INTRODUCTION

The overall mission of the International Journal of Sociotechnology and Knowledge Development (IJSKD) is to provide a practical and comprehensive forum for exchanging research ideas and down-to-earth practices which bridge the social and technical gap within organizations and society at large. The chapters highlighted in this book are exemplars of some of these ideas in practice.

The journal also provides a forum for different viewpoints on sociotechnical practice and methods. Its papers are aimed at providing “handles” for practitioners who wish to implement sociotechnical thinking in different locales.

When looking at the chapters submitted to the journal and now entered into this book, they fall into five main categories or sections.

The first category begins with chapters touching on the themes of design and participation. Two chapters develop this theme. The first one, by Fischer and Hermann, provides a meta-explanation of how core sociotechnical principles can be put into practice following a framework rather than a fixed set of steps and scripts. The chapter provides an interesting discussion on how cultures of participation have an important impact on design frameworks. Tuffley’s chapter on Design Research outlines how this type of research, already used successfully to inform processes in software engineering, can also be used to model organisational behaviour and leadership.

The second category of chapters in this book is about methods. Coakes and Elliman illustrate how story-telling and grounded theory can be combined in information systems research in order to provide causal analysis and pattern recognition. Hunter illustrates the use of in-depth interviews with qualitative research of Chief Information Officers. His work demonstrates how to allow for flexibility to keep the richness of interviews while keeping consistency across the style for all interviewees. Based on experiences on rural Finland, Reiman and Väyrynen offer a chapter on guidelines to evaluate the sociotechnical quality of the work environments of small and medium enterprises (SME) at regional level.

The chapters clustered in Section 3 refer directly or indirectly to the idea of sociotechnical balancing. The first chapter by Smith introduces Stafford Beer’s Viable System Model and Network Visualization Analysis to identify decision leaders and its sociotechnical impact in the context of audit theory and practice. In the next chapter, Potts presents a cultural argument against the technologically determined understanding of the evolution of virtual reality. She achieves this by comparing key concepts between the work of Marshall Mc Luhan and Raymond Williams. Section 3 is closed by Sajeva’s proposal to balance systems thinking and sociotechnical thinking in order to successfully manage knowledge in an organisation.
The book then moves onto considering *sociotechnical experiences in Latin America and Africa*. This section contains four chapters: two on Latin America and two on Africa. A tale of introduction of teledmedicine in Northeastern Peru by Miscione highlights its local adoption based on different interpretations of technology, where traditional and biomedical forms of medical knowledge are not overtaken by each other. The second chapter on Latin America covers different case studies in the region by Scheel and Pineda. These authors argue that business practices originated in industrialised countries need to be adopted in a state of clustering readiness, which for Latin America is different due to scattered and limited resources. They discuss challenges and opportunities for the region through a localised understanding of this concept.

The last two chapters of this section are on Africa. The first one uses structuration theory and actor network theory as mechanisms to analyse organisational politics and its impact on IT strategy implementation in one South African financial institution. The second chapter highlights the importance of stakeholder collaboration in open source migration in a South African government agency. This is done through explaining and applying the concept of boundary critique.

The last section of the book reports on *sociotechnical thinking in military environments*. Velloso presents a case study highlighting the value of knowledge management research findings in the Brazilian Air Force, and relates the implications of this research at a more general level to organisations not driven by market variables. The final chapter by Ariely describes a sociotechnical analysis of systems and information technology (IT) in military environments where early adoption of systems carries both risks and opportunities.

This preface now describes these 14 chapters in more depth and add comments on the subject matters and why they are important to the sociotechnical community and to those utilising knowledge in organisations.

**COMMENTARY ON CHAPTERS**

The first chapter of the *design and participation* section addresses core conceptual elements, issues, and opportunities for sociotechnical systems from a meta-design perspective. Fischer and Herrmann re-visit the pillars of sociotechnical systems (STS) theory with a refreshed vision of how it should be put in practice. They do by highlighting five principles of meta-design: (1) cultures of participation, (2) empowerment for adaptation and evolution, (3) seeding and evolutionary growth, (4) underdesign of models of socio-technical processes, and (5) structuring of communication. By meta-design they refer to the process of “designing design” where the design setting is a sociotechnical system in itself (Fischer & Giaccardi, 2006).

In looking at these principles, the author of this preface found particularly interesting their discussion of the principle of culture of participation where traditional structures, process and roles in participatory design (PD) are questioned and re-drawn thinking in terms of mergers and co-evolution of roles and reconfiguration of power relations among the different stakeholders. This would then have to be supported and accomplished by empowering end-users and other stakeholders to adapt and evolve with the necessary tools. The third principle is described in terms of the seeding, evolutionary growth, reseeding (SER) model, in which the idea of ‘seeds’ highlights the iterative, provisional nature of artefacts, such as prototypes, and ideas, such as an opportunities for learning and reflection, in the evolution of sociotechnical design. The remaining two principles, underdesign and structuring of communication, are presented as the value of partial-specification of systems and the need to coordinate interaction and information flows among actors of the design process.
The chapter goes on to show concrete examples of socio-technical systems that are meta-designed and, at the same time, are frameworks where design takes place. One of them is ModLab: A Facilitation Collaboratory in which co-located design-oriented communication among stakeholders and collaborative creativity are supported. The second example is The Envisionment and Discovery Collaboratory (EDC). This is a multi-technology platform to support collaboration by participants from different domains and backgrounds trying to resolve design problems. In these two examples, the theme of culture of participation remains as a strong thread to be reflected upon. The chapter closes by providing more concrete guidelines for meta-design of STS and highlighting the need for meta-designed frameworks to handle the tension between improvisation and standardisation.

The second chapter in the section on design and participation by Tuffley attempts to integrate and apply methods, concepts and artefacts developed in design research and software engineering to general organisational behaviour. The author opens the chapter by discussing the complexity of in the work and management of virtual and distributed teams and the nature of the challenges that should be tackled. This is then framed as a problem of leadership and project management. However, in order to manage the participation of virtual team members and lead them to achieve desired outcomes, the concept of leadership needs to be further operationalized in a way that could be learned and objectively assessed. Tuffley proposes a solution for this from the perspective of process reference models (PRM), a need already identified in software engineering (Humphrey, 2002).

Design research is then brought to focus in this chapter by highlighting the re-iterative nature of process models in software engineering. From this perspective Software Engineering is seen as discipline driven by design science where artefacts are produced, tested and improved over several iterations. Based on Hevner’s (2007) guidelines for design-science in technology development, PRM is presented as an artefact iterated in the design cycle.

Following ISO/IEC 15504 and ISO/IEC TR 24774, a three-tier PRM architecture is devised for obtaining concrete outcomes in the leadership of virtual teams. Each of these tiers, i.e. generic leadership factors, integrated teams leadership factors, and virtual team leadership factors, contain a cluster of elements that are then rendered into formal PRM notation to describe a number of processes, purposes and objectives for leadership and project management. The effectiveness of design-science guidelines in iterating and evaluating PRM for team leadership is presented and discussed as a story of success. As a consequence, the author suggests that the scope of the process model introduced in the chapter should be extended to a PRM for Organisation Behaviour. From my perspective the main value of this chapter for sociotechnical thinking is the translation of a ‘soft’ concept like leadership into a clear set of processes and milestones for capability assessment and process improvement purposes.

The second section of this book groups chapters that relate to methods either in terms of sociotechnical design or in terms of how to research sociotechnical systems or environments. Coakes and Elliman talk about grounded theory (GT) and the development of organisational stories through story-telling in the study of strategic planning of information systems (SPIS). The authors highlight the need for qualitative studies to be more prominent and valued in information systems (IS) research. One of the reasons why qualitative methods are not well positioned in IS is because their perceived lack of rigour and low visibility of causal conditions explaining the phenomena under consideration. Coakes and Elliman note that most research in the IS field are surveys followed by mathematical models. In the context of explanatory case study methodology, the combination of GT and storytelling are presented as providing structured ways to make sense and generalise lessons learned for SPIS.
The story-telling approach used by Coakes and Elliman is mainly based on that of Davis (1993) made of five stages: Setting, Build-up, Crisis or Climax, Learning, and New Behaviour. Story-telling is this presented as vehicle to convey individual and collective meanings. They must be intelligible not only for members of the organisation, but, more importantly, to readers or listeners outside of the organisation in question so that lessons could be learned and applied, after some adaptations, to other contexts with similar conditions. A brief but on-the-spot discussion of GT and the key differences between Glaser’s (1992) vision of the method, closer to its origins, and the more prescriptive version of Strauss and Corbin (1990) is presented. The authors recognise Glaser’s vision of GT as it allows identifying and analysing the core issues driving the emerging storyline. At the same time, Strauss and Corbin axial coding stages are presented as giving a structure to the unfolding story presented through story-telling techniques. In fact, towards the last sections of the chapter a correlation between the axial coding and story-telling stages is presented based on a clear example of a study on a university’s SPIS and IS implementation. The chapter closes by highlighting the value of these combined methods not only for SPIS but also for broader studies of social and organisation change.

On a similar spirit to that of story-telling as a methodological strategy for data gathering and analysis, the second chapter on methods by Hunter discusses the value of narrative enquiry (Scholes, 1981) and the long interview technique (McCracken, 1988). Hunter presents an interesting case study identifying common issues in the role of Chief Information Officer (CIO) in New Zealand, Taiwan, and the United States. One of the key findings in of this study after interviewing eighteen individuals across different organisations is that no country-specific differences were found across the sample. On the contrary, the interviews identified a number of consistent issues reflective of common corporate culture shaping the roles of CIOs. The issue of role alignment was a consistent theme: Chief Executive Offices (CEO) tend to have expectations of the CIO role, which are not in line with the interpretations of those appointed to fulfil the role.

Hunter closes the chapter by discussing the value of having a narrative enquiry perspective for qualitative research as it provides ‘the symbolic presentation of a sequence of events connected by subject matter and related by time’ (Scholes, 1981, p. 205). He achieves this in practice by the long interview technique (McCracken, 1988), which covers not only the interview process itself but also its preparation and subsequent analysis in the identification of emerging themes. The strength of this technique is the possibility to consistently treat data while allowing for flexibility in the gathering of interpretations from the different interviewees.

The final chapter in the methods section, by Reiman and Väyrynen, leads to tools for strategic management of work environments inspired in sociotechnical principles. The authors present a number of case studies of SMEs in Northern Finland evaluating and implementing improvements in safety and quality management, participatory work design and intra- and interorganisational communication and cultural issues. Drawing on micro and macroergonomics (Hendrick, 2002) and on Eason’s (1990) temporary design structures for system implementation, a number of sociotechnical challenges were tackled in order to optimise organisational structures, stakeholder participation and health, safety and environment quality management.

While a number of different microergonomics were found across the different case studies, much convergence was found at a macroergonomics level. As a consequence, a Self Assessment Tool (SAT) is presented in this chapter as an instrument for evaluating the quality of the work environment. This tool for managers measures a number of different criteria including the physical, social and mental environment and other factors affecting production and unwanted events. In my opinion, this is the main contribution of this chapter, i.e. trying to operationalize sociotechnical principles for the management of the work environment and change from an implementation perspective.
The third section of this book contains chapters where the idea of sociotechnical balancing is central. The chapters deal with this issue in different ways, which makes this an interesting section of this book. The first chapter by Smith focuses on audit practice and the role of decision leaders from a sociotechnical perspective. Based on a variation of Stafford Beer’s Viable System Model (VSM) (Beer, 1972), referred to as Network Visualization Analysis (NVA) (Smith, 2010), a method for the audit of how decision leaders impact their own networks within the organisations is presented. This is presented as complement to audit enquiry methods often referred to as subjective and too ‘soft’. The VSM-NVA method offers an objective way of measuring and visualising the extent to which decision leaders are being effective in comparison with archetypical characteristics of ideal decision leaders produced according to VSM. This enables the balancing of roles in the formal and informal social networks where leaders operate. In other words, these techniques and maps help define the extent to which organizational members are influential as decision leaders, and that there exists a willingness and ability to engage in knowledge transfer and collaboration.

Moving onto media studies, Potts’s chapter presents a sociotechnical view of technological determinism by looking at McLuhan’s (1967) and William’s (1980) ideas. As the title says, she tries to balance a technologically determined view of virtual reality with one that takes into account context and human agency. Looking at media text reception as a negotiated phenomenon in which the audience does not automatically accept the intended meaning of the producers (Hall, 1980), Potts questions McLuhan’s premise of the medium is the message. This premise implies that content is not as important as the technological medium used to convey the message. The former leaves an imprint on users’ minds that determine their perception and experience of reality. However, a sociotechnical vision of technology and new media in our time does not mean rejecting the idea that technology and new digital media has a clear constraining power in the perception and interactions of its users. Instead, Potts presents the recent shift of relations between audiences and a new technology, e.g. virtual reality, as a ‘cross-media intertextuality important for examining these sociotechnical systems’. Technology articulates reality but it is not the sole provider of meaning to those who interact with it. A sociotechnical balanced understanding of technologies for interaction and consumption will therefore be required for a comprehensive understanding of impact and design.

The final chapter of the section on sociotechnical balancing by Sajeva looks at how systems thinking and sociotechnical thinking can be combined to manage knowledge in organisations. The author offers a view on knowledge management systems (KMS) that not only maps the elements of such systems but also explains how they interact with one another. A conceptual model is then presented including the social and technical elements of KMS. A systems thinking vision of KMS, inspired in Ackoff’s (1971) model, acknowledges these systems as complex, with interrelated elements and, more importantly, with emergent properties only possible through the interaction of the system elements. The author offers an interesting literature survey of sociotechnical perspectives in KMS. The general finding from the studies cited indicate that investing in information technologies alone is not enough to facilitate knowledge sharing, which also requires social and human interaction. However, most of the sociotechnical research in this area is based in knowledge sharing. A second area in sociotechnical research based on models of KMS is discussed in this chapter (e.g. Handzic, 2011). The main contribution of these models is a better understanding of major elements in KMS.

A consequence of this discussion of systems thinking and sociotechnical research is the construction of a The Conceptual Model of a Sociotechnical Knowledge Management System. This model is made of a number of elements: (1) knowledge management process, (2) organizational infrastructure,
(3) technological infrastructure, (4) strategic leadership, (5) organizational learning, and (6) knowledge culture. The value of this chapter in my opinion is that the model is empirically tested in terms of how these different elements interrelate. A number of Lithuanian executives were surveyed, and the analysis of the interrelatedness of KMS elements showed that the sociotechnical context significantly correlated with the knowledge management process ($rs=0.794$).

The fourth section of this book includes empirical studies and accounts of sociotechnical implementations from Latin America and Africa. This cluster of chapters helps us understand the value of sociotechnical thinking and methods outside of Europe and North America. Miscione opens up this section by presenting a tale of telemedicine implementation in North Eastern Peru. In this ethnographic study an encounter of two different knowledge systems is presented as a reflexive exercise for researchers of distributed cognition and related artefacts. Miscione develops a rich discussion around dominant and local notions of medicine, illness and medicine. Relying on postmodern thinkers, such as Foucault and Latour, the rationality, accountability and discourse of western biomedical and indigenous healing systems are contrasted pointing towards a case of co-existence of knowledge systems. The biggest takeaway from this chapter is that technological and knowledge transfer projects, such as the telemedicine case study presented here, should move away from technical and rationalistic approaches to those that support organizational change. The later type of approaches recognise that knowing is situated (rejecting universal conceptions of knowledge). Therefore, implementing a telemedicine system in different cultural contexts and information ecologies carries critical sociotechnical considerations: recognising local knowledge systems; understanding the accountability frames of beneficiaries; integrating, instead of replacing, medical practice into existing practices and value systems; seeing social change as something cultivated and not induced.

The second chapter, by Scheel and Pineda, provides a Latin American perspective on the need for clustering SMEs in the region as a strategy for growth and success. They report on the analysis on more than 20 projects of SMEs in the region. A thorough study of success factors, barriers, competitiveness and opportunities is discussed under the assumption that the transfer of successful practices from the ‘industrialised world’ into Latin American SMEs is not an easy affair. Success is directly linked to ‘clustering readiness’, which in turn is driven by innovation. The concept of ‘clustering readiness’ is richly developed in this chapter and refers to the regions’ capabilities to associate different human, material and technological resources in order to nurture innovation and economic growth.

Based on Porter’s (1998) ideas and work on innovation and competitive advantage, Scheel and Pineda examine implications of clustering readiness for Latin America. They confirm “regions must be creative, innovative and capable of transferring local knowledge, technology and science, into economic value added, directly imbedded into substantial benefits for the community.” For innovation to flourish a region needs a vibrant industry, and a fluent transference of R&D into successful business, a social coherent capital, and a high quality of life. The problem with Latin America, as the authors evince in their study, is that the conditions and degrees of development in terms of innovation and infrastructures are quite different. A number of inhibitors linked to lack of collaboration, under skilled workers, lack of stable competition rules and frameworks and global competition, among others, are identified. The chapter includes a number of solutions relevant and indexical to the Latin American situation. The main contribution of this chapter is a model designed to develop local (regional) competitive clusters into world-class value systems. This model can be seen as a sociotechnical system integrating processes of learning, linking and benchmarking of clusters and associated logistics operations.
The third chapter in this section by Iyamu gives an account how organisational politics shape the implementation of an IT strategy in a South African financial institution. Similar to Miscione’s use of postmodern concepts, the author draws on two theories: Structuration Theory (ST) (Callon & Law, 1989) and Actor–Network Theory (ANT) (Giddens, 1984). Through the duality of structure concept of ST, and the concept of translation of ANT, he is able to give an account of agency and interactions in the definition and implementation of an IT strategy in an organisation. From the point of view of ST, the tensions between the interpretive schemes, rules and legitimation mechanisms of a bank and the agency and different levels of interaction and power of employees are used as explanatory framework to make sense of the gap between the planned IT strategy and was actually implemented. On a similar vein, ANT is used to complement this explanation by giving a more refined explanation of the process of translation whereby a obligatory passage point (OPP) in the form of the IT project is used to align business and IT strategies and as a frame of reference to enrol different actors in the network.

Having provided a ST and ANT accounts of the implementation of IT strategy, Iyamu extracts a number of organisational political factors, identified in the qualitative analysis of the data, shaping the processes reported upon. These factors are racial behaviour, exploitation of job insecurity, exploitation of performance contracts, and pursuit and protection of personal and group interests. The two main contributions of this chapter lie on a detailed illustration of how ST and ANT can be used to analyse case study data on IT strategy implementation and on the identification of organisational politics factor that could be reflective of South African organisations.

Implementing open source software in a governmental department in South Africa is the focus of the final chapter on this section on Latin America and Africa. Jokonya and Hardman highlight the importance of stakeholders and their role in the information systems lifecycle. This role is particularly salient in the implementation of open source software projects where support is more de-centralised and stakeholder collaboration is crucial. Based on Churchman’s (1971) boundary critique, the authors provide an account of stakeholders’ perception of the challenges of the project. Boundary critique refers to the intellectual and inter-subjective construct that defines the knowledge and people to be considered relevant for analysis in a social design. Jokonya and Hardman argue that following this perspective will allow the most marginalised stakeholders to become visible and have a more direct role in the process of open source software migration.

After a round of interviews inspired by the boundary critique concept, the authors present findings that revolve around issues of stakeholder perception of the different boundaries and relevant knowledge for the realisation of the project. The main contribution of this chapter is the value of boundary critique to augment the contrasting views of different stakeholders.

The final section of this book is comprised of two chapters on sociotechnical thinking in military environments. The first chapter reports as study of strategic change driven by knowledge management research in the Brazilian Air Force. Guimarães adopts the ‘pragmatic framework for KM research’ (Grover & Davenport, 2001) studies the intervenient variables of the knowledge process: strategy, structure, people/culture, technology and also the educational approach in place. The application of this framework is valuable as it is focused on military organisation not driven by market variables.

Based on interviews, surveys and document analysis, Guimarães’s study emphasizes issues of power imbalances in the ownership of knowledge, lack of formal opportunities for education and lack of mission comprehension, among the most important. Based on this diagnosis, the author discusses how the knowledge management strategies on public sector organisations should be focused on knowledge management issues, instead of performance issues, engaging the organisation in a virtuous cycle characterised by ‘the inexorable need to evaluate and revisit its strategy fundaments in order to understand and meet the organisation’s specific needs in terms of knowledge’, in the author’s own words.
From my perspective, what makes this chapter a valuable contribution is its illustration of how knowledge management research can support government organisations, which commonly operate in complex scenarios, subject to politics and other contextual forces. This work shows how strategic management approaches tend to result in better performance.

The final chapter of this section by Ariely explores the boundaries of sociotechnical systems and the risk and opportunities of early technology adoption in military environments. The military are typically early adopters of technology but the implications of being at the leading edge can be made more visible if analysed from a sociotechnical perspective. Arieli does precisely that by discussing of knowledge development and flows in these environments. The first important point of this chapter is the tension created in command and control operations between deductive reasoning and sense making. Sociotechnical systems could hamper the identification of important cues that lead to situational awareness and are reflective of the context. The temptation of trying to adjust to patterns without proper attention to indexical elements carries great risks. This is exemplified with the use of war game technology where there are dangers of adopting game behaviours not suitable for actual war situations. Further points are discussed in the context of asymmetric warfare and how sociotechnical systems and associated strategies need to be sensitive to the effectiveness of ‘traditional’ war paradigms, technologies and weapons.

The various discussions thread of this chapter lead to an emerging model: this is a spectrum of sociotechnical systems effects that should be made visible and aligned, based on their level of interference with cognitive processes and group knowledge dynamics. Overall, Arieli reminds us of the sociotechnical gap, already highlighted by authors elsewhere such as Ackerman (2000), in the context of knowledge flows and group dynamics in military contexts. It is a good ending to this book whose mission is to bridge the social and technical gap within organizations and society at large.

In general, the collection of chapters in this book presents a rich and current picture of research and ideas in the fields of sociotechnology and knowledge development. We can see how different philosophical standpoints, theoretical and methodological perspectives converge to enhance the value, relevance and usefulness of sociotechnical design and research. As a whole, the book offers practical guidelines of how to implement, on the ground, sociotechnical principles. STS theories have in the past been criticised for a lack of operational guidance for designers and decision makers. I think most of the chapters in this book prove otherwise and reflect the maturity of this field, which is increasingly pervasive and interdisciplinary. I hope you enjoy this book and its chapters as much as I did in preparing this preface.

José Abdelnour-Nocera
University of West London, UK

REFERENCES


