The significance of context in information systems and organizational change

Chrisanthi Avgerou

London School of Economics, Houghton Street, London, UK, email: C.Avgerou@lse.ac.uk

Abstract. *This paper argues that it is of crucial importance that information systems (IS) research and practice associates technology innovation with the context within which it is embedded. It identifies three principles to be followed in order to address the contextual processes involved in IS implementation: first, technology innovation should be considered in relation to socio-organizational change; second, analysis should consider not only the local organizational, but also the national and international context; and third, analysis should consider both the technical/rational decisions and actions involved in the innovation process and the cultural, social and cognitive forces of such a process. These principles are demonstrated with the analysis of a case study of organizational reform in Cyprus.*

Keywords: Cyprus, flexible specialization, information systems, organizational change, socio-economic context

INTRODUCTION

A great deal of effort in information systems (IS) research has been directed towards developing general knowledge for the implementation of information technology innovation without considering in a systematic way variations of the organizational and the broader context within which the innovation is embedded. Many of the conceptual frameworks and normative models that guide information systems (IS) practitioners draw from such research, contributing into a professional tradition of 'best practice' irrespective of contextual particularities. The tendency to prescribe and apply general courses of action in the implementation of technology is compounded by trends in the business literature – such as Total Quality Management (TQM) and Business Process Reengineering (BPR) – and the 'globalization' discourse, which tends to suggest the exertion of uniform economic imperatives around the globe.

Such general trends support a clear rationale regarding the diffusion of information and communication technologies (ICT) in developing countries: not only is ICT an imperative for taking part in the global economy, but there are standard ways that it should be used, and specific organizational features that it should aim at supporting. Many countries, corporations, influential aid institutions and management and IT consultants have adopted policies, strategies, and practices based on the assumption of universal imperatives, globally valid business

objectives, and general patterns of professional action regarding the exploitation of the potential of the new information and communication technologies (Schware & Kimberley, 1995; Talero & Gaudette, 1995). Such an a-contextual attitude to ICT exploitation is effective in spreading powerful messages about the significance of ICT in the contemporary economy, but it entails high risks of misguiding and frustrating local efforts to make sense and appropriate new technology.

The significance of considering the context of IS innovation in developing countries cannot be over emphasized. Invariably IS innovation in developing countries involves the transfer of technologies and organizational practices which were originally designed and proved useful in other socio-organizational contexts (Avgerou, 1996). Their potential value, their fit in the local socio-organizational conditions and feasibility of use cannot be taken for granted. Indeed, there is substantial evidence indicating the significance of addressing the local context for the exploitation of the potential of new information and communication technologies in developing countries (see, for example, Bhatnagar & Odedra, 1992; Odedra-Straub, 1996; Avgerou and Walsham, 2000).

This paper is based on the assumption that ICT does not deterministically imply any organizational results, and seeks to examine the relationship of the process of ICT implementation with its context. To that end, in the next section I review the way context is addressed in IS studies. I argue that a suitable approach to contextualist studies of IS innovation in developing countries has the following characteristics: it considers IT innovation in relation to socio-organizational change; it considers not only the organizational, but also the national and international context; it considers not only the technical/rational decisions and actions involved in the innovation process, but also the cultural, social and cognitive forces of such a process.

Then I apply such a contextualist approach to discuss the case of an effort to emulate organizational structures for small and medium enterprises (SME) collaboration in Cyprus. Analysis by the contextualist principles identified in this paper reveals the reasons why no substantial ICT infrastructure was developed to support the organizational reform in this case.

CONTEXT IN IS RESEARCH

It could be argued that all information systems studies are contextual, as they address issues of technology implementation and use within organizations rather than in a laboratory setting. Thus, by the nature of the object of its study, information systems research considers a changing entity within its environment. However, studies of information systems vary in terms of (a) the content of change they focus on, (b) the delineation of the environment they consider, and (c) the way they conceptualize the process of change in relation to the environment within which it unfolds.

Content in relation to context

The question of the relationship between content and context refers to whether an IS study focuses on technological change or the interaction between technological change and socio-organizational change. A great deal of IS research has been preoccupied with the former, mainly in the form of the study of the development, management and exploitation of IT-based systems. See, for example, the literature on information systems development (Olle *et al.*, 1986; Avison & Fitzgerald, 1996), management (Earl, 1989; Lacity & Hirschheim, 1993) and strategy (Earl, 1987). The main concern has been action to develop effective technologies, to manage them, and to exploit them effectively. To that end the organizational and social environment is often part of the study as a source of opportunities, or constraints for the technical innovation but organizational and social change unfolding in interaction to the technical innovation is not part of the object of study. Another influential stream of IS research has been devoted to the study of the behavioural characteristics which influence or inhibit particular technological change, or the way technical innovation affects behavioural aspects of an organization. But often in such analytical studies technological change is considered distinct from the organizational and social processes taking place around it. Technological change is the 'content' of change studied, and the socio-organizational circumstances under which it happens is the 'context' of change.

Such separation of technology as content from the organization and society as context has led to the development of useful specialized knowledge that formed the basis of IS professional practice. For example, focusing on the technical systems development process by assuming that the organizational context will provide the 'requirements' for the technology allowed a set of professional practices for the engineering of technically robust and to a large extent relevant technologies. Yet it is well known that organizations themselves are changing by the very fact of fostering systems development initiatives, and therefore it is unrealistic to expect them to determine any definitive requirements.

A closer relationship between technology and its social context was first suggested by the 'socio-technical' researchers in the 1980s, who put forward the concept of information systems as social systems (Land & Hirschheim, 1983). A stream of research elaborated on the social aspects and consequences of information systems innovation in organizations (Kling, 1980; Lyytinen & Lehtinen, 1984). Research on the social dimensions of IT-based information systems in the 1990s continued and indeed increased its theoretical sophistication, drawing from several theoretical and epistemological traditions of the social sciences (Lyytinen, 1992; Walsham, 1993; Hirschheim *et al.*, 1996; Introna, 1997). Such theoretical discourse, feeding into and informed by pragmatic concerns about the social effects of new technologies has recently become a highly visible part of IS research (see, for example, Baskerville *et al.*, 1994; Orlikowski *et al.*, 1996).

Particularly influential in the more recent socio-technical discourse on information systems are the theoretical ideas drawn from the social studies of science and technology of the past 15 years (see, for example, Bloomfield *et al.*, 1997), which have challenged the widespread

belief that science is the result of pure reason and disputed the view that technology determines social effects.

Theoretical ideas on the duality of technology (Orlikowski, 1992; DeSanctis & Poole, 1994), social constructionism (Bijker & Law, 1992; Grint & Woolgar, 1997) and actor networks (Callon, 1991; Latour, 1991; Akrich, 1992; Law & Callon, 1992) have contributed to a conceptual perspective for considering IT innovation *in interaction* with the changes simultaneously being undergone or pursued by people, institutions or other socio-technical hybrids in an attempted IS project.

IT innovation and its social context are so intertwined that, as Callon & Law (1989) have argued, a distinction between technology as content and society as context is a simplification obscuring the complex processes in which technology and human actors jointly take part in forming socio-technical entities. In the vocabulary of actor network concepts, the object of inquiry of such studies is the formation of the 'heterogeneous networks' of IT-supported organizational processes. The technical and the social are not juxtaposed as two alien domains.

Viewing the content of change associated with information systems innovation as a 'heterogeneous network' conveys more accurately what the socio-technical perception of 'information systems as social systems' has been struggling to connote. It suggests that what is generally called 'information system' in the jargon of practitioners as well as academics cannot be meaningfully restricted to computer or communications applications within an independently delineated social environment. Technical artefacts such as hardware, software, data in paper or electronic form, carry with them engineers with the conventions of their trade, industries that sell, install and support them, 'users' who understand their significance and interpret the way they should be put to action according to their circumstances and consultants who convert them from symbol manipulating machines to 'competitive advantage'.

In other words, the content of change considered in IS studies should not be technology innovation but the change of heterogeneous networks of institutions and people within which ICT is called to play a role.

The boundaries of contextualist studies

Information systems studies have been concerned mainly with IT innovation processes that take place inside organizations. The context of change considered by such research – seen either as technology innovation or as interacting technological and social change – is therefore the organization. Research on information systems development is a good example of focusing within organizational units. From the predominantly engineering (DeMarco, 1978; Yourdon, 1989) to the social theory-driven conceptions of systems development (Mumford & Weir, 1979; Hirschheim *et al*., 1995; 1996) the factors and actors considered are confined within the boundaries of an organization. Other streams of research considering the organizational context are the web models analysis by Kling and colleagues (Kling & Scacchi, 1980; 1982; Kling, 1987) and the soft systems methodology for the analysis of information systems

in relation to human activity systems (Checkland, 1981). More recently, structurational analyses of IT by authors such as Orlikowski, (1992) and Walsham (1993) have added particularly interesting new insights into the organizational context by elaborating on the processes through which ICTs are shaped under the influence and at the same time contribute to the shaping of the social relations of the organizations within which they are introduced.

In several areas of information systems research the focus of study extends beyond the single organization and includes aspects of the organization's environment. Widely influential, at least in terms of informing practice, has been the research that seeks to address the strategic potential of IT and organizational change. The information systems literature has highlighted the existence of competitive pressures on organizations and sought to provide guidance on the actions management should take to harness the potential of IT in order to secure a competitive position of a firm within its environment (Porter & Millar, 1984; Earl, 1989; Scott Morton, 1991; Hammer & Champy, 1993). Such studies tend to adopt a contingency analysis, suggesting that organizations choose courses of action according to their assessment of the type of environment they are faced with. They do not elaborate on the process through which a particular change is related to its context.

To study the processes of change occurring when new information and communication technologies are introduced in organizations in relation not only to the organizational context, but also their national and international environment several researchers adopted a method of enquiry proposed by Pettigrew (1985), initially for the study of strategic organizational change.

Pettigrew's contextualist analysis focuses on 'the event in its setting', and studies the history of emergent changes in an organization, as they are shaped by the organization's social, economic and political context. To that end, the researcher should delineate a set of levels of context and strive to understand the way these levels are connected, using an appropriate theory of the process of change concerned, capable of explaining how this process is constrained by its context and also shapes its context. The context here is seen not only as a barrier to action, but as essentially involved in its production.

Such a contextual study of a phenomenon involves the interconnection of two directions of analysis: (a) a processual or horizontal analysis which refers to the sequential unfolding of events in historical, present and future time and (b) a vertical analysis which traces the interdependencies between higher or lower levels of context (such as the level of the organizational context and the level of the national context) within which a process has been unfolding.

The contextual approach has been used in several information systems research studies (Avgerou, 1989; Madon, 1993; Walsham, 1993), which saw the process of ICT implementation taking shape in an interplay with social and cultural aspects of both the organizational and the broader national environment.

Conceptualizing the process of change

There are two different types of theories of the process of IS innovation inside an organization and in relation to the organization's broader environment: those which consider such processes of change as 'rationally' planned interventions, and those which perceive them in

terms of situated action involving political and subjective aspects. The most frequently told story in the IS literature is of a well-calculated process of choice and methodical development of technologies to fulfil particular organizational requirements and thus to enable desirable improvements, either of operational or strategic nature, as for example the ideas on strategic planning and business process re-engineering (Earl, 1987; Hammer & Champy, 1993). In the 1990s, the technological possibility of interorganizational information systems, such as EDI and electronic commerce has fuelled a new shift of research emphasis on processes cutting across organizational boundaries (O'Callaghan, 1998). Also, as macro-economic restructuring presented opportunities for externalizing organizational functions for the development and use of information systems, a stream of research on 'outsoursing' has addressed the new possibilities of interaction of an organization with service providers and sought to inform prudent decision making and organizational restructuring (Lacity & Hirschheim, 1993; Willcocks *et al.*, 1996).

The view that general 'rational' principles can be discovered to guide the successful implementation of information systems in order to achieve unambiguous organizational objectives was challenged by pointing out the subjective, apparently 'irrational' elements of actions within organizations which interfere with 'rational', planned, and methodical actions and often drive the overall organizational performance. The stories told by such studies present processes of social action situated in particular organizational settings. The development and use of computer technologies have been perceived as intertwined with the social fabric of organizations, and it is seen as emergent, incremental, more accurately characterized as improvization rather than precalculated (Ciborra, 1991; Ciborra & Lanzara, 1994; Orlikowski, 1996; Ciborra, 2000).

The distinction between the technical/rational and situated approaches to the study of information systems is a manifestation of a more fundamental theoretical distinction in the study of change in organizations and the relationship between action in an organization and its context. The theoretical underpinnings of the technical/rational perspective that emphasize planned action can be traced to the resource dependency theory (Lawrence & Lorsch, 1969; Pfeffer & Salancik, 1978). This school of sociological thought attempts to explain the survival and development of organizations in terms of the strategic choices available to organizations that are seen to be interdependent to their competitive environment to secure the necessary resources for their survival. Resource dependency theory seeks to promote the decision-making capacity of organizational management, and has been widely influential in business management literature.

An influential alternative perspective is the institutionalist theory, based on the premise that technical rational norms of competition and strategic behaviour do not adequately account for the actions and structures of organizations. It postulates that we cannot explain what is happening in organizations by considering only the 'rational' actions of managers and technology experts, and provides a conceptual platform to study the 'irrationalities' stemming from the institutional context of organizations as well as from the cultural systems embedded in them.

This stream of theory has powerful insights to offer to the inquiry of the way ICT is implicated in organizational change. The core argument in institutionalist theory is that formal orga-

nizational structures and processes are maintained not because they necessarily constitute efficient ways of carrying out complex activities, but because they are sustained by powerful myths, that is by meaning-laden public knowledge about how organizations should function (Meyer & Rowan, 1991). In modern societies, such myths are rationalized, impersonal prescriptions, through which certain practices are taken for granted as efficient, without evaluation of their outcomes. For example, professional roles carry a strong element of rational myth, as they legitimate individuals' activities on the basis of expertise and not by evaluating the results of their actions.

The institutionalist conception does not deny that action in organizations involves calculated choices and is driven by concerns for efficiency. It complements efficiency-concerned accounts of organizations with elements associated with the social nature of the organizations themselves and their environment. Institutional forces may be social, cultural, or cognitive in nature. The sources of such forces may be other formal organizations such as trade partners or competitors, formal legislation, professionals, or the collective values of the society that sustains the organization. Their significance lies not only in that they determine the legitimacy of particular organizational forms, actions, or missions, but also in setting the factors that need to be taken into account in the choices of technical rational action.

DiMaggio & Powell (1991) identified three distinct forces stemming from the broader environment of an organization – its organizational field – that influence its actions and structure: coercion, imitation and normative professional conduct. Coercive pressures may be formal or informal, exerted through force or persuasion. They sanction the legitimacy of organizational structures, processes and outputs. The clearest source of coercive pressures is government mandates and the legal framework of the regional, national or international context of an organizational field. For example, organizations are obliged to adopt specific accounting practices, safety procedures and pollution avoidance mechanisms.

Mimetic mechanisms refer to the voluntary acquisition of particular characteristics of structure and process by emulating other organizations seen as successful. It is seen as a way of coping with problems that do not have clear technical solutions, or addressing uncertainties and ambiguous threats or opportunities. More generally, organizations tend to model themselves on other organizations, rather than to design totally new structures and patterns of behaviour on the basis of efficiency plans. Swanson & Ramiller (1997) proposed the term 'organizing vision' to describe the adoption of IT innovations. They argued that decisions for the development of technically innovative information systems are influenced by the general views about the value, entailed risk of new technologies or business processes created by a heterogeneous network of actors in the interorganizational community where an organization participates.

Normative pressures refer primarily to the effects of professional practice. Professionals convey a combination of cognitive and regulatory norms that legitimate their occupational autonomy. Such norms are produced and maintained through formal education and training, as well as through professional associations.

It is important to note that the institutional forces exerted on an organization may be contradictory. Different institutional agencies in the local environment of organizations may exert

conflicting pressures; an organization may receive both local and international or 'foreign' institutional pressures or models for imitation; and particular aspects of the historically constructed taken for granted structures and processes may be in conflict with emerging new rationalized myths.

Lessons for contextualist analysis

From the review of the three aspects of contextualist research identified above, it is now possible to derive principles for the study of information systems, and more specifically for efforts of information systems innovation that involve the transfer of technology or organizational features.

First, in such cases it is important to address technology innovation imbedded in, and indeed inseparable from processes of social change. The objective of study of information systems research should be the ICT-supported social activities of an organization or a network of organizations.

Second, analysis should be extended to address the socio-technical process of IS innovation across layers of context, from the international, through the national or regional, to the local organizational. Innovation inside an organization is rarely a result of its 'free choice' and action; it is to a large extent determined by events, trends, pressures, opportunities, or restrictions in the international or national arena.

Third, IS innovation should be considered a combination of technical/rational and institutional action. Management and IS methodically calculated plans and activities are facilitated or restricted by social, cultural, or cognitive forces, both within and beyond the boundaries of organizations.

A CASE STUDY OF ORGANIZATIONAL TECHNOLOGY TRANSFER

To demonstrate the significance of these principles of contextualist analysis, in this section I trace the story of an effort of industrial reform in the island economy of Cyprus, examining in particular the role attributed to ICT in the re-organization process. The details of this case study, which was conducted in the period 1993–96, are described in Chrysohos (1999). In this paper, I draw extensively from that source. In addition, I use primary data that I collected through six semi-structured interviews with three SME owners, one consortium manager and two government officials involved in the flexible specialization initiative on Cyprus.

I first became interested in this case in the early 1990s, expecting it to elucidate the 'enabling' role of information systems in organizational change. The IS literature of that time emphasized that IS innovation acquires a strategic role in sectors undergoing organizational reform. A much-quoted example was the extensive and innovative use of IT in banks after deregulation of the financial sector. Also at that time, the business process re-engineering literature put forward a strong message about the capacity of IT to support organizational reform.

The industrial re-organization effort that Cyprus had embarked upon involved many of the characteristics which in the IS literature were associated with the kind of context where ICT acquires a strategic role. It is a case of emulation of the industrial model of flexible specialization, which attracted a great deal of attention from the early 1980s, as a way of organizing a production suitable for the changing market context of advanced industrial societies. However, with the first close investigation of this case, it became clear that it did not corroborate the widely held view of the enabling capacity assumed by IT on occasions of reform. On the contrary, the organization reforms in Cyprus did not involve substantial ICT innovation. The following description and analysis of the story of the flexible specialization experience of Cyprus attempts to explain this unexpected finding.

Background of the case

In 1987, the Government of Cyprus sought the services of the United Nations agency UNDP/UNIDO to develop an effective industrial strategy. The international consultancy team found that the country's labour intensive industry was geared towards mass production, and would not be competitive in international markets. With a large number of small firms in a secluded economy and without prior success in exports, mass production was judged to be an inappropriate strategy. Of the 6616 manufacturing firms of the country, 6184 had less than 20 employees, and only 56 companies employed more than 100 people (Murrey *et al*. 1987). The majority of business firms were family owned and followed a craft tradition. It was estimated that about 13% of total wages and salaries were paid to working proprietors, their partners and family members. The consultants suggested restructuring the economy on the principles of flexible specialization, judged to be particularly suitable for the social conditions of the island.

The theory

Flexible specialization is one of the best-known models of the organization of production. It was proposed in the 1980s as an alternative to the Fordist method of mass production, more suitable for the changing pattern of consumer demand. Fordism – characterized by hierarchically managed organizations, using specialized technologies to produce efficiently for mass markets – has been the dominant model for the organization of production in all advanced Western economies since the turn of the twentieth century. However, growing uncertainty of mass demand in the 1970s raised questions about the merits of Fordism. Flexible specialization emerged as an alternative viable industrial strategy that re-instates craft production to supply for diverse consumer tastes (Piore & Sabel, 1984). But the craft-based business units suitable for the contemporary volatile markets are not just independent small producers. Flexible specialization consists of networks of task-specialist organizations, or organization units, equipped with skilled labour and flexible technologies. It is suggested that such a network is capable of producing changing volumes of quality goods for volatile markets without loss of productivity due to a under-utilized workforce or machinery. Thus, in general, flexible speciali-

zation is associated with the following features: production driven by economies of scope rather than economies of scale; flexible machinery; niche markets; information intensive production inputs; task integration and flexibility; network and informal, rather than hierarchical, management structures; close customer and supplier linkage; and competition by innovation, rather than by capacity.

The principles of flexible specialization have been demonstrated with several different examples in various countries. Invariably, such cases exhibit close co-operation among geographically concentrated firms, involving usually small or medium sized enterprises. Significant factors for the success of flexible specialization are considered to be a high degree of trust between employees and skilled workers, the provision of collective services through self-help, and often government mediated organizations (Piore & Sabel, 1984; Pyke, Becattini *et al*., 1990; Cooke & Morgan, 1994).

One of the best-known cases often referred to as a successful example of the model of flexible specialization is the industrial networks of small producers and service providing agencies in the region of Emilia Romagna in Italy, and it was this particular case that Cyprus attempted to emulate. The area of Emilia Romagna, extending from the Apennines to the Adriatic, has 50 industrial districts, each with a population of less than 100 000, and with a predominance of small firms, specializing in a particular sector. The firms in each district have formed networks of industry associations, co-operative consortia and joint facilities. The consortia play a significant management role in their constituent firms, co-ordinating their production and serving them with access to external information sources, export promotion programmes, market research and staff training. This allows the small firms to further specialize, some producing particular parts, others assembling, while they are able to share out production to others whether demand exceeds capacity. Moreover, through the consortia the artisans of the small firms have access to complex and expensive technologies such as art machinery and CAD.

The small firms participating in the consortia continue to be managed internally in a rather informal manner, but they have moved towards formalization of particular functions, such as sales and marketing which are mediated by the services of the consortia.

Analysts of the development of flexible specialization in Third Italy tend to emphasize the significance of the socio-cultural environment that fostered such collaborative industrial relationships that amount to collective entrepreneurship. A catholic tradition combined with the prevalence of collectivist socialist ideology forms a socio-economic fabric that mixes traditional and modern elements. Such a culture facilitated the development of collaboration without the need for direct government intervention.

The organizational complexity of the industrial network of flexible specialization in Emilia Romagna is sustained by rich information flows, both formal and informal. Although management information requirements of the specialized SME producer firms are modest, the consortia and the network of support organizations need sophisticated systems to deliver multiple services to their diverse customers.

For example, a crucial role in the collaborative business of the region is played by the information centre ASTER, which provides on-line search facilities to about 4000 firms and con-

sortia through connections with over 1000 international information services. It disseminates data related to location, financial performance, products and activities of 55 000 manufacturing firms of the region. Another system maintains information on research and technology transfer facilities in the region, and allows interested firms to identify partners for collaborative projects.

Moreover, ASTER develops and conducts test studies for new technologies, such as the development of the intranet for exchange of information among SMEs, and a pilot study aiming to assess the socio-economic issues of EDI use by the SMEs of the region. Also, it acts as an information systems centre, providing services of requirements analysis for innovative IT uses, such as teleworking, and technical assistance for industrial automation, and new process technologies. In short, ASTER acts as an information broker both to the industrial actors of the region and to their potential customers.

The adopted strategy

Taking the industrial experience of the region of Emilia Romagna as a model, the UNDP/UNIDO consultants to the Cypriot government recommended a strategy of economic restructuring that involved action at three levels: the small producer firms (SMEs), sector-wide and national.

The most substantial structural recommendation concerned the formation of co-operative entities of small firms in a number of industrial sectors. Co-operative networking was suggested as a suitable organizational form for functions such as finance, production, marketing, research and training that individual firms were too small to carry out effectively. Specifically, the UNDP/UNIDO team suggested that the small manufacturing companies would benefit from the formation of consortia to carry out such collective services for themselves.

Further developments regarding finance, design, training and human resources were suggested for the national level. The strategy required an industrial banking system capable of taking a long-term development view. To that end, the country's Development Bank was advised to play a central role in promoting industrial restructuring by becoming a front line consultancy agency providing firms with support to re-orient their activities along the flexible specialization lines.

Finally, the UNDP/UNIDO study, reflecting the significance attributed to geographic concentration in flexible specialization, advised local and government authorities to plan for district industrial estates which would provide common facilities and services to specific industries.

Beyond the structural aspects of this industrial intervention, the social and cultural characteristics in Cyprus were expected to play a significant role in the success of the flexible specialization experiment. The island's craft tradition, high percentage of educated population, strong presence of trade unions which had historically trusted the government and supported its policies, strong family and local ties were considered promising factors for the success of a flexible specialization strategy.

However, such a strategy required a substantial change in the relationship between industry and government. Government was to assume a facilitating role, particularly for setting up the national level institutions outlined above, but it had to abolish its protectionist policies. Reciprocally, business owners and work forces were required to appreciate the need for the recommended restructuring and adopt the necessary initiatives in a creative way. In essence, the strategy amounted to re-orientation of attitudes, practices, and work and business values of a large network of people and organizations; in short a substantial institutional change.

Implementation of the flexible specialization strategy

The adoption of the flexible specialization strategy implied action for extensive organizational reform. Individual firms ought to consider their competitive position in the local and international market and adjust their production and business operations to become part of the industrial networks. New organizational entities – the consortia – with functions complementing and rationalizing the performance of their individual firm members, had to be created. Specialized service providers had to be established to support both the producer firms and their consortia.

A number of such initiatives were taken with varying degrees of success. The most visible area of activities was in the formation of consortia. Much less was carried out for the development of service providers, while rather minor changes took place within the small firms as a result of the strategy.

The consortia

The consortia developed in the furniture manufacturing sector are indicative of the kind of interorganizational collaboration triggered by the flexible specialization initiative. The first consortium created in the furniture manufacturing sector under the flexible specialization initiative was AtoZ. It was founded in 1987 by 12 furniture making firms based in Limassol. These firms varied in size from 15 to 40 employees. The purpose of the consortium was to promote common marketing for the 12 shareholder SMEs. It built its central office at an industrial district of its SME member, and began operations by creating showrooms in all major cities in the island.

AtoZ began operations with an informal manual system to transfer customer orders from the showrooms to the manufacturing firms production lines. When an order was placed by a customer a standard form was filled and the details were communicated to the specialized producer, mainly by telephone. A number of problems were experienced, such as incomplete information and misunderstandings in communicating order details, which in turn caused delays in meeting delivery dates.

To overcome such problems the executive committee of the consortium decided to computerize order processing. Technically and operationally, the computer-based information system developed for this task was relatively simple. A database was installed at the headquarters of the consortium. Order details are transferred to the headquarters, entered in the

database and consequently distributed to the producers. The system produces information lists on orders, delivery dates, customers, and selling prices, and is generally considered to have resulted in a positive efficiency impact. Later, this system was used to implement a penalty system for late deliveries.

Encouraged by this positive experience, the executive director developed plans for two further technology projects: a network to connect the showrooms with the consortium head-quarters, and a design system through which the manufacturers would be able to propose models and then display them at the showrooms of the consortium to monitor customers' response. However, these ideas did not find a great deal of support by the shareholder SME firms and have not been implemented.

Another consortium, Line-11, comprising 11 small furniture manufacturers in the industrial district of Larnaca was established in 1991. It is intended to serve the same purpose as AtoZ, to market the products of its shareholder members under a common trademark, and its oper-ations and management were very similar to those of AtoZ. Indeed its first executive director was a former director of AtoZ.

However, Line-11 continues to rely on largely informal communications for the dispatching of customer order details. Telephone and fax are seen as perfectly adequate by its share-holders, and by 1997, the time of last interview held with its director, there were no comput-erization plans.

Substantially different from the two consortia outlined above is MFC, a consortium estab-lished in 1994 with the aim to achieve efficiency in one particular specialized process of fur-niture making, panel cutting, through utilization of computer-controlled production machinery. MFC involves four furniture manufacturers of approximately the same size, 40–50 employees. The initial idea was to equip the consortium by pulling together existing machines and tech-nical staff of its members. However, a number of problems emerged when the implementa-tion of such a strategy was thought out. Existing machines were found to be obsolete, with limited capacity and capability, and incompatible with each other. Moreover, it was not easy to release employees from other duties in their firms and transfer them to the new organization. It was decided to set up MFC by purchasing new computer-controlled production machines, and by transferring only a few employees from the shareholder firms.

The work of panel cutting at MFC is carried out by nine workers trained to operate the com-puter-controlled machines, and supervised by a director with the support of a secretary. Strate-gic management is the responsibility of a board committee comprising the owners/managers of the member firms and the director.

Initially, the goal set was to achieve 60% utilization of the capacity of the computer-controlled machines' optimal capacity within 3 years of operation. That target was met within the first 6 months, covering all the production needs of the four members of the consortium and allowing surplus capacity that could be used by taking orders from non-member firms.

Despite the success in achieving the initial goal of the consortium, there are obvious inef-ficiencies in the use of the computer-controlled production technology. Details on panel cutting are received on manual forms that include designs of the ordered products. Such order details are first typed on the machine, as input to an optimization algorithm that calculates the size

of the panels to be used in order to minimize waste of raw materials. Subsequently, and according to the production schedule, the output of the optimization application and relevant programmes are typed into the production machines. The production process involves several steps and different machines. Data and software commands are reloaded at each step with frequent mistakes and significant delays. At the time of the study, the consortium had no plans to integrate the operations of the optimization algorithm and the production machines.

Information services

One intermediary service provider set up at the national level, of particular relevance to this case study, is the Institute of Technology (IOT). It was established in 1992 as an agency of the ministry of Commerce and Industry with the mandate to support the technological upgrading of the manufacturing industry, and to create new technology industrial units. Among the aims of the IOT was to establish an information technology centre, and to provide consultancy services on technology and industrial development.

The information centre of the IOT was intended to provide information on a wide range of areas, such as market research, trading, abstracts of research relevant to various industries, industrial policy and regulations of the European Union, statistics, academic and professional journals and programmes on human resources development. In 1996, IOT assumed also responsibility for administering a government plan, partly funded by the World Bank, of subsidising consultancy services on IT.

However, the impact of the IOT information and consultancy services is still to be felt. The small firms and the consortia of the furniture industry have not made any substantial use of these resources.

The producer firms

The small production outlets continue to be the most significant agents of the industrial network of flexible specialization. They were expected to adjust their operations and develop their organizational capacity taking part in the wider network of agencies that complement or support their business. For example, the firms taking part in the AtoZ and Line-11 consortia were intended to remain independent organizations, but they were advised to specialize by product, such as children's furniture, garden furniture, pinewood furniture, or office furniture. The firms that formed the MFC consortium agreed to allocate all panel cutting to their consortium.

Initially, the producer firms appeared to take advantage of the new opportunities offered by the various intermediary organizations set up by the government. For example, several firms made use of the new financial schemes of the Development Bank to expand their business, and sought to upgrade the skills of their workforce through government-sponsored training programmes.

They were particularly appreciative of the opportunities to enhance their production technology. Thus, the MFC consortium was created by the initiative of the owner of one firm and has continued to enjoy the commitment of its member firms.

There has been much less appreciation of and commitment to rationalizing business strategy. Within 2 years of the creation of the AtoZ and Line-11 consortia, their members started acting antagonistically both to each other as well as to the consortia that were supposed to be their marketing and sales agencies. Although initially the consortia boosted sales of the products of their members, they could not absorb all their production capacity. The owners/managers of the small firms reverted to their preconsortium state, each producing and selling on their own a broad range of products, rather than specializing by product. Each of them were competitors as well as suppliers of their consortium. Today, they often supply their products to the consortia at selling prices higher than those they offer directly to their customers. Thus, AtoZ and Line-11 are now viewed as customers with whom producers have an agreement to supply a particular line of products with a prespecified mechanism of pricing and delivery timing.

The industrial restructuring had little effect on the management of the small firms. Again, the most significant changes concern the rationalization of production that resulted from the use of computer-controlled machines. Producer firms had to standardize their product parts in order to be able to use the efficient new machines. In turn, such standardization benefited the MFC consortium as an independent business organization, increasing the efficiency of its operations, reducing errors in orders, and releasing spare machine capacity of further business.

However, the structure, management and business culture of the small firms remained unchanged, mitigating rather than contributing to the industrial change initiative. The owner/manager of the firm retains total control of the business through communications and task allocation. Unlike the traditions of Emilia Romagna, there is no co-operative culture to foster trust relationships among the entrepreneurs who strive for the growth of their family business.

Another aspect that remained unchanged is the perceived role of government institutions as protectors of the survival of local business concerns and providers of supporting services. Nurtured in the protectionist regime of the post-war boom in the 1970s and 1980s, the owners of the small firms did not manage to develop an export orientation and have not developed a competitive attitude appreciative of market information services.

Under such conditions the information systems requirements of the producer firms remain very limited. Computers are extensively used for administrative tasks, but the potential of IT to support decision making remains irrelevant in an environment of informal management. As the interorganizational links that the flexible specialization strategy intended to establish have remained very limited no need for network communications has arisen. Moreover, lack of export orientation makes international information communications irrelevant.

DISCUSSION

The industrial restructuring initiative in Cyprus did not have the impressive results observed in the region of Emilia Romagna it sought to emulate. The limited networks of producers and

service providers that emerged after the adoption of the flexible specialization model in the 1980s did not develop the expected capacity to compete beyond the shores of the island. ICT clearly did not assume a strategic enabling role, and continues to be a weak actor in the networks of the furniture manufacturing sector.

Therefore, the question this case study raises is why IS development did not acquire high significance within the implementation of the re-organization strategy of the flexible specialization in Cyprus. The discrepancy of the case from the generally expected enabling role of ICT could be examined in various ways, each contributing particular perspectives of the situation. A static analysis of factors and actions significant for effective IS innovation would point out several omissions: none of the organizations studied had an IS strategy; no business process redesign was undertaken to exploit the potential of IT for organizational reform; and there were no 'champions' for IT innovation. An analysis of the 'fit' of technology to the organizational context would elaborate on the limited information requirements and the poor technology skills of the SMEs and their consortia. A static contingency analysis of the options available to the SMEs within their competitive environment would perhaps show that the managers of the SMEs did not address themselves to the opportunities opened within the new structure of flexible specialization.

Although each of these perspectives contributes valid observations, they do not explain why IS innovation did not acquire a significant role, and therefore had limited value for the effort to understand what interventions are needed to introduce effective change. Indeed, such observations, if not accompanied by adequate understanding of the processes responsible for them, may lead to wrong interventions. For example, one could advise SMEs to draw an IS strategy aligned to their business objectives, or apply BPR, actions completely futile within their context.

The contextualist approach suggested in this paper provides a way to gain insights into the processes that explain the role attributed to IS innovation. After the first contextualist principle – that IS innovation is inseparable from the endeavours of organizational change – the reasons why IS innovation has been so limited should be traced by examining why organizational re-structuring has been limited in the first place. And according to the second and third principles, a process of socio-technical change should be studied by considering the combination of technical/rational actions and institutional forces at three different levels of context: international, national and organizational. An analysis along these principles reveals the following influences on the organizational change process:

(a) Technical/rational ideas and action at the international level. A prominent technical influence in this case is the flexible specialization theory and its adoption by international aid agencies. It can be argued that the limited use of ICT is due to the limitations of the flexible specialization model, which did not include a convincing strategy for the mobilization of ICT for management purposes. The socio-economic theory of flexible specialization does not elaborate on organizational processes, management and information systems. It is concerned with the macro system of production and consumption and with relationships between macro-institutional entities such as labour, government agencies, efficient production and distribution chains, and market demand. Technology does feature within the list of factors considered sig-

nificant for a flexible specialization, but this refers almost exclusively to production technology. Thus, the initial analysis of what changes were required, did not direct attention to information systems, information resources for management, and information-based decision making. The traditional informal type of managing family-owned business firms was left intact. Even less effort was made to introduce management appropriate for the more complex entities that the new industrial model was aiming to develop.

(b) Institutional influences at the international level. All three types of coercive, mimetic and normative forces played a role in the initial decision to adopt the flexible specialization strategy. The government of the country was facing international pressure to restructure its economy, and abolish protection policies. Professional 'economic planners' were involved in designing a new economic structure, thus introducing prevalent international socio-economic ideas. Finally, there was a strong element of organizing vision, as the 'image' of Third Italy – a region that succeeded to preserve traditional values and, at the same time, to achieve affluence within the modern global economy – appealed to the government and the local industrialists.

(c) Technical/rational initiatives at the national level. There has been a clear government policy making and planning intervention in this case. Flexible specialization was adopted officially as the government policy to develop an export-oriented manufacturing sector. The wisdom of such a policy is questionable, and indeed towards the end of the 1990s government economic policy shifted emphasis to services, relaxing the significance attributing to manufacturing for the country's economic development. However, in the meantime there have been a number of government initiatives as part of the implementation of the flexible specialization strategy, including relevant legislation, financial services, and the establishment of the Institute of Technology. These initiatives offered an extensive range of support for the reform process.

(d) Institutional influences at the national level. Perhaps the most significant institutional aspect that sustained the choice of the flexible specialization strategy is the 'organizing vision' of a small island economy claiming a place in the 'club' of industrialized countries. To that end, the re-organization of the small manufacturing firms was accepted as a desirable process. But, another strong institutional aspect that acted as an impediment to such a 'vision' is the traditional relationship between government and industry, and the parochial attitude of the local industrialists. The small manufacturers were not able to transform from government-protected local entrepreneurs to export-oriented global market actors.

(e) Technical/rational action at the organizational level. A number of technical aspects associated with the re-organization efforts and IS innovation are found in the history of this case. There have been planned and formally executed restructuring initiatives, including the formation of consortia, some efforts for employees retraining, some redesign of business processes. However, particularly noticeable is the limited capacity of formal professional management in the SMEs, which to some extent explains why the strategic value of ICT-based information systems has not been exploited. Lack of formal management capacity in SME companies has been shown to be an impediment to the use of computer-based information systems in several other countries (Lind 2000; Volkow 2000).

(f) Institutional aspects at the organizational level. The new industrial organization was not in harmony to the underlying values of the traditional way of running the small manufacturing firms, and the managerial order implied in the development of export-oriented industrial networks clashed with the entrepreneurial rationality of the SME owners. Unlike the initial idea of local collaboration within traditional communities, the Cypriot traditional family and business ownership values created mistrust for the partnership schemes involved in the flexible specialization. SME owners were reluctant to relinquish power of the running of their business to professional managers and no complex heterogeneous networks that require the management of interdependencies were developed. Consequently, the information requirements of the small informally managed firms did not provide a need for sophisticated technology-based information systems.

CONCLUSIONS

The argument put forward in this paper is that in order to understand the realistic potential of ICT innovation we should study the way such innovation is related with processes of socio-organizational change. Moreover, IS studies should go beyond the technical/rational actions of professional experts and managers, and should consider the institutional forces – both within an organization and its environment – that necessitate or legitimate such actions. The explanatory capacity of these arguments were demonstrating by examining the reasons for the limited IS innovation that took place in the case of the implementation of organizational reform in the manufacturing sector in Cyprus.

Such contextualist analysis is not only an appropriate approach for academic research aiming at explaining complex situations, failures, or successes of IS innovation. It is also a necessary competence for professional practice. If, as it is now widely recognized, ICT innovation does not deterministically lead to desirable effects of economic performance and social change, there is a crucial need to develop professional capacity to facilitate the exploitation of technological potential in relation to the socio-organizational processes of change within which innovation is embedded.

Such analysis is particularly relevant for countries which pursue ICT-based development planning under the perceived imperatives of the global economy and by emulating other regions' successful techno-economic policies. For example, during the 1990s there has been a widespread adoption of 'information society' policies throughout the world. In most such cases IS experts limit their role in assisting with the implementation of the technology innovations. At best they try to 'fit' the technology to the local organizational characteristics. Nevertheless, within a changing socio-organizational environment such a 'fit' defies the policy objectives new technology is expected to serve, as the desirable objective is change. IS professionals must be able to judge the potential, develop and manage information systems in a changing context. To do so they need to develop the capacity to take into account the processes of change across layers of context, and to judge the forces that contribute to the realization or impede initial plans in order to pursue feasible action.

At present, though, such an analysis is beyond the capacity of IS professionals. Most of the knowledge developed and taught in the IS field promotes a normative professional practice, based on a limited perception of context. Broader organizational processes are usually outside the perceived terms of reference of IS practice. Further research is needed to develop appropriate analytical knowledge to equip professionals with capabilities to pursue contextualist analyses. Such knowledge is probably to be more judgmental than method driven, more analytical than normative, and oriented towards advising rather than deciding and doing. The argument that IS innovation is inseparable from social processes unfolding through layers of context partly by technical rational calculations and partly under the influence of institutional forces poses a challenge to redefine the role and knowledge of IS professionals.

REFERENCES

Akrich, M. (1992) The description of technical objects. In: *Shaping Technology/Building Society*, Bijker, W.E. & Law, J. (eds), pp. 205–224. MIT Press, Cambridge, MA.

Avgerou, C. (1989) Information systems in Social Administration: factors affecting their success. Unpublished PhD thesis, London School of Economics.

Avgerou, C. (1996) Transferability of information technology and organisational practices. In: *Global Information Technology Socio-Economic Development*, Odedra-Straub, M. (ed.), pp. 106–115. Ivy League, Nashua, New Hampshire.

Avgerou, C. & Walsham, G. (2000) *Information Technology in Context: Studies from the Perspective of Developing Countries*. Ashgate, London.

Avison, D.E. & Fitzgerald, G. (1996) *Information Systems Development: Methodologies, Techniques and Tools*. Blackwell Science, Oxford.

Baskerville, R., Smithson, S., Ngwenyama, O. & DeGross, J.I. (1994) *Transforming Organizations with Information Technology*. North-Holland, Amsterdam.

Bhatnagar, S.C. & Odedra, M., eds (1992) *Social Implications of Computers in Developing Countries*. Tata McGraw-Hill, New Delhi.

Bijker, W.E. & Law, J., eds (1992) *Shaping Technology/Building Society*. MIT Press, Cambridge, MA.

Bloomfield, B.P., Coombs, R., Knights, D. & Littler, D. (1997) *Information Technology and Organizations: Strategies, Networks, and Integration*. Oxford University Press, Oxford.

Callon, M. (1991) Techno-economic networks and irreversibility. In: *A Sociology of Monsters Essays on Power, Technology and Domination*, Law, J. (ed.), pp. 132–161. Routledge, London.

Callon, M. & Law, J. (1989) On the construction of sociotechnical networks: content and context revisited. *Knowledge Society*, **9**, 57–83.

Checkland, P. (1981) *Systems Thinking Systems Practice*. John Wiley, Chichester.

Chrysohos, N. (1999) Information systems and organisational change: the case of flexible specialisation in Cyprus. Unpublished PhD thesis, London School of Economics.

Ciborra, C.U. (1991) From thinking to tinkering: the grassroots of strategic information systems. In: *Proceedings of the 12th International Conference on Information Systems*, pp. 283–292. New York.

Ciborra, C. (2000) *From Control to Drift: the Dynamics of Corporate Information Systems*. Oxford University Press, Oxford.

Ciborra, C. & Lanzara, G.F. (1994) Formative contexts and information technology: understanding the dynamics of innovation in organizations. *Accounting, Management and Information Technology*, **4**, 61–86.

Cooke, P. & Morgan, K. (1994) Growth regions under duress: renewal strategies in Baden Wurttemberg and Emilia-Romagna. In: *Globalization, Institutions, and Regional Development in Europe*, Amin, A. & Thrift, N. (eds), pp. 91–117. Oxford University Press, Oxford.

DeMarco, T. (1978) *Structured Analysis and Systems Specification*. Prentice Hall, Englewood Cliffs, New Jersey.

DeSanctis, G. & Poole, M.S. (1994) Capturing the complexity in advanced technology use: adaptive structuration theory. *Organization Science*, **5**, 121–147.

DiMaggio, P.J. & Powell, W.W., eds (1991) The iron cage revisited: institutional isomorphism and collective ratio-

nality in organizational fields. In: *The New Institutionalism in Organizational Analysis*, pp. 63–82. The University of Chicago Press, Chicago.

Earl, M.J. (1987) Information systems strategy formulation. In: *Critical Issues in Information Systems Research*, Boland, R.J. & Hirschheim, R.A. (eds), pp. 157–178. John Wiley, Chichester.

Earl, M. (1989) *Management Strategies for Information Technology*. Prentice Hall, Hemel Hemstead.

Grint, K. & Woolgar, S. (1997) *The Machine at Work: Technology, Work and Organization*. Polity Press, Cambridge.

Hammer, M. & Champy, J. (1993) *Reengineering the Corporation, A manifesto for Business Revolution*. Nicholas Brealey, London.

Hirschheim, R., Klein, H. & Lyytinen, K. (1995) *Information Systems Development and Data Modeling: Conceptual and Philosophical Foundations*. Cambridge University Press, Cambridge.

Hirschheim, R., Klein, H.K. & Lyytinen, K. (1996) Exploring the intellectual structures of information systems development: a social action theoretical analysis. *Accounting, Management and Information Technology*, **6**, 1–63.

Introna, L.D. (1997) *Management, Information and Power: a Narrative of the Involved Manager*. Macmillan, Basingstoke.

Kling, R. (1980) Social analysis of computing: theoretical perspectives in recent empirical research. *Computing Surveys*, **12**, 61–110.

Kling, R. (1987) *Defining the Boundaries of Computing Across Complex Organizations*. John Wiley, Chichester.

Kling, R. & Scacchi, W. (1980) Computing as social action: the social dynamics of computing in complex organizations. In: *Advances in Computers*, pp. 19. Academic Press, New York.

Kling, R. & Scacchi, W. (1982) The web of computing: computing technology as social organization. In: *Advances in Computers*, pp. 21. Academic Press, New York.

Lacity, M. & Hirschheim, R. (1993) *Information Systems Outsourcing*. John Wiley, Chichester.

Land, F.F. & Hirschheim, R.A. (1983) Participative systems design: rationale, tools and techniques.' *Journal of Applied Systems Analysis*, **10**, 91–107.

Latour, B. (1991) Technology is society made durable. In: *A Sociology of Monstrers: Essays on Power, Technology and Domination*, Law, J. (ed.), pp. 103–131. Routledge, London.

Law, J. & Callon, M. (1992) The life and death of an aircraft: a network analysis of technical change. In: *Shaping Technology/Building Society*, Bijker, W. E. & Law, J. (eds), pp. 21–52. MIT Press, Cambridge, MA.

Lawrence, P.R. & Lorsch, J.W. (1969) *Organization and Environment*. Richard D. Irwin, Homewood, IL.

Lind, P. (2000) On the design of management assistance systems for SMEs in developing countries. In: *Information Technology in Context: Studies from the Perspective of Developing Countries*. Avgerou, C. & Walsham, G. (eds), pp. 46–55. Ashgate, London.

Lyytinen, K. (1992) Information systems and critical theory. In: *Critical Management Studies*, Alversson, M. & Willmott, H. (eds), pp. 159–180. Sage, London.

Lyytinen, K. & Lehtinen, E. (1984) On information modeling through illocutionary logic. In: *Report of the Third Scandinavian Research Seminar on Information Modelling and Data Base Management*, Kangassalo, H. (ed.), pp. 35–118. University of Tampere, Tampere.

Madon, S. (1993) Introducing administrative reform through the application of computer-based information systems: a case study in India. *Public Administration and Development*, **13**, 37–48.

Meyer, J.W. & Rowan, B. (1991) Institutionalized organizations: formal structure as myth and ceremony. In: *The New Institutionalism in Organizational Analysis*, Powell, W.W. & DiMaggio, P.J. (eds), pp. 41–62. Chicago University Press, Chicago.

Mumford, E. & Weir, M. (1979) *Computer Systems in Work Design: the ETHICS Method*. Associated Business Press, London.

O'Callaghan, R. (1998) EDI, organizational change and flexible strategies. In: *Information Technology and Organizational Transformation: Innovation for the 21st Century Organization*, Galliers, R. & Baets, W.R.J. (eds), pp. 179–193. John Wiley, Chichester.

Odedra-Straub, M., ed. (1996) *Global Information Technology Socio-economic Development*. Ivy League, Nashua, New Hampshire.

Olle, T.W., Sol, H.G. & Virrijn-Stuart, A.A. (1986) *Information Systems Design Methodologies: Improving the Practice*. North Holland, Amsterdam.

Orlikowski, W.J. (1992) The duality of technology: rethinking the concept of technology in organizations. *Organization Science*, **3**, 398–427.

Orlikowski, W.J. (1996) Improvising organizational transformation over time: a situated change perspective. *Information Systems Research*, **7**, 63–92.

Orlikowski, W.J., Walsham, G., Jones, M.R. & DeGross, J.I. (1996) *Information Technology and Changes in Organizational Work*. Chapman & Hall, London.

Pettigrew, A.M. (1985) Contextualist Research: a natural way to link theory and practice. In: *Research Methods in Information Systems*, Mumford, E., Hirscheim, R., Fitzgerald, G. & Wood-Harper, A.T. (eds), pp. 53–78. North-Holland, Amsterdam.

Pfeffer, J. & Salancik, G.R. (1978) *The External Control of Organizations: a Resource Dependence Perspective*. Harper & Row, New York.

Piore, M. & Sabel, C. (1984) *The Second Industrial Divide: Possibilities for Prosperity*. Basic Books, New York.

Porter, M. & Millar, V. (1984) How information gives you competitive advantage. *Harvard Business Review*, **63**, 149–160.

Pyke, F., Becattini, G. & Sengenberger, W. (1990) *Industrial Districts and Inter-firm Cooperation in Italy*. International Institute for Labour Studies, Geneva.

Schware, R. & Kimberley, P. (1995) *Information Technology and National Trade Facilitation, Guide to Best Practice*. The World Bank, Washington DC.

Scott Morton, M.S. (1991) *The Corporation of the 1990s, Information Technology and Organizational Transformation*. Oxford University Press, New York.

Swanson, E.B. & Ramiller, N. (1997) The organizing vision in information systems innovation.' *Organizational Science*, September/October, 458–474.

Talero, E. & Gaudette, P. (1995) Harnessing information for development: a proposal for a World Bank Group Vision and strategy. *Information Technology for Development*, **6**, 145–188.

Volkow, N. (2000) Strategic use of information technology requires knowing how to use information. In: *Information Technology in Context: Studies from the Perspective of Developing Countries*, Avgerou, C. & Walsham, G. (eds), pp. 56–69. Ashgate, London.

Walsham, G. (1993) *Interpreting Information Systems in Organizations*. John Wiley, Chichester.

Willcocks, L., Fitzgerald, G. & Feeny, D. (1996) Sourcing decisions: developing an IT outsourcing strategy. In: *Investing in Information Systems: Evaluation and Management*, Willcocks, L. (ed.), pp. 333–353. Chapman & Hall, London.

Yourdon, E. (1989) *Modern Structured Analysis*. Prentice Hall, Englewood Cliffs, New Jersey.

Biography

Chrisanthi Avgerou is Senior Lecturer in Information Systems at the London School of Economics. She chairs the IFIP WG 9.4 group on computers in developing countries and is vice-chairperson of the IFIP Technical Committee 9 on the social implication of Information Technology. Her research interests include the relationship of information technology to organizational change, and the role of IT in socio-economic development.