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Contexts of Relevance in Explanatory Case Studies in Information Systems: Ubiquitous Information Technology Implementation in Organizations

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CONTEXTS OF RELEVANCE IN EXPLORATORY CASE STUDIES IN INFORMATION SYSTEMS: UBIQUITOUS INFORMATION TECHNOLOGY IMPLEMENTATION IN ORGANIZATIONS

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Abstract

Case studies of the organizational implementation of traditional business computing have often emphasized the importance of context in research design and data analysis. The emergence of computing phenomena that pervade different contexts within and even beyond the organizational boundary suggests the need to disaggregate the notion of context to allow for finer levels of contextual analysis. Indeed we demonstrate that a failure to consider interdependent levels of context in organizational case studies of computing technologies that even approach ubiquity runs the risk of partial and even incorrect conclusions being drawn. We illustrate this argument by means of two explanatory case studies of intranet and mobile technology implementation in organizations. Based on the extant literature on context in case study design and examples drawn from the cases, we propose a range of interconnected and interrelated contexts to consider in the research design of explanatory cases of ubiquitous technology implementation in organizations.

Keywords: Case studies, context, research methodology, organizations, implementation, ubiquitous information technology

Introduction

The study of contemporary phenomena in a real-life context is one of the distinguishing characteristics of case study research (Yin 1994). In this regard, case studies of traditional business computing phenomena have often been conducted within the “natural setting” (Benbasat et al. 1987) of the organizational context (e.g., Cooper and Zmud 1990; Franz and Robey 1986; Lucas et al. 1990; Markus 1983; Orlikowski 1996; Robey and Sahay 1996; Sabherwal and Robey 1993; Swanson 1987; Walsham 1993).

We are currently witnessing the emergence of the ubiquitous computing paradigm (Lyytinen and Yoo 2002a; Weiser 1991, 1993). For many organizations today, computing technologies such as personal digital assistants (PDAs), “smart” mobile phones and other handheld computing devices extend the office wirelessly to employees’ briefcases, shirt pockets, cars, and homes. Even within organizations, computing technologies such as intranets entice various organizational units (outside the traditional IT function) and even individuals to become involved with their own implementation activities (Jarvenpaa and Ives 1996; Lamb and Davidson 2000; Scheepers 2003).

Past studies of IT in organizations have stressed the importance of examining a process such as IT implementation within its historical and social context in the organization (e.g., Kling 1996; Orlikowski and Baroudi 1991). The emergence of computing phenomena that seem to pervade different contexts within and even beyond the organizational boundary suggests the need to
revisit our view of context. In this paper, we thus explore the question of how researchers should consider context(s) in the design of explanatory case studies of ubiquitous IT implementation in organizations.

We conducted a series of explanatory case studies on the implementation of (1) intranet and (2) mobile technologies in organizations between 1997 and 2002. With the benefit of hindsight, we reflect on the research design of these studies in terms of context. Although intranet and mobile technology only approach ubiquity (Lyytinen and Yoo 2002a), we found that even for these technologies a range of different related levels of context within and beyond the organizational boundary shape their implementation processes (and vice versa). These include supra-contexts such as society at large, other organizations globally, the media and popular IT press, and individuals’ private contexts; and sub-contexts such as organizational units, project groups, and the individual (employee) context within the organization. We show that a failure to consider these interdependent levels of context runs the risk of partial and even incorrect conclusions being drawn.

Our findings show that it is necessary to disaggregate the conflated notion of context in explanatory case studies to allow for finer levels of contextual analysis. The examples of interrelated levels of context from the illustrative cases can assist researchers to systematically consider finer levels of contextual analysis at an operational level of detail.

The paper is structured as follows. First, we review the literature on context in case study research. We draw on the notions of horizontal and vertical (sub- and supra) contexts and illustrate how these are relevant in our case studies of organizational implementation of the two mentioned computing technologies. We conclude with practical suggestions for considering vertical and horizontal contexts in studies of ubiquitous technology implementation in organizations.

**Literature Review: Context in Case Study Design**

In this review, we reflect on perspectives on contextualism and highlight concepts in the methodological literature that specifically address context and its operationalization in case study design. Given the scope of this paper, we restrict the literature review to issues of relevance to in-depth case designs in organizational contexts.

The study of contemporary phenomena in a real-life context is one of the distinguishing characteristics of case study research (Yin 1994). Miles and Huberman (1994) define context, such as the context of a person’s behavior, as immediate relevant aspects of the situation (e.g., the person’s physical location, involved parties, history of contacts) as well as relevant aspects of the social system in which the person appears (e.g., department, company, local community). Explanatory case studies in particular seek to discover the meaning of phenomena such as events or practices by placing these within a specific social context (Boland 1985; Neuman 2000).

The notion of context is widely addressed in the social research methodology texts, the case study literature in general, and also by methodologists within the IS field. In organizational studies of information technology in particular, Orlikowski and Baroudi (1991) argue that the design and use of information technology is “intrinsically embedded in social contexts, marked by time, locale, politics, and culture.” They conclude that the neglect of such influences may result in incomplete assessments of IS phenomena. Such views are also reflected in advice on qualitative data analysis where it is argued that the meaning of a specific event, statement, or action should be analyzed in context, else misunderstanding will likely result (Klein and Myers 1999; Miles and Huberman 1994; Neuman 2000).

The origins of contextualism are often attributed to the work of the philosopher Pepper (1942). Pepper views contextualism as a root metaphor for understanding phenomena or events, describing the process of analyzing phenomena as the interplay between phenomena and their contexts. In his work, Pepper introduces a range of subtle ideas about the attributes of context. Pettigrew (1985a, 1985b, 1990) has applied Pepper’s ideas into a theory of method (called contextualism), especially for studies of organisational change. Pettigrew (1985b) argues that a contextual analysis of organizational change should incorporate both a horizontal and vertical analysis of context. A horizontal analysis examines the interconnectedness of events over time (past, present, and future), which is especially relevant in longitudinal studies of organizational change processes (Pettigrew 1990). Pettigrew further argues for a vertical level of analysis whereby the reciprocal relationship between process and interdependent sub- and supra-contexts (within and beyond the organisational context) are examined (Pettigrew 1985a). In Pettigrew’s terminology sub-contexts within the organization would, for example, address departmental, group, and individual levels of analysis concerning the change. Analysis of supra-contexts could, for example, examine environmental issues beyond the organizational boundary that have a specific impact on intra-organizational change processes.
In organizational change processes, Pettigrew (1990) further suggests that context shapes the change process under study and vice versa, that process shapes context, either in the direction of preserving or altering context. This mutuality between context and processes in IS implementation is well documented (e.g., DeSanctis and Poole 1994; Lee and Grover 2000; Orlikowski 1992). As such, Pettigrew advocates for processual, comparative, pluralist, historical, and contextual data to be collected to “examine the reciprocal relations between process and context at different levels of analysis” (1990, p. 277). These different sets of data can be used to triangulate and cross check different views through an iterative process (Pettigrew 1990). This form of triangulation (using multiple sources of evidence) is also advocated by others (e.g., Patton 1990; Yin 1994).

In the case study literature, the importance of context is widely addressed. Yin (1994) contrasts the strong emphasis placed on context in the case study approach with alternative research methods such as experiments (that seek to detach phenomena from contexts) and surveys (that have a limited ability to investigate the context of phenomena). Despite broad agreement on the importance of context in the case study approach, there are different viewpoints on how to operationalize the concept methodologically in research design. These differences are mostly attributable to divergent epistemological positions (positivist, interpretivist, critical) of the authors (Guba and Lincoln 1994; Myers 1997; Orlikowski and Baroudi 1991). As such, context is addressed differently in the research purpose (e.g., explanation, theory building, hypotheses testing, triangulation), in how context is recorded (as variables, qualitative indicators), in the motivation for site selection (e.g., to enable literal comparison, for replication, to gain rich insights), and in decisions about units of analysis (Benbasat et al. 1987; Darke et al. 1998; Eisenhardt 1985; Kaplan and Duchon 1988; Lee 1989a, 1989b, 1991; Patton 1990; Shanks 2002; Walsham 1995; Yin 1994).

Yin views the unit of analysis as one of the key considerations in case study research design. The unit of analysis relates to what the research will investigate, i.e., the phenomenon of interest (Yin 1994, p. 21). Yin notes that it can be quite problematic to pinpoint the unit of analysis at the commencement of research. However, once the unit of analysis has been decided upon, the context for the case study becomes everything that is outside the unit of analysis (Yin 1994, p. 24). This view demarcates the immediate target of the study (the unit of analysis) from its context. Yin further distinguishes between case study designs with a single unit of analysis (holistic designs) and designs with multiple units of analysis. Multiple units of analysis are embedded subunits within the larger unit of analysis (Yin 1994, p. 41). Subunits hence share the larger unit of analysis as context, for example, specific employees (subunits) in the same organization (context). Yin highlights certain disadvantages to both holistic and embedded designs. Holistic designs run the risk of the researcher fixating on subunits, without returning to the larger unit of analysis (their context).

Methodologists within the IS field have specifically addressed the role of context in research design. For example, Klein and Myers (1999) list contextualization as one of their seven principles for conducting and evaluating interpretive field research. The principle of contextualization requires that research designs accommodate the social and historical background of the research setting to describe how the situations under investigation emerged (similar views are expressed in organizational ethnography, e.g. Van Maanen 1979). In terms of context, the views of Klein and Myers on historical background correspond to Pettigrew’s horizontal context (past events) and, similarly, their social background principle could be related to Pettigrew’s views of supra-contexts.

Context is further emphasized during the analysis and interpretation of case study data, especially within-case analysis. Again depending on epistemology, the advice in the literature differs in terms of the relative importance of and approach to how context is accounted for. Klein and Myers propose the principle of the hermeneutic circle, which argues all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form. In this respect, “the whole” is seen as a context that again could be part of an even larger context (Klein and Myers 1999; Myers 1994). In terms of interrelated contexts, Patton (1990, p. 385) identifies “layers of possible analysis” of case study data such as the individual, program, institution or group. Similarly, Miles and Huberman suggest researchers draw context charts that graphically map various interrelationships among, for example, roles, groups and organizations that may make up the context of individual behavior (p. 102). Again an iterative approach is advocated to develop explanations through a process of condensing, sorting, and linking themes, patterns and clusters in the data (p. 101).

In the analysis of complex technology adoption processes in organizations in particular, various authors have shown how interrelated levels of context (environmental, organizational, subunit) all contribute to explaining subsequent processes such as implementation and secondary adoption at lower levels (e.g., the individual level) (Gallivan 2001; Orlikowski 1993; Rousseau 1985). Researchers should determine what level(s) and what corresponding measurements are necessary in the research design (Prescott and Conger 1995). The strongest results have been obtained when the research design matches the appropriate context of analysis (e.g., individual) with the respective measures for that level (e.g., personal technology use) (Fichman 1992). For
precision it thus becomes necessary to analyze complex organizational adoption/implementation technology processes in different phases and at various contextual levels of activity (Rousseau 1979).

Despite epistemological differences and varying degrees of emphases, the review suggests that there is agreement in the case study literature that context remains important in the study of phenomena. The review further highlights attempts by some authors to disaggregate context into finer levels of analysis such as sub-contexts, supra-contexts, the historical context, and so forth. Yet, there is currently no specific framework to assist researchers in considering interrelated contexts systematically at an operational level of detail. For organizational studies, Pettigrew’s suggestion of horizontal and vertical (sub- and supra) contexts is a useful point of departure. However, criticism of contextualism as a theory of method includes that it is vague and at the level of an abstract ideology that lacks operational detail (Greiner 1985).

We thus see the need for a framework to help researchers systematically consider finer levels of contextual analysis (especially vertical dimensions) at an operational level of detail in the design of case studies of ubiquitous computing phenomena in organizations. Other researchers of ubiquitous computing have also echoed this need (e.g., Lytytinen and Yoo 2002b).

**Illustrative Explanatory Cases**

In moving toward such a framework, we shall illustrate a number of interrelated contexts that should be considered in the research design of organizational case studies of ubiquitous computing phenomena. We do so by reflecting, with the benefit of hindsight, on the research design in terms of context of a series of explanatory case studies that we conducted into the implementation of intranet and mobile computing in organizations. In each case, we show the need to disaggregate context and that a sole focus on the organizational level of analysis will likely result in incomplete or incorrect conclusions being drawn.

Ubiquitous computing is considered as the next evolution in computing (Lytytinen and Yoo 2002a; Weiser 1991, 1993). Ubiquitous computing is seen as an environment in which interconnected computing devices allow enhanced use, but these computing devices are transparent to the user (Weiser 1991, 1993). Lytytinen and Yoo (2002a) describe the dimensions of ubiquitous computing through the characteristics level of embeddedness and level of mobility. The level of embeddedness refers to computing devices’ ability to interact dynamically with their environment, to seamlessly obtain information from their environment, and to adjust accordingly. The level of mobility is the capability to physically move computing services with the user (Lytytinen and Yoo 2002a, 2002b). As such, four different computing paradigms are identified: traditional business computing (low level of mobility and low level of embeddedness), mobile computing (low level of embeddedness and high level of mobility), pervasive computing (low level of mobility but high level of embeddedness) and ubiquitous computing (high level of mobility and embeddedness). Although intranets and mobile technology are not strictly classified as ubiquitous technologies, both of these information technologies can be regarded as examples of the transition toward ubiquitous computing when applied in the organizational context, not the least since they often manifest outside the auspices of the traditional IT function (Lamb and Davidson 2000; Lytytinen et al. 1998; Lytytinen and Yoo 2002a; Scheepers 2003; Weiser and Brown 1996).

**Intranet Implementation**

We conducted three in-depth, longitudinal organizational case studies of intranet implementation between 1997 and 2002. One of the aims with the case studies was to examine different intranet implementation approaches and to explain why some intranets became institutionalized, while others seemed to stagnate.

Three large organizations were chosen for in-depth study, one from Denmark and two from South Africa. The organizations were selected because they represented diversity in size and geographical scope and since they claimed to have some of the more advanced intranets in these countries at the time of the commencement of the study (1997). The findings from these studies have been published elsewhere (Damsgaard and Scheepers 1999, 2000; Scheepers 2003).

In terms of research design, the organization was initially the unit of analysis (Yin 1994). We developed a pilot interview questionnaire based on a number of macro change perspectives (e.g., Leavitt 1964), the IS implementation literature, data collection instruments of similar prior investigations, mechanisms for assessing the organizational culture (e.g., Robbins 1983; Schein 1992), etc. The initial pilot questionnaire was tested in a number of interviews in one of the case study organizations.
The data collected from the pilot study indicated a problem with our initial research design. Contrary to our expectations, we found not one intranet, but also multiple “child intranets” within the case organizations. These intranets were implemented by units (e.g., departments, divisions), and project groups, and there were even a number of unofficial bottom-up intranet efforts driven by individuals. In fact, many of these decentralized intranet efforts predated (and often triggered) the subsequent implementation of the formal organizational intranet. Similar observations of intranet implementation were later reported by other researchers (e.g., Lamb and Davidson 2000). We hence had to revise our initial research design to accommodate for such embedded levels (e.g., intranet implementation processes within units, project groups, and individual efforts).

This brief account highlights the risk of drawing incorrect or partial conclusions when analyzing ubiquitous technology implementation solely at an organizational level of analysis. For example, it would be incorrect to examine “the” intranet, without carefully determining to which intranet a particular interviewee is referring. In our studies, it transpired that many interviewees referred to their local (unit level or project intranet) as the intranet, whereas some other respondents would use the very same term in reference to the organization’s formal intranet (or some part thereof). This complexity also occurs when investigating the commencement date and even who the original “founder” of the intranet was. Again without accommodating sub-contexts, different reported commencement dates and intranet founders can easily lead to incorrect or partial conclusions being drawn such as disregarding the effect of earlier grassroots efforts in shaping the current intranet. This account confirms that information technologies can be interpretively flexible (Orlikowski 1992), and that data analysis should proceed cognizant of the different contexts in which the interviewees respond, sometimes even within the same interview.

With the benefit of hindsight, we can now also see the influence of other levels of context (even beyond the organizational level) on the implementation processes within the case organizations over the duration of the study. For example, the rise in the general awareness of the Web and the recognition of its potential for use in business contributed to these organizations adopting intranets. The publicity of the first intranet success stories in the media and popular IT press as well as intranets in peer organizations around 1997 also influenced views of an intranet as a corporate necessity, explaining the urgency we encountered in our case organizations. Although we didn’t specifically address these interrelated contexts in our research design at the time, they do account for why intranets were so rapidly and widely adopted in such a relatively short space of time (Eder and Igbaria 2001). In Table 1, we illustrate the vertical and horizontal contexts of relevance to intranet implementation in the case organizations.

![Table 1. Vertical and Horizontal Contexts of Intranet Implementation in Organizations](image)

<table>
<thead>
<tr>
<th>Vertical Contexts</th>
<th>Horizontal Context</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supra-contexts (extra-organizational)</strong></td>
<td><strong>Prior to case study: 1996-1997</strong></td>
</tr>
<tr>
<td>Society at large</td>
<td>Rise in the general awareness of Internet (Web) technology</td>
</tr>
<tr>
<td>Organizations globally</td>
<td>Initial pioneering intranet efforts</td>
</tr>
<tr>
<td>Media and popular IT press</td>
<td>Publicity of first intranet success stories</td>
</tr>
<tr>
<td><strong>Organizational Context</strong></td>
<td>Development of organization’s Internet site a precursor to intranet implementation</td>
</tr>
<tr>
<td><strong>Sub-contexts (intra-organizational)</strong></td>
<td><strong>Incorporation or abandonment of individual efforts</strong></td>
</tr>
<tr>
<td>Organizational units</td>
<td>Independent intranet efforts in specific divisions, functions, project groups</td>
</tr>
<tr>
<td>Individuals (employees)</td>
<td>Unofficial, grass-roots intranet experiments by employees</td>
</tr>
</tbody>
</table>

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Mobile Technology Implementation in the Organization

Between 2000 and 2002, we conducted two in-depth longitudinal case studies of mobile technology implementation (personal digital assistants and handheld mobile computing devices) within organizations in the health sector. Both case organizations are located in Melbourne, Australia. The first is a small private paramedical organization while the second is a center of a large non-profit nursing organization. The initial aim with the studies was to understand the implementation approaches employed by the organizations, and to assess the reported use of mobile devices by individual users.

In both case studies we utilized a single case, embedded case study design (Yin 1994) with the organization implementing the mobile system as unit of analysis and individual employees taking part in the implementation as embedded units of analysis. The findings from these studies have been published elsewhere (Burley and Scheepers 2004; Scheepers 2002; Scheepers and Steele 2002).

We developed an initial interview guideline similar to the questionnaire development process for the intranet research described above. The questionnaire was adapted to reflect the unique technological aspects related to mobile technology, such as the wireless infrastructure and organizational support for mobile computing applications. The initial questionnaire was tested in a number of pilot interviews in one of the case study organizations.

In both case studies, we derived a rich processual view of the implementation of the mobile systems. Furthermore, a detailed assessment was obtained of how the implementation of the mobile systems changed work practices in each organization.

Upon closer inspection of the data, it became apparent that the mobile computing phenomenon drifts over various use contexts. A failure to accommodate and disaggregate these various contexts runs the risk of drawing incorrect conclusions. For example, prior research indicated three different levels of analysis in studies of ubiquitous computing: organization, team, and individual (Davis 2002; Lyytinen and Yoo 2002b). Our findings, however, pointed to even finer levels of analysis in the case of the individual. The same individual operates in various contexts: the individual within the organizational context, the same individual within a private use context, and the individual as part of a professional context. Typical responses on the use of the mobile computing device related to either use in the organizational context, private use, or use in a professional context. In fact, the management in one case organization actively encouraged private use of the mobile device to leverage the overall adoption of the technology within the organization.

When asked about the advantages of the mobile system, responses from employees initially did not seem to correlate. The same respondent would indicate that she believed that the system was satisfactory, but then continue to describe the negative aspects of the system. In following up on these apparent contradictions, it became clear that respondents were referring interchangeably to their private use, use within the health profession, or use experiences within their particular organizational context. Users compared their actual experiences with the mobile system to expectations created via professional folklore and mobile computing success stories publicized in the media and popular IT press. This better explained their expressed satisfaction or dissatisfaction with the mobile system, stressing the importance of specifically assessing the relevant mobile use contexts (organizational, private, and professional) to avoid drawing partial conclusions.

With the benefit of hindsight, it was possible to identify these interdependent contexts that not only influenced the implementation process, but also in some instances changed the policies and procedures the organizations employed. In Table 2, we illustrate the vertical and horizontal contexts of relevance to mobile computing implementation in the case organizations.

Discussion

Investigations into processes such as the organizational implementation of traditional business computing phenomena have often emphasized the horizontal context (i.e., the temporal dimension in research design and analysis). This focus remains important in connecting current and historic events and episodes (Robey and Newman 1996; Sabherwal and Robey 1993) associated with the implementation process as chains of evidence (Yin 1994) in organizational case studies. However, the two illustrative accounts suggest that as we move toward ubiquitous computing, more attention should be placed on the vertical contextual dimension (sub- and supra-contexts) in research designs to explore how such interdependent levels of context shape implementation processes (and vice versa) within and beyond the organizational context. The two accounts presented here confirm earlier speculation of the importance of various vertical layers of contextual influences in the case of ubiquitous computing phenomena (e.g., Lyytinen et al. 1998; Lyytinen and Yoo 2002b).
Table 2. Vertical and Horizontal Contexts of Mobile Technology Implementation in Organizations

<table>
<thead>
<tr>
<th>Vertical Contexts</th>
<th>Horizontal Context</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supra-contexts (extra-organizational)</strong></td>
<td><strong>Prior to case study: before 2000</strong></td>
</tr>
<tr>
<td>Society at large</td>
<td>Widespread adoption of mobile phones</td>
</tr>
<tr>
<td>Profession</td>
<td>Individual exploration of mobile technologies for professional purposes in health sector</td>
</tr>
<tr>
<td>Private Use</td>
<td>Adoption of personal digital assistants (PDAs) for personal productivity (e.g., diary, contact lists)</td>
</tr>
<tr>
<td>Media and popular IT press</td>
<td>Publication of mobile technology success stories by vendors and popular IT press</td>
</tr>
<tr>
<td><strong>Organizational Context</strong></td>
<td><strong>In terms of research design and subsequent data analysis of case studies of ubiquitous computing phenomena, we question the usefulness of viewing context broadly as “everything outside the unit of analysis” (Yin 1994). Our findings here are consistent with some social science sources (e.g., Patton 1990) that advocate finer layers of within-case study analysis (e.g., unit, group and individual), and similar suggestions in the IS literature on ubiquitous computing of contextual levels of analysis at the individual, team, and organizational layer (Jessup and Robey 2002). Furthermore, our findings refine the broad notion of the environmental context by means of specific examples of extra-organizational vertical contextual levels that shape the implementation process within organizational contexts. The data analyses in Tables 1 and 2 identify supra-contexts relevant to the study as society at large, organizations globally, and the media and popular IT press for both the intranet and the mobile technology implementation. Additional supra-contexts relevant to mobile technology implementation in the health sector are the professional and private use contexts.</strong></td>
</tr>
<tr>
<td><strong>Sub-contexts (intra-organizational)</strong></td>
<td><strong>Preparation for implementation (e.g., workshops, newsletters)</strong></td>
</tr>
<tr>
<td>Organizational units</td>
<td>Expectation about use of mobile device formed based on individual experiences with technologies (e.g., mobile phones, PDAs) and media reports</td>
</tr>
<tr>
<td>Individuals (employees)</td>
<td></td>
</tr>
</tbody>
</table>

Other research has emphasized the contextual complexity at the individual level in an era of nomadic work made possible by ubiquitous computing (Davis 2002; Lyytinen and Yoo 2002a, 2002b). Such research has indicated that ubiquitous computing enables individuals to switch freely and easily between work and private use contexts. Our findings in the mobile cases support such observations and the interrelatedness of the individual context (both as employee and as private user). However, we recommend that researchers distinguish between these contexts in organizational case study designs for the following reasons. First, not all ubiquitous computing technologies have the potential for use in the private context. Devices such as mobile stock-take scanners and some industrial wearable devices are not of much use in the private context. Secondly, we have come across some organizational policies that restrict private use of their mobile computing technologies. Different individual contexts were clearly illustrated in the mobile implementation cases, where individuals’ private, professional, and work contexts influenced their views of the success of the mobile information system within the organization.

Our findings stress the need for methodological frameworks to help researchers systematically consider finer levels of contextual analysis (especially vertical dimensions) at an operational level of detail. The examples identified in the illustrative cases pave the way for establishing such frameworks.

We do not see the identified vertical contexts as issues or variables that emerge and which can easily be accommodated during the course of case study research (Cavaye 1996). We arrived at these examples with the benefit of hindsight, often having to revise data collection instruments and reanalyze case study data. We hence stress the merits of systematically considering interrelated contexts up front in the case study design to enable subsequent steps of data collection and analysis.
A research design that accommodates different levels of vertical context holds other benefits apart from enabling finer levels of analysis. For example, the influence of complex contextual aspects such as culture on processes can be studied at the different vertical levels (e.g., organizational and unit or functional subcultures). Furthermore, the different levels of analysis enable contextual triangulation (Patton 1990; Yin 1994) in that different but interrelated sets of data may be used to corroborate accounts of the implementation process within the organization.

At an operational level, we suggest the following practical advice to assist researchers in disaggregating context in case study design. Pilot studies are often used to explore relevant issues and to refine data collection prior to the main study. As such, pilots are ideally suited to explore the different sub- and supra-contexts that may be relevant to a particular study. The examples in this paper can be drawn upon as a starting point in considering the relevant contexts. During data collection, it is necessary to be attentive to contextual information (beyond the unit of analysis), including relevant historical and emerging developments at different contextual levels. Questions that address both supra- and sub-contexts should be considered for inclusion in interview instruments. Collecting supporting data relating to specific sub-contexts (e.g., unit, individual) and supra-contexts for the study (e.g., from industry, media and vendor sources) should also be considered. The illustrative cases suggest that systematic attention to and collection of different levels of contextual data will contribute to drawing more informed conclusions.

Conclusion

We conclude it is necessary to disaggregate the notion of context to allow for finer levels of contextual analysis in explanatory case studies of computing technologies in organizations. Context has always been important in explanatory case studies, but the analysis of the illustrative cases highlighted that it now becomes even more pressing to draw on different levels of context as IT becomes more ubiquitous and pervades nontraditional contexts within and beyond the organization. Thus, attention to multiple contexts is required during the design, data collection, and analysis of explanatory case studies. To illustrate, we identified a range of specific interdependent levels of context that explain the implementation process of ubiquitous computing within the organizational context. Our findings demonstrate that a failure to consider such interdependent levels of context in organizational case studies of computing technologies that even approach ubiquity runs the risk of partial and even incorrect conclusions being drawn.

The applicability of the findings in this paper is limited in the sense that we have focused only on processual studies of implementation within organizational contexts. First, we do not claim that the examples of contexts identified are exhaustive or pertinent to all research issues in ubiquitous computing. However we believe the examples and illustrative application pave the way for frameworks to systematically consider various interrelated contexts in case study designs. Second, the technologies (intranets and mobile computing) are not ubiquitous per se, but are representative examples of the transition toward such a computing paradigm. We expect that the findings will be even more relevant for case studies of truly ubiquitous technologies. Finally, with the benefit of hindsight, we revisited our existing case study data with a focus on the past and present. The horizontal perspective, however, opens up the possibility of accommodating future vertical contexts (e.g., new industry layers) in which research issues such as emerging standards, lock-in effects, etc. (Shapiro and Varian 1998), could be explored within the case study design.

Researchers in the IS field have historically drawn upon methodological advice from reference disciplines such as the social sciences. As the IS field matures with the potential to become a reference discipline for others (Baskerville and Myers 2002), future research should continue to develop and refine frameworks pertinent to IS research (such as the one called for here), to enable others to examine contemporary computing phenomena from various disciplinary and analytical perspectives.

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