EDITORIAL

From technical to socio-technical change: tackling the human and organizational aspects of systems development projects

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Guest Editors

Because of its critical role in support of the day-to-day operations and strategic positioning of the modern business enterprise, information technology has become a ubiquitous and increasingly significant part of the fabric of most organizations. Consequently, the implementation of information technology within organizations almost invariably results in a wide variety of, often very significant, impacts upon the design of the business, its economic performance and the working conditions of members of staff (Markus & Robey, 1983; Clegg *et al.*, 1997; Doherty & King, 1998; Robey & Boudreau, 1999); technical change is the catalyst for organizational change. For example, the introduction of a highly integrated, enterprise resource planning system (ERP), within a manufacturing company, is likely to have a significant impact on that organization's business processes, structure, culture and enterprise level performance, as well as the motivation, job specifications and performance of individual employees (Markus, 2004).

Information technology cannot, however, be viewed as a deterministic artefact, as it does not generally behave in a well ordered and predictable manner (Grint & Woolgar, 1997). Organizational stakeholders have the potential to interpret, appropriate and ultimately shape their information systems in a wide variety of ways (Orlikowski, 1992). This view – typically termed '*social constructivism*' (Bijker, 1995) – is supported by the wide variety of evidence that shows how the application of identical technologies, in very similar organizational contexts, can often result in radically different organizational impacts (e.g. Barley, 1986, Orlikowski, 1993). For example, Sahay & Robey (1996) have demonstrated how the implementation of a particular geographical information system, in two very similar governmental agencies, resulted in two very different organizational outcomes: a significant impact on working practices in one county government organization, as opposed to very limited change in another. Consequently, a significant problem facing the systems developer and the systems sponsor, is that the impacts and outcomes of introducing a new information system, cannot generally be predicted at the project's outset, as the system may be interpreted and appropriated in multifarious ways, during the development period, as well as throughout its operational life (Orlikoski *et al.*, 1995).

Perhaps, an even bigger problem facing the systems developer and the systems sponsor, is that too often the organizational impacts resulting from the implementation of information systems are undesirable. As Martinsons & Chong (1999) note, IT-induced organizational change often results in user resistance and, in extreme cases, possibly even system rejection. Indeed, the incidence of negative impacts is increasingly common, to the extent that there is a growing consensus that the

difficulties associated with predicting and managing the organizational impacts of information system's investments are the primary cause of system's failure (e.g. Lyytinen & Hirschheim, 1987; Lederer & Nath, 1991; Ewusi-Mensah & Przasnyski, 1994). Moreover, given that it is widely acknowledged that the failure rates, for information systems' projects, are far too high (e.g. Hochstrasser & Griffiths, 1991; Clegg *et al.*, 1997), then the need to understand the nature of organizational impacts, and how best to manage them, has become absolutely critical.

It is possible to extend a number of plausible explanations as to why the organizational impacts of IT projects are so often undesirable. For example, it may be that many of the consequences of an information system's implementation will remain unanticipated (Robey & Boudreau, 1999), because increasingly sophisticated and flexible information technologies can interact with their host organizations in such a diversity of manners, that it will never be possible to predict all their impacts. It can also be argued that systems development projects often result in unanticipated and undesirable impacts because of the difficulties of attaining a consensus amongst key stakeholder groups, as to how the technology should be interpreted and shaped (Bijker, 1987). However, perhaps the most commonly argued and compelling explanation as to why the organizational impacts of technology are often so unfavourable is simply the reluctance of systems development teams to proactively and enthusiastically engage with and address organizational issues (Hornby *et al.*, 1992; Ahn & Skudlark, 1997; Eason, 2001). As Clegg *et al.* (1997) have noted:

> Lack of attention to the human and organizational aspects of IT is a major explanatory factor (with regard to the high levels of systems failure) and is manifest in poor management generally, poor project management, poor articulation of user requirements, inadequate attention to business needs and goals, and a failure to involve users appropriately.

Consequently, it can be argued that many organizational impacts only remain unanticipated, because systems developers are reluctant to tackle the human and organizational aspects of IT projects. Systems development projects have typically been viewed as exercises in technical change, rather than socio-technical change; '*most investments in IT are technology-led, reflecting too technical an emphasis*' (Clegg, 2000). While the development of efficient, accurate and reliable technical systems is clearly important, the delivery of well aligned and value-adding business solutions is not generally the result of '*technical wizardry*' (Dvorak *et al.*, 1997). Consequently, the adoption of techno-centric development approaches can be a very dangerous strategy, as it encourages developers to deliver and implement the information system, and only then, if at all, worry about adapting it to its organizational context (Poulymenakou & Holmes, 1996). For example, the inadequate treatment of organizational issues was cited as a significant, if not the

primary, contributing factor in the failure of high profile IT projects, such as the London Ambulance System (Beynon-Davies, 1995); the Taurus System (Drummond, 1996); and the Benefits Payment Card System (NAO, 2000). The management of organizational impacts is not, however, just about avoiding negative consequences, as it is also widely acknowledged that many beneficial impacts may not be fully realized without an appropriate programme of organizational change (e.g. Fitzgerald, 1998; Ward & Elvin, 2000).

While the importance of treating the human and organizational aspects of systems development projects is now widely acknowledged (e.g. Clegg *et al.*, 1997; Eason, 2001), little progress has been made in the development of practical socio-technical methods and approaches that have succeeded in making the transition from research laboratory to widespread commercial usage. As Clegg (2000) notes, '*socio-technical principles and practices have not had the impact that their proponents might wish.*' This view is supported by Mumford (1997) who notes that while: '*management tended to regard these successful (socio-technical) projects as one-offs; there was no great enthusiasm or motivation to spread the approach through their companies*'. While the assertions that organizations are not commonly adopting purpose-built socio-technical approaches, was broadly supported in a recent study (Doherty & King, 2001), it was discovered that the majority of organizations (60% of the sample) claimed to be adopting some form of '*explicit*' interventions to treat organizational issues; typically at a single point in the project, such as the feasibility study or the requirements analysis phase. However, a further 27% of the sample only treated organizational issues '*implicitly*', whilst in the remaining organizations (13% of the sample), such issues were '*rarely considered at all.*' These findings suggest that many organizations are starting to treat organizational issues, but probably using a variety of '*home grown*' or '*pragmatic interventions*', rather than employing purpose-built socio-technical approaches (Doherty *et al.*, 2003). As Eason (2001) notes '*organizational issues are tackled in an ad hoc way whenever they emerge, which is often after the system has been implemented.*' While this may be true, we still know very little about the nature, role and effectiveness of such '*ad hoc*' or '*home grown*' interventions.

In summary, the information systems' literature is very clear on three points: general levels of system failure are unacceptably high; the primary cause of this problem is the failure to adequately predict and manage the organizational impacts of IT investments; and progress in producing socio-technical approaches that explicitly address the human and organizational aspects of systems development projects, has been painfully slow. Consequently, it can be argued that there is an urgent need for well focused and rigorous research that seeks to shed fresh insights into the nature of the organizational impacts of information technology and the ways in which they can best be proactively managed to promote

the development of effective, value-adding information systems.

Our goal for this special issue of the *European Journal of Information Systems* was to deliver a coherent collection of information systems' research that provides significant new insights into how the human and organizational aspects of systems development projects can best be tackled. The call for papers attracted a very encouraging and enthusiastic response of 60 prospective research papers, from all corners of the globe. Following a very rigorous three-phase review process, these 60 papers were filtered down to the seven that ultimately form this special edition. Together, these papers provide a variety of perspectives and viewpoints as they try to illuminate different aspects of this complex problem. Ranging from careful statistical analysis developing important new metrics in this field, through to single longitudinal case studies, they provide both new tools and new interpretations. Some of the case studies provide new concepts or approaches for analysing the organizational impacts of IT projects and, in some senses, they both highlight the problems, as well as pointing to possible ways of addressing them, or at least predicting them. While none of the papers pretend to provide a complete, or even a partial, solution, together they provide sufficient evidence to encourage all those concerned with IT projects to proactively and enthusiastically engage in developing better approaches to addressing the organizational impacts of IT projects. In this context, it is invidious to arrange the papers in any particular order. It is hoped that each will be stimulating and interesting in its own right, and so the following are commended:

Davidson & Chiasson: Contextual influences on technology use mediation

The authors of this paper provide new insights into the '*technology use mediation*' (TUM) process (Orlikowski *et al.*, 1995), in the context of two cases of the operation of electronic medical record systems, in two separate healthcare organizations. The analysis examines the contextual influences on mediation and considers the TUM processes and outcomes in projects utilizing modern systems development methods. It is concluded that crucial technology use mediation actions occur during systems development phases as well as during system use, and that mediation was vitally important with these specialized IT artifacts.

Chae & Poole: The surface of emergence in systems development

The information systems' literature has typically treated systems development projects, as isolated and independent events, and has therefore ignored the influential role of pre-existing information systems. The authors of this paper present a case study of a large-scale information system within a major university system in the U.S. as a mechanism for exploring the role of pre-existing information systems in the development and emergence of a new system. A further novel contribution of this study is the application of the '*surface of emergence*' (Foucault, 1972; Pickering, 1995), as theoretical lens, to help focus and interpret their study of the human and organizational aspects of systems' development.

Kotlarsky & Oshri: Social ties, knowledge sharing and successful collaboration

Research relating to the effectiveness of collaboration in information systems' development projects has grown, but has tended to focus upon co-located project teams. Consequently, relatively little attention has been paid to the operation of globally distributed development teams and, in particular, the human and organizational aspects of such distributed projects. To fill this gap, the authors of this paper present a study of the contribution of social ties and knowledge sharing to successful collaboration, within two distributed information systems' development teams. The results of this study suggest that human and organizational aspects, such as rapport and transactive memory, have a particularly important role to play in facilitating effective collaboration, within the systems development context.

Lin & Silva: The social and political construction of technological frames

The authors of this paper present an exploration of the dynamic nature of '*technological frames*' (Bijker, 1995), in the context of information systems' development. In particular, they focus upon how the social and political aspects of the process of information systems' adoption, might influence stakeholders to frame and reframe their perceptions of the system, over the project's duration. A case study carried out in a European Bank is used to illustrate how the Bank's technical team influenced users' technological frames, including those of senior management in order to ensure a smooth implementation process.

Hatzakis *et al.*: A social capital approach to evaluating change management interventions

It has long been recognized that a significant contributing factor in the unacceptably high levels of information systems' failure has been the poor relationship between business stakeholders and their IT colleagues (Peppard, 2001). The authors of this paper argue that this is partly because there is no appropriate evaluative framework for relationship management, in the context of information systems development. In response, this paper proposes a framework, based on social capital theory, for conceptualizing the effects of change management interventions in the poor relationship between business and IT colleagues.

Lee & Xia: Flexibility measures for information systems development project teams

The human and organizational aspects of information systems development projects frequently change as rapidly, or even more rapidly, than the technical aspects,

so a project team's flexibility in responding to these changes is critical for a system's successful development. However, little is known about the types of changes that occur or how to assess a team's flexibility. The authors identify major types of changes that occur during information systems development projects and two key dimensions of team flexibility. For these dimensions they developed measures of team flexibility which were tested across different segments of project size and duration, using survey data from 505 information systems development project managers. Their work develops a conceptual framework and measurement tool to help managers discuss and assess team flexibility and identify gaps between a team's current and desired flexibility level.

Luna-Reyes et al.: Systems development as emergent socio-technical change

A longitudinal case-study in a NY State agency is used to develop a process-oriented view of information systems' development projects which focuses on the dynamics of the human and organizational aspects. The authors treat the information systems' development project as a socio-technical phenomenon embedded in an emergent process of change in professional practice, building on the concept of the duality of technology (Orlikowski, 1992). The changes are characterized as an iterative process of sense making and negotiations among stakeholders with the description over time based on different events or incidents which can be *encounters* or *episodes*. Episodes constitute a series of events that stand apart from others; encounters mark their beginning and end. This approach yields a feedback-rich framework that offers a theoretical explanation of the information systems' development process, as well as practical heuristics to aid system developers and project managers.

Finally, the guest editors would like to thank the General Editors of EJIS – Ray J Paul, Bob O'Keefe and Richard Baskerville – for their help, support and guidance throughout the preparation for, and publication of, this special edition. Moreover, it is important to acknowledge the very substantial contribution of the seventy plus individuals who helped out by reviewing papers for us.

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