

## **Balancing Interpretation and Intervention in Information System Research: The Action Case Approach**

***R. Vidgen***

*Department of Computation*

*UMIST*

*Manchester M60 1QD, England*

*Tel: +44 161 200 3386*

*Fax: +44 161 200 3324*

*E-mail: rvidgen@sna.co.umist.ac.uk*

***K. Braa***

*Department of Informatics*

*University of Oslo*

*N-0316 Oslo, Norway*

*E-mail: kbraa@ifi.uio.no*

### **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. The research framework is then used to describe and explain an IS research project from which a practice-based rationale for an action case method is argued. 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 as a way of

reflecting on both the content of an IS research project and the IS research methods employed.

## 1 INTRODUCTION

A major strength of IS research is the potential to consider technological and organizational issues jointly, spanning the traditions of organization behavior and management through computer science and engineering. We argue that the primary laboratory for IS research is the organization, where the development and use of technical artefacts can be studied in-context and the resulting research findings used to inform both the practice and theory of IS. However, in conducting in-context research we recognize that it is possible for IS researchers to find themselves caught in an uncomfortable space, falling between research traditions which have different notions of relevance and rigor (Keen 1991) as well as different research methods. Thus, a central concern for IS research is the difficulty and challenge of adopting an interdisciplinary approach to research in the organizational laboratory.

The interdisciplinary nature of IS research may mean that we need new concepts and new or hybrid research methods in order to design, control, report and make effective use of IS research. An IS research framework has been proposed by Braa and Vidgen (1997) to assist IS researchers in navigating the space of in-context research. The research framework is based on the assumption that, regardless of the research tradition and method adopted, the organization constrains and enables what research can be done while at the same time recognizing that, to a greater or lesser extent, any research activity has the potential to initiate change in the organizational context. The aim of this paper is to illustrate the use of the IS research framework in practice as a device for planning, controlling, and evaluating IS research projects. One specific outcome of this work is the identification of a hybrid IS research method: action case.

The structure of the paper is as follows. In section 2, the IS research framework is described and a theoretical justification for an action case method advanced. In section 3, experiences of applying the research framework to an in-context IS research project are documented. The action case research method is elaborated in section 4; in section 5, a three-level analysis of learning from research projects is proposed; and in the last section a summary is made, together with ideas for future work.

## 2 AN IS RESEARCH FRAMEWORK FOR THE ORGANIZATIONAL LABORATORY

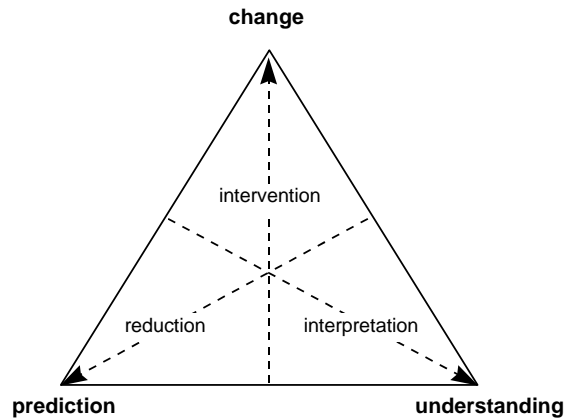
Research methods can be classified into two categories: positivist and interpretivist (Galliers 1985, 1992; Galliers and Land 1987). The positivist approach assumes that phenomena can be observed objectively and rigorously; good research is legitimated

with reference to the virtues of repeatability, reductionism, and refutability (Checkland 1981). In contrast, the interpretivist approach considers the methods of natural science to be inappropriate where human beings are concerned, recognizing that different stakeholders (including researchers) will interpret a situation in different ways. These two views of research can be characterized as positivism, which is concerned with reducing the area of investigation in order to be able to make reliable predictions and explanations, and interpretivism, which is concerned with making a reading of history in order to gain understanding. With the positivist approach, the researcher is an observer of the laboratory. 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. When an interpretivist approach, such as case study, is used, researchers also attempt to minimize their impact on the situation. However, we argue that in both positivist and interpretivist approaches the researcher is making an intervention (observation/interpretation constitutes an intervention) and can therefore affect the organizational context insofar as there may be unintended consequences (Giddens 1984). In some forms of research, such as action research, the aim is to gain knowledge through making deliberate interventions in order to achieve some desirable change in the organizational setting. The ideas of reduction (positivism), interpretivism, and intervention form the basis of the IS research framework.

## 2.1 The IS Research Framework

The framework is represented by a triangle (Figure 1), which comprises points, sides, and a constrained space (Braa and Vidgen 1997). The points represent intended research outcomes: *prediction* is aligned with the reduction of a positivist approach; *understanding* with an interpretive approach; and *change* with an interventionary approach. 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. As such, these ideal type approaches to research are not attainable in practice, which is represented by the constrained space of the triangle.

The dotted lines inside the triangle represent movements toward the ideal types. As the researcher moves toward the prediction point through a process of *reduction* there should be greater explanatory power, predictive power, and statistical generalizability. The traditional approach to explanation and prediction is experimental method. 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 and is achieved typically through case studies. Baskerville and Wood-Harper (1996) point out that IS as a highly applied field with strong vocational elements (p. 235), which means that a mix of practice and research is needed if relevant and usable knowledge are to be produced. Action research allows the researcher to address the practical aspects of IS and helps the researcher develop a practical compe-



**Figure 1** An IS Research Framework for the Organizational Laboratory.

tence that the methods of positivism and interpretivism can only approximate. The change point is achieved through a process of *intervention*, through which the researcher learns at first-hand about the mundane realities of IS and IS development in organizations.

## 2.2 Research Methods for the Organizational Laboratory

In this section, the different approaches to research adopted in the organizational laboratory are described in brief. We consider three purified forms of research - field experiment, soft case study, and action research – together with three hybrid research methods – quasi-experiment, hard case study, and action case.

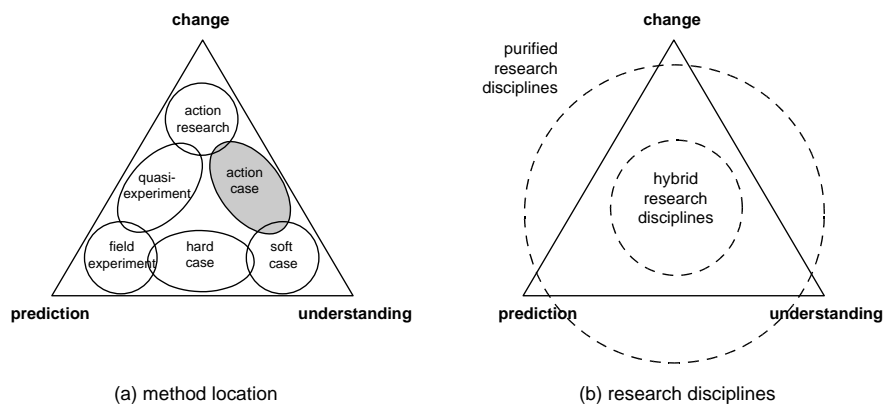
With a view to making generalizable statements that are applicable to real-life situations, the motivation for field experiments is to construct an experiment in a more realistic environment (an organizational context) than is possible in a laboratory setting. Field experiments aim at controlling a small number of variables which may then be studied intensively. There are two types of field experiments (Cook and Campbell 1989; Zmud, Olson and Hauser 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.

Galliers (1992) classifies case study as scientific, while Iivari (1991) categorizes the case study as an interpretivist method. For the purpose of providing a contrast we thus distinguish between the positivist *hard* case study, in the tradition of Yin (1984) and Lee (1989), and the interpretivist *soft* case study, as described by Walsham (1993,

1995). Soft case studies based on ethnographic methods can involve a variety of data collection techniques, such as videotape, and data analysis might involve techniques from grounded theory (Glaser and Strauss 1967).

Action research has been typified as a way of building theory and descriptions within the context of practice itself (see, for example, Susman 1983; Checkland 1991). Theory is 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 and Schön 1991). Drawing from Habermas (1972), we argue that change also involves a critical perspective, as exemplified in the Scandinavian tradition (Bansler 1989; Ehn and Kyng 1987).

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



**Figure 2** Research Methods.

Analysis of the research framework suggests that a further hybrid might be appropriate. The shaded area of Figure 2a has been labeled “action case,” which is a hybrid of understanding and change. In Figure 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 IS research method for use in the organizational laboratory. Such a method would need to be a three-headed hybrid that satisfies the requirements of prediction, understanding, and change.

### 2.3 Dilemmas of IS Research in the Organizational Laboratory

McGrath (1982) introduces the term dilemmatics and states 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 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 Figure 2, which manifests the three-horned dilemma in two ways. First, 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 be involved with IS practice as though she/he were entirely and indistinguishably part of the organization, while also being an outsider 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.

Focusing 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 toward hypothesis testing and a desire to keep the organizational context constant. The difficulty of conducting true experiments in an organizational laboratory is reflected in a survey conducted by Zmud, Olson and Hauser of the use of field experimentation within IS research in which they found only seven such studies reported. Thus, quasi-experiments (designed and natural) are more likely to be used than true field experiments in IS research. This trade-off is made at the expense of richness of insight (*understanding*).

- *understanding/change*: a trade-off between being an outside observer who can make interpretations (*understanding*) and a researcher involved in creating change in practice. Case study methods attempt to minimize changes caused by the research activity, 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 labeled action case. This trade-off is made at the expense of explanatory power (*prediction*).

In summary, the points of the triangle are characterized by action research, field experiment, and soft case study. Of the three dilemmas of IS research highlighted by the sides of the triangle, two are addressed currently, by quasi-experimentation and hard case study. The third dilemma we posit is not currently addressed by IS research theory and we have labeled this area action case. In the next section, the research framework is used to analyze an IS research project and to gather empirical evidence concerning the action case method.

### 3 APPLYING THE RESEARCH FRAMEWORK IN PRACTICE

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 research was sponsored by Eurospace's Software Quality Directorate. The terms of reference for the project called for the development and application of an IS quality method that could be used alongside the structured systems analysis methods (for example, SSADM (CCTA 1990) and object-oriented methods (for example, Rumbaugh et al. 1991)) that were currently in use within the organization. For the purposes of this paper, we focus on the research method adopted for the project and the context in which the research was conducted; we do not present details of the research content, i.e., the development and application of an IS quality method, this being described elsewhere (Vidgen 1996). The fieldwork was divided into three phases and spanned an elapsed time of just over two years, allowing for gaps between phases. The three phases are presented in chronological order.

### **3.1 Phase 1: Study of the Development Organization**

The first phase of the research lasted five months. At the outset of the first phase, the empirical research was loosely structured, being organized around the general objective of finding out about the system development process within Eurospace and the quality issues perceived by system development staff. All of the interviews were carried out with personnel from the technical computing department, who develop and manage applications software for aircraft documentation systems and computer-aided engineering (CAE) (see Dean and Susman [1989] and Liker, Fleischer and Arnsdorf [1992] for experiences of integrating CAE software into the manufacturing process). As the interviews progressed, common themes began to emerge that formed a basis for semi-structured interviews. In phase 1 of the research project, an understanding of the system development environment in technical computing was acquired through interviews and inspection of source documents. The researcher's interpretation of the phase 1 data highlighted the technology-based and process-centered perspective of system developers and gave an indication of the difficulties development managers might face in adopting a quality and customer-centered approach to system development.

### **3.2 Phase 2: Analysis of Specific Information Systems**

The aim of phase 2, which had a duration of nine months, was to understand better the context in which IT applications were used. Two computer systems were chosen for in-depth investigation: one was a planning system for aircraft electrical systems and the other a design quality monitoring system. Stakeholder analysis was used by the researcher to identify those affected by and affecting the computer system being studied and, as in phase 1, a series of interviews were conducted. Different stakeholders, including developers and various categories of users, were then brought together in a workshop in order to explore different conceptions of quality. This brought together primary and secondary users with the system developers and constituted an intervention insofar as prior to the research there had been no formal channel for the developers and secondary users to communicate. As a result of the workshop and the report produced at the end of the phase, changes to the operation and management of the electrical planning system were initiated. Following the completion of phase 2, a provisional approach to incorporating quality methods within the IS development process was proposed.

### **3.3 Phase 3: Application of the IS Quality Method**

The IS quality method developed at the end of phase 2 was now to be tested and developed further through action research. The researcher met with the head of technical computing to discuss potential projects, the result being that 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

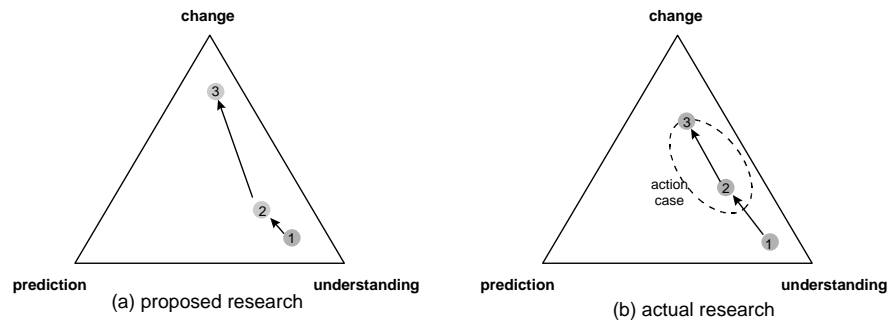


the project team and introduced the use of quality techniques, including quality function deployment (King 1989; Slabey 1990) and soft systems methodology (Checkland 1981; Checkland and Scholes 1990). In the third phase, which lasted ten months, there was a considerable degree of intervention initiated by the researcher: a series of quality requirements workshops were held with wind tunnel customers; there was close working with wind tunnel staff in producing an IS quality plan (this incorporated a quality questionnaire which was distributed to the user community); liaison with system developers in defining a computer system architecture, object model, and process model; and a work study of wind tunnel operation was made. Together these activities constituted a considerable intervention in the problem situation from which the IS quality method could be evaluated and made operational.

### **3.4 Using the Research Framework: Explanation and Reflection**

The three phases described above were mapped retrospectively (the research framework was not available until a point in time after the project had started) into Figure 1: the research design allowed for a general study of the system development context, more specific studies of particular computer systems and the development of an IS quality method which was to be tested through action research (Figure 3a). In practice it seemed that the case studies of phase 2 contained a greater element of intervention than had been envisaged. This intervention can be attributed in part to the workshop and to the end of phase report, both of which relate to improved communication between stakeholders. Thus, we consider that there was a higher degree of intervention than would occur with a “pure” case study, although in this instance the resultant change was largely an unforeseen consequence.

Phase 3 of the project, although having a quite considerable degree of intervention, did not result in the level of intervention and assimilation of methods that might have resulted from a commercial exercise with senior management backing and consultancy support. We attribute this to the project being perceived by the organizational participants as primarily a research exercise that would not change to any great extent the way system development was conducted. This was due in part to organizational factors. For example, the research project sponsors reported through a different part of the organization from the system development and wind tunnel departments, which meant that any access had to be negotiated on an informal basis; this could be difficult since all personnel time had to be accounted for and allocated against a budget code – participants could easily and legitimately decline to be involved. However, despite this the researcher was able to gain significant access to different parts of the organization and to conduct quality workshops. Phase 3 resulted in changes to the way the role of the wind tunnel department was perceived by its customers, the way in which the wind tunnel department perceived its role, and in a significant revision of the wind tunnel department’s IT strategy.



**Figure 3** Proposed and Actual Research Illustrated.

Our concern is that phase 2 does not seem to be a “pure” case study, due to the change element, while phase 3 does not quite constitute “pure” action research, due to the perception of the project as largely academic. Thus, in Figure 3b we show the research as it unfolded as being better typified on the boundaries of the action case area. The comparison afforded by Figure 3 can be used to help explain how the research unfolded in practice, particularly the unforeseen consequences that are characteristic of any activity in the organizational laboratory. The framework can also be used to monitor and take control action as the research unfolds.

#### 4 ACTION CASE ELABORATED

The area labeled action case in Figures 2a and 3b represents a mix of interpretation/understanding and intervention/change. In Figure 2a we argued for action case on the basis of dilemmas in the research framework and in Figure 3b we argue for action case on the more pragmatic grounds of unintended consequences and organizational constraints in the organizational laboratory. In practice the dilemma between intervention and interpretation is significant. For example, when doing a case study in a development context it is hard not to affect solutions on a concrete level, by bringing people together, stating critical questions, as happened in the fieldwork when workshops were conducted. However, if the aim of the research is to bring in new methods and concepts and to study their effect on the development process, what then is being studied in actuality? The researcher’s ability to diffuse new ideas and solve problems or the appropriateness of the method? These issues need to be framed, not as an either/or choice, but as a deliberate space for action. Thus the action component reflects the potential for research to change organizations resulting in changes to the social world and the case component reflects the necessity of weighing the understanding gained from the findings. With respect to the action component, we follow Checkland’s (1991) seven-stage model of action research in making a

framework of ideas explicit (a theory to be tested): 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. With purer forms of action nearer to the change point of the research framework this requirement might be relaxed, typically in situations in which a strongly critical perspective is taken.

From the fieldwork described above a number of practical lessons have been extracted, which serve to better delineate action case as well as providing further practical support for such an approach to IS research. The issues that have arisen from the fieldwork have been categorized under the headings of *suitability* (is action case a suitable method according to the research question investigated), *interpretation* (will sufficient depth of understanding be achieved), *intervention* (what degree of intervention can be achieved and managed), and *practicability* (what organizational constraints might impede the research). Each of these has been divided into a number of subheadings and an example from the fieldwork provided by way of illustration (Table 1).

#### 4.1 Characteristics of the Action Case Method

We recognize that the demands of the interpretation and intervention perspectives of action case might conflict (e.g., richness versus scale) and prefer to address such issues directly. However, it might be argued that action case, being a hybrid method, will inherit the weaknesses of the contributing “purified” research approaches, namely case study and action research. Thus, an action case might be subject to the criticisms of case study, such as generalizability, replicability, and control (Lee 1989) and of action research, such as paying insufficient attention to the ethical implications of change (Galliers 1992). However, we argue that action case should be seen as a response to the dilemma of interpretation and intervention as well as providing a pragmatic response to the issues of manageability of in-context research. Similarly, quasi-experiments and hard case studies represent approaches for dealing with the dilemmas of reduction and intervention, and interpretation and reduction respectively. Labeling the area of the research framework “action case” provides a basis for delineating the characteristics and usefulness of such an approach.

We see the characteristics of the action case approach as follows. First, the scope of the investigation is restricted such that small-scale interventions are made in the interests of gaining practical knowledge of IS use at the same time as achieving a rich, albeit proscribed, understanding of the context in which change takes place. Second, the timescale will typically be of a short to medium duration rather than the long durations associated with full-scale action research. Third, the intervention will be focused and deliberate such that the effects of the change can be studied in detail, per-

**Table 1** Characteristics of the Action Case Method.

<b>Factor</b>	<b>attribute</b>	<b>action case concern</b>	<b>example from the Eurospace fieldwork</b>
Suitability	Research design	Is action case appropriate to the research question to be investigated?	The action case method was appropriate to phase 2 (formulation of an understanding of what constitutes IS quality) and phase 3 (learning how the quality management can be incorporated in IS development).
	Re-searcher 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.
Interpretation	Richness	Is the scope of the research wide enough to provide understanding?	The scope of the research project was widened to include multiple stakeholders to ensure sufficient richness of context.
	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.
Intervention	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.
	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.
	Critical impact	Is a critical approach required?	The current situation was not perceived as requiring a critical intervention and the small-scale intervention of the research was expected to change working practices significantly.
Practicability	Economics	Is sufficient financial support and researcher time available?	The researcher was available two days per week and had funds available for travel and equipment.
	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.
	Politics	Does the research conflict with the organizations 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 sponsors had no direct leverage with senior user management and thus access was negotiated bottom-up.

Control	Can the research project be controlled?	The research focus, scope, and scale contributed to a reduction of complexity such that the research could be monitored against the research plan (using the research framework) and compensating action taken.
---------	-----------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

haps involving pre- and post mini-case studies. Although there is a flavor of experimental design in which the researcher seeks to control variables, in action case this will be rather less formal and is related to the issue of scope; in this sense action case involves a quasi-reduction of complexity. Fourth, action case will take from the tradition of action research a concern with building the future through purposeful change, while maintaining an interest in the historic conditions in which the research is set.

## 5 ORGANIZING THE LEARNING FROM THE RESEARCH

Learning from research is a combination of learning about the content of the research and learning about the process of enquiry. In order to talk about the learning from research, we propose that three levels are distinguished: concrete, general, and meta level learning. The motivation for adopting this approach is grounded in systems theory; three levels of analysis provides a powerful way of organizing our thoughts such that one can look up a level to (more) basic assumptions and down a level to practical results. Although it is often difficult to set the level of resolution appropriately (and the levels are potentially infinite in their upward and downward extent), the process of defining the levels promotes reflection and provides a vehicle for the organization of learning. Bateson (1972) provides similar levels of learning originated in communication theory and cybernetics (Star and Ruhleder 1994). Bateson differentiated between first, second, and third order learning. 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 underlie the different categories of tools. We similarly adopt a three level approach to learning, referring to the three levels as concrete, general, and meta levels. Furthermore, we apply the three levels to both the content and process of IS research.

### 5.1 Learning from the Content of the Research

Although the details of the content of the IS research project are excluded from this paper, it is relevant to comment on how the learning achieved in the project might be assessed. At the first level, the research could be evaluated in terms of practice. For example, the experiences of running and facilitating IS quality workshops and the mechanics of applying quality function deployment (QFD) to the IS domain were reflected on in terms of practical learning (*concrete* level). At the second level, the

implications of combining quality methods with mainstream IS development methods were considered from a methodological perspective (*general* level). At the third level, the research was considered from the viewpoint of basic assumptions about quality and information systems development (e.g., objectivism and subjectivism, conflict, and ethics): the *meta* level. This three-level approach to the analysis of the research was found to be a useful way of structuring the learning and is orthogonal to the research framework of Figure 3.

## 5.2 Learning About the Research Process

The three levels of learning can also be applied to the research process. Practical experience of using individual research methods is gained (concrete). Learning is made about the research framework (Figure 3), including the identification of the action case method (general). The third level is concerned with the assumptions on which the research framework is based (meta) and in this instance is associated in part with the problems of inter-disciplinary working, an issue that we consider to be central to both IS and IS research. It would be reasonable to expect there to be some justifiable relationship between the three levels of analysis of the content of a research project and the three levels of analysis of the research process employed, particularly at the assumptional (meta) level. This relationship need not necessarily be a one to one correspondence as shown by Clegg (1990), who uses modernist methods to study post-modern forms of organization, but the assumptions underpinning the research method and the assumptions under-pinning the research topic should be expected to have some degree of consistency.

## 6 SUMMARY AND FUTURE WORK

Some of the challenges and difficulties of being part of an interdisciplinary field consisting of often contradictory values, assumptions and methods have been highlighted in this paper. An IS research framework has been presented in order to provide language and concepts to support researchers navigating the organizational laboratory. The aims of IS research are presented as prediction and explanation, understanding and insight, change and practical knowledge. We recognized that these three aims constitute a three-horned dilemma represented by purified (one-point) research approaches – field experiment, soft case study, action research – and hybrid (two-point) research approaches – quasi-experiment, hard case study, and action case. We believe that a particular strength of IS research is the integration of theory and practice, intervention and interpretation, and that the elaboration of how these interests can be balanced will help in making IS research more professional.

An IS research project was analyzed using the research framework and it was proposed that learning from the content of the project be considered using three levels of analysis: concrete, general, and meta. The three-level analysis of learning is also recommended for evaluation of the learning achieved with respect to research

methods. At the concrete level, we have gained experience of applying the action case method and have identified some of the characteristics of the method, which were elaborated using the categories suitability, interpretation, intervention, and practicability. Action case is typified as involving a mix of interpretation and intervention with a sufficiently rich context; a focused research question; a framework of ideas to be tested; less than full participation by members of the organization; a low planned level of critical impact; small-scale interventions that are achievable given the researcher's experience and resources; and a short to medium duration. Clearly, further work is needed in developing an action case method and it is recognized that this requires the method to be adopted and developed by others. At the general level, the action case method was identified and the usefulness of the IS research framework for guiding and managing an IS research project has been reported; the research framework needs also to be applied in further research projects by others to assess whether it might have wider usefulness.

The meta level addresses the inter-disciplinary nature of IS research, where the assumptions at this level may be based on different schools of thought. For example, the meta level might be based on paradigmatic closure (Burrell and Morgan 1979), which would suggest that research methods should be developed faithfully within their paradigms. We tend toward more recent developments such as structuration theory (Giddens 1984) and actor network theory (Callon 1986; Latour 1987) where there is symmetric treatment of object and subject worlds. Given that these basic assumptions influence the content of IS research projects (for example, Hirschheim and Klein (1989) use the Burrell and Morgan's four paradigm model and Orlikowski (1992) uses structuration theory) we would expect these ideas to affect also research approaches and methods. We suggest that IS research methods need to be developed at all three levels of analysis and, although it is not possible to address the issues associated with a meta-level discussion of IS research in this paper, we consider that this is an important and continuing area for further work.

## 7 ACKNOWLEDGMENT

We thank the IFIP 8.2 referees for their valuable and constructive comments. This paper has benefited also from being the subject of an Internet Project discussion group and we wish to thank everybody who participated for their thorough and helpful criticism. We acknowledge the financial support provided to the Internet Project by the Swedish Transport and Communications Research Board (Kommunikationsforskningsberedningen). See <http://internet.adb.gu.se/> for further details of the Internet Project.

## 8 REFERENCES

- Argyris, C., and Schön, D. A. (1991). "Participatory Action Research and Action Science Compared." In W. F. Whyte (Editor), *Participatory Action Research*. Newbury Park, California: Sage.



- Braa, K., and Vidgen, R. (1997). "An IS Research Framework for the Organization as Laboratory." In M. Kyng and L. Mathiassen (Editors), *Computers in Context: Joining Forces in Design*. Cambridge, Massachusetts: MIT Press (forthcoming).
- Bansler, J. (1989). "Systems Development Research in Scandinavia: Three Theoretical Schools." *Scandinavian Journal of Information Systems*, Volume 1, pp. 3-20.
- Baskerville, R., and Wood-Harper, A. T. (1996). "A Critical Perspective on Action Research as a Method for Information Systems Research." *Journal of Information Technology*, Volume 11, pp. 235-246.
- Bateson, G. (1972). *Steps to an Ecology of Mind*. New York: Ballantine.
- Burrell, G., and Morgan, G. (1979). *Sociological Paradigms and Organizational Analysis*. London: Heinemann Educational Books.
- Callon, M. (1986). "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay." In J. Law (Editor), *Power, Action and Belief*. London: Routledge and Keagan Paul, pp 196-233.
- CCTA, (1990). *SSADM Version 4 Reference Manual*. Oxford: NCC Blackwell.
- Checkland, P. (1981). *Systems Thinking, Systems Practice*. Chichester, England: Wiley.
- Checkland, P. (1991). "From Framework through Experience to Learning: the Essential Nature of Action Research." In H.-E. Nissen, H. K. Klein, and R. Hirschheim (Editors), *Information Systems Research: Contemporary Approaches and Emergent Traditions*. Amsterdam: North Holland.
- Checkland, P., and Scholes, J. (1990). *Soft Systems Methodology in Action*. Chichester, England: Wiley.
- Clegg, S. (1990). *Modern Organizations: Organization Studies in the Postmodern World*. Newbury Park, California: Sage.
- Cook, T. D., and Campbell, D. T. (1989). *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. Chicago: Rand McNally.
- Dean, J., and Susman G. (1989). "Organizing for Manufacturable Design." *Harvard Business Review*, January-February, pp. 28-36.
- Ehn, P., and Kyng, M. (1987). "The Collective Resource Approach to Systems Design." In G. Bjerknes, P. Ehn, and M. Kyng (Editors), *Computers and Democracy: A Scandinavian Challenge*. Aldershot, England: Avebury, pp. 17-58.
- Galliers, R. D. (1985). "In Search of a Paradigm for Information Systems Research." In E. Mumford, R. Hirschheim, G. Fitzgerald, and A. T. Wood-Harper (Editors), *Research Methods in Information Systems*. Proceedings of the IFIP WG 8.2 Colloquium, 1 - 3 September, 1984, Manchester Business School. Amsterdam: North Holland.
- Galliers, R. D. (1992). "Choosing Information Systems Research Approaches." In R. D. Galliers (Editor), *Information Systems Research: Issues, Methods and Practical Guidelines*. Oxford: Blackwell Scientific.
- Galliers, R. D., and Land, F. F. (1987). "Choosing Appropriate Information Systems Research Methodologies." *Communications of the ACM*, Volume 30, Number 11, pp. 900-902.

- Giddens, A. (1984). *The Constitution of Society*. Cambridge: Polity Press.
- Glaser, B., and Strauss, A. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago: Aldine.
- Habermas, J. (1972). *Knowledge and Human Interests*. London: Heinemann.
- Hirschheim, R. A., and Klein, H. K. (1989). "Four Paradigms of Information Systems Development." *Communications of the ACM*, Volume 32, Number 10, pp. 1199-1216.
- Iivari, J. (1991). "A Paradigmatic Analysis of Contemporary Schools of IS Development." *European Journal of Information Systems*, Volume 1, Number 4, pp. 249-272.
- Keen, P. (1991). "Relevance and Rigor in Information Systems Research: Improving Quality, Confidence, Cohesion and Impact." In H.-E. Nissen, H. K. Klein, and R. Hirschheim (Editors), *Information Systems Research: Contemporary Approaches and Emergent Traditions*. Amsterdam: North Holland.
- King, R. (1989). *Better Designs in Half the Time: implementing QFD*. Methuen, Massachusetts: GOAL/QPC.
- Latour, B. (1987). *Science in Action*. Cambridge, Massachusetts: Harvard University Press.
- Lee, A. S. (1989). "A Scientific Methodology for MIS Case Studies." *MIS Quarterly*, Volume 13, March, pp. 33-50.
- Liker, J.; Fleischer, M.; and Arnsdorf, D. (1992). "Fulfilling the Promises of CAD." *Sloan Management Review*, Spring 1992, pp. 74-85.
- McGrath, J. (1982). "Dilemmatics: The Study of Research Choices and Dilemmas." In J. McGrath, J. Martin, and R. Kulka (Editors), *Judgement Calls in Research*. Beverly Hills: Sage, pp. 69-102.
- Orlikowski, W. (1992). "The Duality of Technology: Rethinking the Concept of Technology in Organizations." *Organization Science*, Volume 3, Number 3, pp. 398-427.
- Rumbaugh, J.; Blaha, M.; Premerlani, W.; Eddy, F.; and Lorenzen, W. (1991). *Object-Oriented Modeling and Design*. Englewood Cliffs, New Jersey: Prentice-Hall.
- Slabey, R. (1990). "QFD: A Basic Primer." *Transactions from the Second Symposium on Quality Function Deployment*, June 18-19, Novi, Michigan.
- Susman, G. (1983). "Action Research: A Sociotechnical System Perspective." In G. Morgan (Editor), *Beyond Method: Strategies for Social Research*. Newbury Park, California: Sage.
- Star, S. L., and Ruhleder, K. (1994). "Steps Toward an Ecology of Infrastructure: Complex Problems in Design and Access for Large-Scale Collaborative Systems." *Proceedings of the CSCW'94: Transcending Boundaries*. New York: ACM Press, pp. 253-265.
- Vidgen, R. (1996). *Multiple Perspectives of Information System Quality*. Unpublished Ph.D. Thesis, April, University of Salford.

- Walsham, G. (1993). *Interpreting Information Systems in Organizations*. Chichester, England: Wiley.
- Walsham, G. (1995). "Interpretive Case Studies in IS Research: Nature and Method." *European Journal of Information Systems*, Volume 4, pp. 74-81.
- Yin, R. K. (1984). *Case Study Research: Design and Methods*. Second Edition. Thousand Oaks, California: Sage.
- Zmud, R. W.; Olson, M.; and Hauser, R. (1989). "Field Experimentation in MIS Research." In I. Benbasat (Editor), *The Information System Research Challenge: Experimental Research Methods, Volume 2*. Cambridge, Massachusetts: Harvard Business School Research Colloquium.

## 9 BIOGRAPHY

**Richard Vidgen** has a first degree in Computer Science accounting Accounting and an M.Sc. in Accounting, both of which were awarded by the University of Manchester. He then developed and supported financial applications software for MSA Inc. (now Dunn & Bradstreet Software). This was followed by a number of years working as a freelance consultant engaged in the design and implementation of information systems in the financial sector. In 1992, he was appointed to a lectureship at the University of Salford, where he completed a Ph.D. in Information System Quality. He is currently a lecturer in the Department of Computation at UMIST with research interests in IS development methods, requirements analysis and process modeling, and group-working technologies.

**Kristin Braa** received her Ph.D. in computing science from the University of Oslo in 1995. She now holds a position as associate professor at the Department of Informatics at the University of Oslo. She does most of her research in the Internet project (<http://internet.adb.gu.se/>).