concerned with how progress might be made theoretically and methodologically. There remains much to be done.

References

CLEGG, C. W. 1994, Psychology and information technology: The study of cognition in organizations, *British Journal of Psychology*, **85**, 449–477.