



Pergamon

Accounting, Management & Information Technology 9 (1999) 25–47

ACCOUNTING
MANAGEMENT AND
INFORMATION
TECHNOLOGIES

Interpretation, intervention, and reduction in the organizational laboratory: a framework for in-context information system research

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Abstract

Understanding how technical artefacts are created and used within organizations is a central aspect of the IS research discipline. The conduct of research in an organizational setting is thus a major issue for the IS community. A research framework for in-context IS research is presented and used to position purified and hybrid forms of research method. From the framework theoretical support for an ‘action case’ research method is presented. Two IS research cases are presented and analyzed using the IS research framework, leading to a practice-based rationale for an action case method. Characteristics of the action case method, a hybrid of interpretation and intervention, are described. Learning at three levels of analysis—concrete, general, and meta—is proposed and used as a way of reflecting on IS research methods and IS research frameworks. © 1999 Elsevier Science Ltd. All rights reserved.

Keywords: Research methods; Action research; Action case; Case study; Dilemmatics; Actor network theory

1. Introduction

This paper is founded upon the belief that the primary laboratory for information system research is the organization, where the development and use of technical

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artefacts can be studied in-context (Ehn, Meggerle, Steen & Svedmar, 1995). The organizational laboratory provides researchers with a rich setting for investigating the work, management, and technology issues associated with information systems. Such investigations are not necessarily passive affairs; the IS researcher can also be involved in making an intervention in the problem situation with the aim of achieving some desirable change. Baskerville and Wood-Harper (1996) point out that information systems is a highly applied field with strong vocational elements (p. 235) and argue that a mix of practice and theory is needed for usable and relevant knowledge to be produced.

In referring to ‘organizations’ it is not our intention to limit the scope of IS research to traditional commercial and non-commercial enterprises—the ideas presented in this paper are equally appropriate to the study of IS in domains such as homes, schools, and local communities. The increasing rate of diffusion of information and communication technologies into this broader range of organization types, together with uncertainty about how changes in patterns of work (Orlikowski, Walsham, Jones & DeGross, 1996) and leisure will play themselves out, make in-context approaches to IS research a pressing and significant issue.

The field of information systems research does indeed provide a meeting place for the joint and in-context study of work, management, and technological issues. However, the multi-disciplinary nature of information system research can lead to researchers finding themselves caught in an uncomfortable space, falling between research traditions that have different notions of relevance and rigour (Keen, 1991) and, as a consequence, different research methods. As a result, it may be that we need new concepts and new or hybrid research methods in order to design, control, report and make effective use of IS research.

Accordingly, the aim of this paper is to present a framework to assist researchers in navigating the multi-disciplinary space of in-context IS research (Braa & Vidgen, 1997). The development of the research framework together with practical experiences of conducting in-context research has resulted in the identification of a hybrid research method: the ‘action case’ (Vidgen & Braa, 1997). We believe this hybrid approach to research to be of particular relevance to the IS domain and develop the characteristics of this method here. The structure of the paper is as follows. In Section 2 the IS research framework is described. In Section 3 relevant methods for in-context IS research are presented and then located within the IS research framework. In Section 4 the difficulties of multi-disciplinary research are considered as a set of dilemmas. In Section 5 empirical results of applying the framework to two research cases are presented and in Section 6 learning about the IS research framework is reflected upon. In the last Section 7 a summary is made, together with ideas for future work.

2. A framework for in-context IS research

Research methods can be separated broadly into two categories: positivist and interpretivist (Galliers, 1985, 1992; Galliers & Land, 1987). The positivist approach

assumes that phenomena can be observed objectively and rigorously; good research is legitimated with reference to the virtues of repeatability, reductionism, and refutability (Checkland, 1981). When working within the positivist paradigm the researcher is an observer of the laboratory—an outsider (Evered & Louis, 1981). Any intervention must be controlled such that only the experimental variable changes; the prevailing organizational context is kept constant in order to provide replicability and predictive power. In contrast, the interpretivist approach considers the methods of natural science to be inappropriate where human beings are concerned, mainly because different people (including researchers) will interpret a situation in different ways. Hirschheim, Klein and Lyytinen (1996) argue that IS development is historically contingent, socially situated, and politically loaded and therefore needs to be grounded in theories of social action. When an interpretivist approach, such as participant observation (Jorgensen, 1989), is used researchers try to understand the meanings people use to make sense of their lives (Schutz, 1967). The researcher aims to understand the insiders' viewpoint, even going as far as becoming one of the insiders themselves.

Typically, positivism is concerned with reducing the area of investigation in order to be able to make reliable predictions and explanations, while interpretivism is concerned with making a reading of a situation in order to gain understanding. We argue that in both positivist and interpretivist approaches the researcher is making an intervention, despite aspirations to being an objective outsider (or indeed a subjective insider), and that there will therefore be unexpected outcomes. In some forms of research, such as action research, the aim is to gain learning and knowledge through making deliberate interventions in order to achieve some desirable change in the organizational setting. Thus, a researcher working in the organizational laboratory is both constrained and enabled by the context while at the same time the researcher has the potential to initiate change (to a greater or lesser extent) in that organizational context. We take inspiration for this stance from Giddens' structuration theory (Giddens, 1984), in which agency and structure are seen as co-present and inseparable. This means that any in-context IS research initiative, regardless of the research tradition and methods adopted, will have unintended consequences and a degree of uncertainty concerning how the research project will play itself out. Drawing from Habermas (1972) we argue that change can always be perceived to contain a critical element. A critical perspective on change is exemplified in the Scandinavian tradition (Bansler, 1989; Ehn & Kyng, 1987), where action-oriented research played a role in promoting 'workplace democracy' with IS researchers collaborating with unions to place system development in a broader social and economic context.

These three dynamics—positivism, interpretivism, and intervention—form the basis of the IS research framework presented in the next section.

2.1. The IS research framework

The research framework is represented by a triangle (Fig. 1), which comprises points, sides, and a constrained space (Braa et al., 1997; Vidgen et al., 1997). The points represent intended research outcomes: *prediction* is aligned with the system-

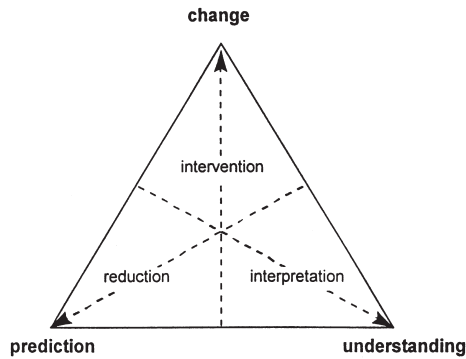


Fig. 1. An IS research framework for the organizational laboratory.

atic *reduction* of a positivist approach; *understanding* with an interpretive approach; and *change* with an interventionary approach. Prediction is shown as the outcome of positivist modes of enquiry because although a ‘good’ theory does indeed have explanatory power, the more significant outcome of positivist theories is the ability to control and predict. Change is shown as the outcome of intervention, but it is implicit that the intervention should be motivated by a desire to make improvements in the problem situation. Interpretations that are successful bring out insider rationality and promote understanding.

The points of the triangle should be viewed as ideal types in the Weberian sense, that is, they are non-moral abstractions that can be used to make comparisons with empirical reality. Consequently, these ideal type approaches to research are not attainable in practice, which is represented by the constrained space of the triangle. One implication for research praxis is that all three dynamics (reduction, interpretation, and intervention) are, regardless of the research method adopted, co-present, albeit with differing mixes and emphasis. For example: interpretivist research methods involve a reducing of the infinite range of factors that might be considered relevant to a particular inquiry, although such a ‘reduction’ is not rationalized through the application of the systematic procedures of positivism. Since all forms of research conducted in the organizational laboratory carry with them an interventionary element we suggest that a critical perspective will always be of relevance to in-context IS research. The need for a critical perspective is an outcome of the belief that the any intervention should have the intention of changing the problem situation for the better rather than for the worse.

The dotted lines inside the triangle represent research dynamics as movements towards (and away from) the ideal types. As the researcher moves towards the prediction point through a process of formalized *reduction* there should be greater explanatory and predictive power. The traditional approach to explanation and prediction is experimental method (Lee, 1991). Movement toward the understanding point through a process of *interpretation* is associated with greater richness of insight into the role of IS in organizational settings. Understanding is achieved typically through case studies informed by schools of sociological thought such as phenomenology, hermen-

eutics (Boland, 1991), and ethnography (Orlikowski, 1993). The change point is achieved through a process of *intervention* as typified by action research (Baskerville et al., 1996).

3. Research methods for the organizational laboratory

In this section a range of research methods suitable for in-context research are described in brief in order to highlight the differing foundational assumptions of the research methods such that they might be located within the IS research framework shown in Fig. 1.

3.1. Case study

Visala (1993) notes that the case study has been classified as a scientific method by Galliers (1992), who followed the case study tradition of Lee (1989), while Iivari (1991) categorizes the case study as an idiographic, or interpretivist, method. In a revised taxonomy Galliers (1993) presents IS research methods on a spectrum ranging from traditional positivism (observation-based) to newer post-positivism (interpretations). Galliers positions the case study nearer to the observation-based end of the spectrum, which shows the difficulty of associating the case study either with positivism or with interpretivism. We have found it useful to distinguish between two types of case study: the positivist-informed *hard* case study and the interpretivist *soft* case study.

3.1.1. Hard case study

Yin (1994) defines a case study as an empirical inquiry that ‘investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident’ (p. 13). Yin (1994) notes that case studies can be used in three modes: explanatory, descriptive, and exploratory. Case studies are applicable where the research question is of a ‘how’ or ‘why’ nature, where control over behavioural events is not needed, and where there is a focus on contemporary events. Case studies allow reality to be captured in detail and many variables to be analyzed; from a positivist stance, problems with case studies include the difficulty of generalization, lack of control over variables, and different interpretations by different stakeholders (Galliers, 1992).

3.1.2. Soft case study

Walsham (1993) describes an interpretivist (soft) approach to case study in which he argues that:

However, from an interpretive position, the validity of an extrapolation from an individual case or cases depends not on the representativeness of such cases in a statistical sense, but on the plausibility and cogency of the logical reasoning used

in describing the results from the cases, and in drawing conclusions from them. (p. 15)

The interpretivist approach is concerned with gaining understanding; generalization is the movement from a concrete situation to the social totality beyond the individual case (Orlikowski & Baroudi, 1989, quoted by Walsham, 1993; see also Walsham, 1995a). Walsham declares a topic of interest and overall premise and uses these to choose appropriate methodologies and methods for conducting a research project (Walsham, 1993, p. 22). A soft case study based on ethnographic methods can involve a variety of data collection techniques, such as videotape, and data analysis might involve, for example, techniques from grounded theory (Glaser & Strauss, 1967), as used in Orlikowski (1993) investigation of the use of CASE tools.

3.2. *Action research*

The roots of action research can be traced through that part of research that has been taken up with democratization and organizational development. There is a link from Lewin's research on social change and social conflicts (Lewin, 1948), through the Tavistock Institute's work on socio-technical theory (Emery & Trist, 1960), to Checkland's view of human activity systems (Checkland, 1981). Action research is a way of building theory and descriptions within the context of practice itself (Hult & Lennung, 1980). Theories are tested through intervention in the organizational laboratory, that is, through experiments that bear the double burden of testing hypotheses and effecting some desirable change in the situation (Argyris & Schön, 1991).

One approach to action research that has been adopted widely (Susman, 1983) involves the establishment of a relationship between researchers and the participants' (clients') infrastructure and an action research cycle consisting of five phases: diagnosing; action planning; action taking; evaluating; and specifying learning. Checkland (1991) also describes a process for action research, which consists of a seven stage cyclical process: enter the problem situation; establish roles; declare methodology and framework of ideas; take part in the change process; rethink roles, methodology and framework of ideas and take part in further change processes; exit from the problem situation; reflect and record learning in relation to the framework of ideas, the methodology, and the area of application. There are clear parallels between the 7-stage model of Checkland and the 5-step model of Susman. For example, the action planning stage of the Susman model is concerned with the identification of planned actions guided by a theoretical framework. Checkland sees the declaration of an explicit methodological framework as a vehicle for establishing the validity of action research, 'thus beginning the process of developing a legitimate rigorous alternative to positivistic research' (Checkland, 1991, p. 402). Also, the declaration of a framework of ideas and methodology is important if action research is to be distinguished from consultancy (Baskerville et al., 1996).

However, it should also be noted that action research comes in many flavours, ranging from the formal approaches exemplified by Susman (1983) and Checkland (1991) through to less formalized, more reflective and personal approaches, such as

participative action research (Whyte, 1991; Reason, 1994). Participatory action research is a form of action research that involves practitioners as both subjects and co-researchers. Whyte (1991) defines participatory action research as a process in which some of the people in the organization or community being studied participate actively with the professional researcher throughout the research process from the initial design to the final presentation of results and discussion of the action implications.

3.3. Field experiments and quasi-experiments

Field experiments are an extension of laboratory experiments into an organizational context. One feature of the laboratory experiment that is applicable to field experiments is the identification of precise relationships between chosen variables using quantitative analytical techniques. In a field setting this is less rigorous than a laboratory experiment as there are lots of factors which the researcher cannot control but which could affect the outcomes. With a view to making generalizable statements which are applicable to real-life situations, the motivation for field experiments is to construct an experiment in a more realistic environment than is possible in a laboratory setting.

Two essential elements of any experimental design are randomization and experimental control (Zmud, Olson & Hauser, 1989). Randomization involves allocating the people or units being studied to the experimental group, or to a control group, on an entirely random basis, taking no account of their characteristics or preferences. Experimental control is essential and involves taking appropriate steps to eliminate ‘nuisance’ variables, which are factors other than the independent variables that might be responsible for observed changes in the dependent variable. There are two types of field experiments (Cook & Campbell, 1979; Zmud et al., 1989): ‘true’ experimental design which meets the criteria of multiple treatments (or one treatment and a control group), randomization, and experimental control; and ‘quasi’ experimental design, which does not meet these three criteria but rather attempts to preserve as many of the properties of true experimentation as possible, given the constraints of the research setting.

Field experiments aim at controlling a small number of variables which may then be studied intensively. A major advantage is that the experiment is conducted in a real-life setting. A major problem however is the difficulty of finding organizations prepared to be experimented on. In addition, replication is problematic because it is extremely difficult to achieve sufficient control to enable replication of the experiment such that only the study variables are altered. The difficulty of conducting true experiments in an organizational laboratory is reflected in a survey conducted by Zmud et al. (1989) of the use of field experimentation within IS research in which they found only seven true experiments reported.

3.4. Summary of IS research methods

In Fig. 2a we align field experiment with prediction, case study with understanding, and action research with change in order to locate the research methods within

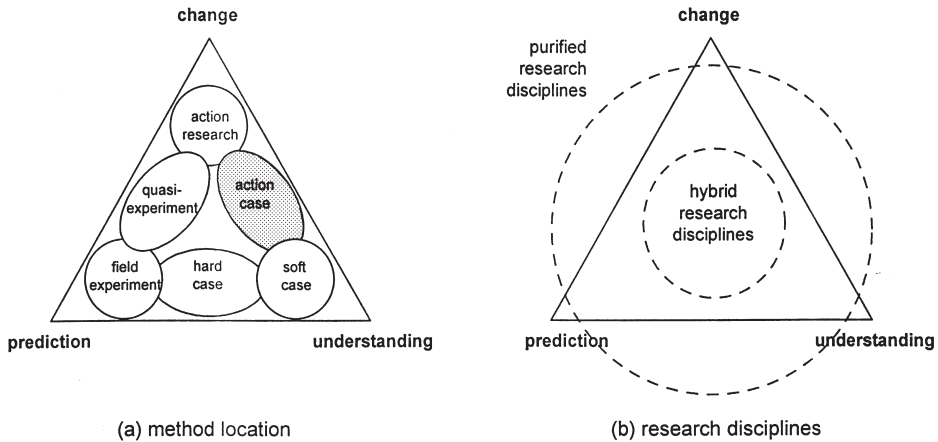


Fig. 2. Research methods.

the research framework. Hard case study and quasi-experiment have a less pure basis with respect to the ideal types of research outcome and are placed in the triangle such that hard case study is represented as a mix of understanding and prediction, and quasi-experiment as a mix of prediction and change.

We consider techniques such as surveys and interviews to be orthogonal to the above methods. Surveys designed to have statistical generalizability and would fall into the reduction/prediction area. Surveys can also be designed to collect qualitative data and be analyzed using idiographic methods, placing them in the understanding/interpretation area of the framework. Although a survey is, perhaps, unlikely to initiate change, the interventionary dimension of any research activity in an organizational laboratory should not be discounted entirely.

Analysis of the research framework suggests that a further hybrid might be appropriate. The shaded area of Fig. 2a has been labelled 'action case' (Vidgen et al., 1997), which we see as a hybrid of understanding and change. In Fig. 2b purified disciplines—field experiment, soft case study, and action research—are contrasted with hybrid disciplines—quasi-experiment, hard case study, and action case. In the next section we consider whether it would be possible to develop a general-purpose, three-headed IS research method for use in the organizational laboratory.

4. Dilemmas and trade-offs of in-context IS research

The methods placed in the research framework have been either purified or hybrid, where each hybrid consists of a pairing of purified methods. A further alternative remains: a three-headed hybrid that satisfies the needs of change, prediction, and understanding. This super-method would be located at the centre of the research framework triangle, equidistant from each of the apices. Such a method would hold great appeal for IS research since it would integrate the different research outcomes

for multi-disciplinary in-context research. Unfortunately, the indications are that such a method is unlikely to be feasible.

McGrath (1982) introduced the term ‘dilemmatics’ and stated that ‘the research process is to be regarded not as a set of problems to be “solved”, but rather as a set of dilemmas to be “lived with”’ (p. 69). According to McGrath experimental research should aim to maximize: generalizability with respect to populations; control of variables; and existential realism. Research might be designed to maximize one of the desiderata; for example, a well-designed and well-executed laboratory experiment may result in a high level of control, but does so at the expense of generalizability and realism. Alternatively, the researcher might try to maximize two of the three desiderata; for example, a field experiment addresses control and realism to some extent but falls down on generalizability. Thus, McGrath presents research as a three-horned dilemma in which one can maximize one of the three desiderata (generalizability, control, or realism), but be impaled on the remaining two horns. Alternatively, one might plan to achieve higher levels of two desiderata but be impaled fully on the remaining horn. McGrath (1982) summarizes the three-horned dilemma: ‘There is no way—in principle—to maximize all three conflicting desiderata of the research strategy domain’ (p. 76).

We can take the lessons of McGrath’s dilemmatics and apply them to the IS research framework of Fig. 2, which manifests the three-horned dilemma in two ways. Firstly, the three purified forms of research (field experiment, action research, and soft case study) each address one horn of the dilemma, but at the expense of the remaining two points of the triangle. Secondly, the hybrid research methods (quasi-experiment, action case, and hard case study) make an uneasy compromise between two points, while being impaled fully on the third point. Thus, it is not possible for a researcher to make interventions as though she/he were entirely and indistinguishably part of the organization, while also being an observer who can stand back from the situation and make interpretations, and at the same time produce rigorous results in the positivist tradition. Increasing the proportion of one ideal type of research outcome is counter-balanced by a diminution of one or both of the other ideal types.

Focussing on the sides of the triangle we can express the dilemmas (trade-offs) between pairs of ideal types of research outcome and thus focus on the hybrid methods:

- understanding/prediction: this side highlights the trade-off between a desire to make rich interpretations of complex situations (understanding) and the need to reduce complexity in order to ascribe cause and effect relationships (prediction). The hard case method is an attempt to balance the dilemma of understanding and prediction, of subjectivity and objectivity. This trade-off is made at the expense of practical knowledge (*change*);
- change/prediction: a trade-off between making an intervention in the situation (to create change and gain practical knowledge) and a desire to reduce the number of experimental variables in the interests of predictive power. In action research the aim is to support desired change in an organizational setting while field experi-

ments are geared towards hypothesis testing and a desire to keep the organizational context constant. Quasi-experiments balance change and prediction but the trade-off is made at the expense of richness of insight (*understanding*);

- understanding/change: a trade-off between being an observer who can make interpretations (*understanding*) and a researcher involved in creating change in practice. With case study methods the researcher aims to collect a rich set of data to provide insight into some situation, while in action research the aim is to support desirable change in an organizational setting. However, when doing case studies researchers contribute to change by questioning events and applying new concepts. On the other hand, full-scale action research projects are often not appropriate due to organizational constraints or the nature of the topic to be investigated. Small scale intervention with a deep contextual understanding is one way of balancing this dilemma—this is the area labelled action case. This trade-off is made at the expense of explanatory power (*prediction*).

5. Applying the research framework in practice

We now focus on the action case research method through reporting on two research projects, one of which is concerned with IS quality and the other with priority workshops. The research cases were designed as exercises in action research, but we now believe that both cases can be better represented as action case—hybrids of action research and soft case study. In this report we focus on the research approach adopted rather than on the content of the research itself, which is reported elsewhere (Vidgen, 1996, 1997; Braa, 1995a, b).

5.1. Research case 1—IS quality

The fieldwork was conducted in a European aerospace organization (which we shall call ‘Eurospace’) involved in all aspects of the design and manufacture of aircraft. The terms of reference for the project called for the development and application of an IS quality method that could be used alongside the systems analysis methods being used by Eurospace—primarily SSADM (CCTA, 1990) and Object Modelling Technique (Rumbaugh, Blaha, Premerlani, Eddy & Lorenson, 1991). The fieldwork was divided into three phases and spanned an elapsed time of just over two years.

The first phase of the research lasted five months and was loosely-structured with the intention of becoming familiar with the problem situation and the IS quality issues to be addressed by the research. The aim of the second phase, which had a duration of 9 months, was to investigate a specific computer system in-depth. A case study was made of an electrical planning system and primary users (those who were entering and processing data on the computer system) and secondary users (those who used the reports produced by the computer system) were brought together with system developers in an IS quality workshop. This constituted an intervention insofar

as prior to the workshop there had been no formal communication between system developers and secondary users, who in a sense were the ‘real’ customer of the computer system since they took the output from the electrical planning system and used it to build physical wiring looms for installation into aircraft. Small-scale changes to the operation and management of the electrical planning system were initiated following the workshops and the end of phase report.

In the third phase, the IS quality method developed during the second phase was tested and developed further through practical application. A software development project concerned with the automation of wind tunnel operation and the collection and processing of aerodynamic data was identified. The researcher joined the project team and introduced the use of a quality methodology, which incorporated quality function deployment (King, 1989; Slabey, 1990) and soft systems thinking (Checkland, 1981; Checkland & Scholes, 1990). The third phase lasted ten months and consisted of a number of interventions initiated by the researcher. At the beginning of the third phase the perception of the problem situation was of a straightforward software development project justified on the basis of efficiency gains; wind tunnel operators and supervisors needed improved software automation to increase the throughput of the tunnel and the reliability of the data produced. In widening the boundary of the investigation it became clear that the aerodynamicists were a significant user of the output of wind tunnel software since these people needed wind tunnel data to help them design new aircraft and to make modifications to existing aircraft.

The researcher initiated quality workshops with the aerodynamicists and worked with wind tunnel personnel in constructing a quality plan that was organized around the requirements of aerodynamicists. This intervention led to recognition of the need to integrate the Unix-based data collection system with the mainframe-based data processing system, which turned the raw data collected in the wind tunnel into usable aerodynamic data. In the current system aerodynamicists had to wait for a wind tunnel test run to complete, for the data to be transferred to the mainframe for processing, and then for the processed data to be returned to the work-station. Although the integration of data collection and data processing on a common technology platform would allow analysis of wind tunnel data in real time, integration of the IT platforms had been purposely excluded from terms of reference of the project on the grounds that the project was a self-contained exercise in making efficiency gains. Once the customers (aerodynamicists) had been consulted through quality workshops it became clear that the software development project could be more usefully re-constituted as an initiative for achieving effectiveness gains. Such an expansion of scope could only be achieved with the external legitimization of the aerodynamicists’ requirements—it could not be sanctioned internally to the development project through wind tunnel personnel needs or on technological grounds through the software development organization. A further outcome of the intervention was a deeper understanding in Eurospace that a range of methods and approaches would be needed to address both software/artefact and information system/organizational quality.

5.2. Research case 2—priority workshops

The aim of this research project was to develop and evaluate a technique for user participation in systems re-design. The ‘priority workshop’ technique developed in the research was intended as a means of widening the circle of decision makers involved in system re-design such that arbitrary and unilateral decisions could be avoided and provide an arena for making priorities visible to those who are affected. The assumption was that transparency of plans and priorities is a prerequisite for collaboration. The fieldwork was conducted in a software company co-operating with several user organizations. The research approach was to intervene into the drifting process of redesign by including a broad range of users and a rich diversity of use practices in the evaluation of design decisions.

Firstly, a case study was conducted in order to gain understanding of a particular redesign process, the development of a new version of an administrative system. The collaboration between the software company supplying the administrative system and five of its customer organizations was studied using in-depth interviews and focus groups. The case study in the different user organizations was carried out to gain a rich understanding of the complexity of the use situation and experience of the ongoing redesign process from the user organizations’ viewpoint. In addition, all levels (managers, project leader, designers and programmers) in the software company were interviewed to provide insight into the method used. During the case study and literature study the priority workshop method was developed and tested through running workshops in the user organizations. The priority workshop was initiated as a new communication channel where designers and programmers as well as IT managers could meet with a diversity of user organizations prior to decisions being made. Differences and complexity in use practices could be addressed and matched with priorities and plans for a new version of the software. The design suggestions raised in the priority workshop were then implemented in the new version of the administrative system. The priority workshop method was refined and further developed as a result of an evaluation conducted through post-workshop interviews. However, the willingness to let the users get involved in design activities depends essentially on the attitude of the software managers. The programmers had never met a user before and thought the technique was valuable. However, the managers showed resistance to letting go of control; it turned out that the manager of the redesign process wanted to control the process by selecting a reference group and waiting until the software company had something new to show before consulting the bulk of the users. However, through the workshops the contradictions were openly illustrated, and the users could react accordingly—which they did. The outcome of the intervention was more demanding users even though the priority workshop method was not institutionalized. The research ended when the software company producing the administrative software package was subject to a corporate take-over by a major player in the software industry. The take-over resulted in the resignation of the IT manager who had sponsored the project and facilitated access to user organizations.

5.3. Discussion of the research cases

Both of the research cases began as speculative case studies, one exploring IS quality issues and the other participation and prioritization in IS re-design. Small elements of intervention were instigated through meetings and workshops in early stages of the projects, followed by an overtly interventionist stage where the methods developed in earlier stages of the research were subjected to in-context testing.

In both projects we found that the early stages of the research project were accompanied by some element of change, which we attribute to small-scale interventions, such as bringing together people from different parts of the organization in meetings (particularly where no formal communication channel exists currently within the organization) and the distribution of reports produced as part of the research (particularly to management). Traditionally, meetings and interviews, management reports and academic publications, might be viewed as non-interventionary case study work whereby the researcher is an outsider eliciting and reporting on facts relevant to the research issue being investigated. However, we found that in both of the research cases it was appropriate to recognize that the early investigative stages of a research project do in themselves contain an element of intervention.

By contrast, the last stage of each research case failed to result in the level of intervention and assimilation of methods that might have been produced in a commercial exercise with senior management backing and consultancy support. In part, we attribute this to the projects being perceived by the organizational participants as primarily academic research exercises that would not change to any great extent the way system development was conducted. However, despite these limitations change did result; the IS quality research in Eurospace was associated with changes to the way the role of the wind tunnel department was perceived by its customers, changes to the way in which the wind tunnel department perceived its role, and in a revision of the wind tunnel department's IT strategy and system development plans. The priority workshop research resulted in substantial changes through one cycle of redesign of the administrative system. Users became more demanding once they had experienced the possibility of posing requests for change, and the designers and programmers learnt about the heterogeneous nature of use practices. This empowerment of users together with a broadening of the developers' perspective on IS design brought to the surface significant differences in the interests of users and IT management, which suggested that a critical perspective would be appropriate in the interpretation of the research results.

In summary, we argue that the case studies were not 'pure' interpretations since they contained an element of intervention, while the testing of the IS quality and priority workshop methods did not lead quite to the scale of change that one might expect in full-scale action research. We suggest that the research cases can be better categorized as action case rather than as case study or as action research.

In Table 1 characteristics of the action case method are identified with respect to the intervention stage of the two research cases. We focus here on the part of the research that was concerned with the in-context application of an IS method as this best typifies action case, which is a hybrid of intervention and interpretation. These

Table 1
Characteristics of the action case method

Factor	Attribute	Action case concern	Lessons from the IS quality research	Lessons from the priority workshop research
Suitability	Research design	Have a framework of ideas and a methodology been declared?	A framework of ideas—the constitution of IS quality—and a methodology—incorporating quality management in IS development—were defined.	A framework of ideas—participative design—and a methodology—future workshops—were defined.
	Researcher skills	Does the researcher have the skills and experience to make an intervention?	The researcher had a number of year's experience as a practitioner and as a consultant in the area of IS development.	The researcher had been involved in participatory design involving prototyping with users for some years.
	Richness	Is the context of the research rich enough to provide understanding?	The range of the research project was broadened to include multiple stakeholders to ensure sufficient richness of context.	The case study was conducted in a small number of organizations, which were selected on the basis of their differences.
Interpretation	Focus	Is the research question sufficiently focused?	The focus of the research was reduced to testing a framework of ideas related to a specific aspect of IS development—the role of quality management.	The aim of the research was to investigate the possibility of heterogeneous user groups intervening in the re-design process.
	Scale	Is the scale of the subject for research manageable?	The time-scale of phase 3 was of medium duration (10 months), limited to a single system development project for one department, and involved change on a small-scale.	The focus was on experimenting with one single technique in the redesign of one particular administrative system over a 6 month period.
Intervention	Participation style	What level of participation can be expected from the organization members?	User personnel did not wish to be involved in the development of the IS quality method, but were happy for it to be applied as long as it did not disrupt users or developers. Full-scale action research would have been difficult.	The project sponsor and participants enjoyed the chance of having a forum for meeting with other stakeholders. Pre and post workshop interviews were conducted in addition to monitoring participation in the workshops.

Practicability	Critical impact	Is a critical approach required?	The small-scale intervention of the research was not expected to change working practices significantly. An overtly critical intervention was not considered to be appropriate.	The intervention highlighted differences in interests of IT management and the user-groups. Giving the users a voice raised issues concerning the distribution of power in the IS development process.
	Economics	Is sufficient financial support and researcher time available?	The researcher was available 2 days per week and had funds available for travel and equipment.	The researcher was funded sufficiently with respect to time and financial resources.
	Access	Can access be negotiated with stakeholders (e.g. users, managers, developers, customers, business partners)?	Negotiation of access to an appropriate project for action-oriented research proved to be problematical. A series of smaller scale interventions (phases 1 and 2) were needed to gain the confidence of users and developers.	Access for the intervention was made available by the client management. The client organization was subject to a corporate takeover and negotiations to conduct further workshops were halted.
	Politics	Does the research conflict with the organization's politics? Is there sufficient backing for the action and case components?	The research was not perceived to be politically sensitive from a corporate perspective, but the research sponsors had no direct leverage with senior user management and thus access was negotiated bottom-up.	Management support was strong at the beginning (possibly because the project was perceived as an 'academic' intervention) but over time concerns were raised as management became aware of user demands for greater involvement and control.
	Control	Can the research project be controlled?	A quality method was defined and used in the intervention. The scope and scale were reduced such that the complexity of the intervention would be manageable.	A single technique was introduced and applied in the action case intervention.

characteristics are supplemented by considerations of ‘suitability’ (to the aims of the research project) and ‘practicability’ (the do-ability of the research project). Table 1 summarizes the factors that we experienced as important in designing and conducting the action case projects; it is a starting point and needs to be developed further through further instances of action case fieldwork.

In action case the scope of the investigation is restricted in order that a small to medium-scale intervention can be achieved in a rich local context. Complexity was reduced in the sense that single techniques were introduced. An intervention can raise critical issues, as exemplified in the priority workshop project—in giving users a voice, existing power structures were challenged. The timescale will be of short to medium duration rather than the longer timescales associated with full action research (Jonsson, 1991). A framework of ideas and a methodology for making the intervention should be declared so that it can be tested in-context (Checkland, 1991).

With action case the research design should take particular account of available resources, such as the skills and experience of the researcher, the time available, and financial constraints. The research question should be sufficiently focussed such that the effects of the change can be studied. Lower levels of participation from the organization than generally needed for action research can be accommodated. But, despite these constraints, there will still be an orientation toward building the future through purposeful change.

Although negotiating access when small scale interventions are planned, coupled with low levels of resource required from the participating organization, might be easier than full-scale action research, it might, however, reduce the organizational commitment towards implementing the outcome of the research. Overall, we suggest that in the fast changing IS environment small scale action case interventions focussed on a specific technique or method are valuable, although they are not intended as a replacement for large-scale interventions or for deep case studies.

6. Reflections on the IS research framework

6.1. *Organizing the learning about the research framework*

Learning from research should be a combination of learning about the content of the research and learning about the process of inquiry. In this paper we are concerned with learning about research methods rather than making a report of the learning from the content of the research. In order to talk of the learning about the process of inquiry a three level structure is used, which comprises concrete, general, and meta levels of learning. The inspiration for this comes from Bateson (1972) differentiation of levels of learning—first, second, and third order learning—which originated in communication theory and cybernetics (Star & Ruhleder, 1994). The first level emphasizes learning *something*, such as learning to use a tool. The second level is concerned with learning *about* something, such as the ability to choose between categories of tools. The third level addresses theories of categorization—learning about the *assumptions* that underly the different categories of tools. We similarly

adopt a three level approach in discussing our learning about research methods, referring to the three levels as concrete (learning about action case), general (learning about different classes of research methods), and meta (learning about what constitutes valid knowledge in IS research). The concrete learning about doing action case research has been reported above. In this section we consider the general and meta levels of learning.

6.2. General level—in-context IS research methods

At the general level it is important to differentiate action case from other research methods, particularly its near neighbours action research and soft case study. The research methods shown in Fig. 2a are now differentiated in Table 2 on the basis of the criteria established for action case above but extended to include prediction. Although participation by organizational actors in the research activity is an essential feature of interventionary research, it is possible to conduct action case research with a lower level of participation than would be needed for successful action research. For example, with action case it is possible to introduce new techniques without collaborating with the organizational participants in the design of the technique, as long as there is effective participation in the testing of the technique.

We also found the IS research framework, which contains the research methods depicted in Table 2, to be a useful guide in planning (matching the research question to a suitable method), managing (recognizing when the actual research is moving away from the plan) and explaining (after the event description of how the research unfolded) (Vidgen et al., 1997).

6.3. Meta level—basic assumptions about IS research

The meta level is concerned with basic assumptions about what is to constitute knowledge in IS research. The idea of paradigmatic closure (Burrell & Morgan, 1979; Hirschheim & Klein, 1989) suggests that research methods should be developed faithfully within their paradigms, leading to a strong distinction being made between positivist and interpretivist methods. The adoption of paradigmatic closure at the meta level means that the research results produced as a result of working within the different paradigms will be viewed as being incommensurable. In an attempt at paradigmatic reconciliation Lee (1991) has proposed a framework for integrating positivist and interpretivist approaches to organizational research in which three levels of understanding are distinguished: the subjectivity of the participants, the interpretivism of the researcher, and the objectivity of formal testing. However, Lee has created a hierarchical structure that is biased toward positivism and as a consequence is unacceptable to many IS researchers, such as Orlikowski and Baroudi (1991). Landry and Banville (1992) also address the research paradigm issue and identify three groups of IS researchers: the positivism-inspired ‘mainstream navigators’; the interpretivist, methodological-pluralist ‘knights of change’; and those who seek to bring all parties together under the umbrella of a unified approach to IS research—the ‘unity advocates’. Although we have presented a matrix of research

Table 2
Research method characteristics

	Research method					
	Hard case study	Soft case study	Action research	Action case	Field experiment	Quasi-field experiment
Research outcome	Change (intervention) Prediction (reduction)	Unintended Medium	Intended, large-scale Low	Intended, small to medium scale Low	Intended, small-scale High	Intended, small-scale Medium
Research characteristics	Understanding (interpretation)	Medium	Low to medium	Medium	Low	Low to medium
	Duration	Any	Long	Short to medium	Short	Medium
	Time orientation	Contemporary	Building future	Contemporary and building future	Contemporary	Contemporary and building future
	Participation	Low	High	Medium	High	Medium

methods and factors (Table 2) that might assist researchers at the general level in selecting a research method, it is likely that research methods will be to a large extent selected on the basis of tradition, making it less likely that ‘mainstream navigators’ will adopt interpretivist approaches or that the ‘knights of change’ will conduct experiments. Furthermore, the lessons of dilemmatics suggest that the ‘unity advocates’ are unlikely to find a super-method that meets the needs of prediction, change, and understanding.

We see much of the difficulty with IS knowledge as being rooted in the objectivist/subjectivist divide and the separation of people (organizations) and things (technology). One theory of the sociotechnical that attempts to dissolve these distinctions is actor network theory, ANT (Callon, 1986; Latour, 1987, 1993). ANT is of particular relevance for IS research because of the even-handed treatment of the social and the technological. According to ANT both human and non-human actors need to be enrolled into a heterogeneous network of alliances and their interests aligned. The generalized symmetry of human and non-human actors is a defining aspect of ANT. This symmetry can be disturbing since it requires us to think of non-human actors, such as technology, having interests, which has led Winner (1993) to raise the concern of moral relativism in ANT. It is not possible to do justice to a sophisticated and subtle set of ideas such as ANT in this paper and readers are referred to Latour (1987) for a discourse on the construction of scientific knowledge. However, with respect to the constitution of knowledge, a central theme of ANT is the notion of fact construction as a collective process (Latour, 1987):

The problem of the builder of ‘fact’ is the same as that of the builder of ‘objects’: how to convince others, how to control their behaviour, how to gather sufficient resources in one place, how to have the claim or the object spread out in time and space. In both cases, it is the others who have the power to transform the claim or the object into a durable whole. (p. 131).

There are implications of ANT for all three levels of learning about IS research. At the concrete level ANT can be seen as a research method in its own right, located in the soft case study area of Fig. 2a where ANT can be used to understand the trajectories of sociotechnical networks. ANT is clearly not a positivist method and neither is it an overtly interventionary approach, but ANT can be used to make sense of the data collected in traditional case studies; Walsham (1997) suggests that all reported IS research to date has used ANT in this way. At the general level ANT can be used to explain how the different research traditions create and maintain their networks of IS knowledge. Walsham (1995b) claims that interpretivism is a better method than positivism for studying IS in organizations (pp. 377–378), but notes that that positivism remains the orthodox approach to IS research. Using ANT Walsham (1995b) shows how the IS journal as ‘machine’ enrolls and controls IS researchers through editorial policies, editorial boards, and the selection of referees. Walsham’s concern is to show how the upkeep of a positivist tradition in IS research can be explained through ANT; in the same paper he attempts to enrol allies into a network of researchers and ‘facts’ grounded in interpretivism. At the meta level both

bodies of knowledge—interpretivism and positivism—can be explained through ANT as networks of association. The implications of ANT for the meta level are that there is no need to privilege one approach over the other since both are constituted by sociotechnical networks. For any IS research a central concern is the dissemination of ideas such that they become black boxes with a greater or lesser degree of irreversibility.

Drawing from Latour's later work (Latour, 1993) we argue that at the concrete level we need only continue doing what we have always done, making separations of object and subject world, such as field experiment and soft case study, as this is a practical way of getting on in, and making sense of, the world within research traditions. At the general level researchers will continue to strengthen the networks of their particular research traditions, such as positivism and interpretivism. At the meta level there is the potential of making a reconciliation through ANT, which provides a basis for making sense of both in-context and theoretical research, since all research is concerned with spreading claims, objects, and facts through time and space.

7. Summary

At the beginning of the paper it was argued that research conducted in an organizational context—in-context research—is an important and distinguishing aspect of the IS discipline, and particularly so given the fast changing landscape of IS deployment (for example, Internet technologies, globalization, and virtual organizations). The IS research framework presented here defines in-context IS research as a balance of interpretation, reduction, and intervention. Three purified forms of research (action research, soft case study, and field experiment) and three hybrid research methods (hard case study, quasi-experiment, and action case) were positioned within the IS research framework. We coined the phrase 'action case' to reflect a method that is a hybrid of action research (intervention) and soft case study (interpretation). Two research cases were presented and used to bring out the characteristics of the action case method through examples of research practice. The action case method is particularly well-suited to situations where full action research is not possible or is not appropriate. For example, action case can be used by new researchers, such as doctoral students, who wish to gain experience of in-context research on a small-scale and structured intervention while taking account of their level of experience of IS practice and research.

The discussion of dilemmatics indicates that a super-method for in-context IS research that will give usable levels of understanding, change, and prediction is unlikely to be achievable, making the position of 'unity advocates' (Landry et al., 1992) untenable. At the general level the IS research framework provides a helpful way of thinking about the range of methods that might be deployed for in-context IS research and provides a rationale for choice of a particular method.

Although debate continues concerning the compatibility of positivist and interpretivist approaches to research we lean toward symmetrical theories of knowledge,

such as actor network theory (ANT), where at the meta level different research methods represent differences in tradition rather than fundamentally incompatible views of what constitutes knowledge. We suggest that the traditions and identity of each of the in-context research methods needs to be maintained (although over time these methods will be adapted and new methods will be introduced) at the concrete and general levels while work continues at the meta-level to understand how the range of research findings generated through in-context research can contribute to IS theory and practice as a whole.

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