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Investigating Information Systems with Action Research

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TUTORIAL

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ABSTRACT

Action research is an established research method in use in the social and medical sciences since the mid-twentieth century, and has increased in importance for information systems toward the end of the 1990s. Its particular philosophic context is couched in strongly post-positivist assumptions such as idiographic and interpretive research ideals. Action research has developed a history within information systems that can be explicitly linked to early work by Lewin and the Tavistock Institute. Action research varies in form, and responds to particular problem domains. The most typical form is a participatory method based on a five-step model, which is exemplified by published IS research.

Keywords: action research, action science, research methods, qualitative research, interpretive research, intensive research, consulting, information systems

I. INTRODUCTION

Action research is an established research method in use in the social and medical sciences since the mid-twentieth century. Toward the end of the 1990s it began growing in popularity for use in scholarly investigations of information systems. The method produces highly relevant research results,

because it is grounded in practical action, aimed at solving an immediate problem situation while carefully informing theory. Throughout the decade, calls persisted for improved relevance in information systems research [Keen 1991 and Westfall 1999]. The lack of relevance in IS research spurred much of the increased interest in action research.

This paper is a tutorial in information systems action research. The paper surveys the history, context and domains of action research with particular focus on the information systems research arena. In addition, the method is described and details about a published example are presented. This paper particularly emphasizes the participatory form of action research.

The paper is organized into six sections. Following this introduction, Section 2 highlights the scientific and philosophical context that guides action researchers. Section 3 provides a detailed description of action research, including the defining characteristics, a brief history of action research from an information systems perspective, a survey of different forms of action research, the appropriate research settings for which action research can be most effective (its domains), and the close relationship between action research and consulting. Section 4 is a "how-to" guide for conducting action research including a brief description of its various processes, the distinctive nature of participatory action research, and strategies that have been found to lead to success in information systems action research. Section 5 provides background details about how a particular action research project unfolded, the results of which were published in an information systems journal. Section 6 briefly describes important limitations of the approach.

II. CONTEXT FOR ACTION RESEARCH

Action researchers are among those who assume that complex social systems cannot be reduced for meaningful study. They believe that human organizations, as a context that interacts with information technologies, can only be understood as whole entities. A key implication of this assumption is that the

factoring of a social setting, like an organization and its information technology, into variables or components, will not lead to useful knowledge about the whole organization. How then can we develop an understanding of the interaction of complex social organizations and their information systems? The fundamental contention of the action researcher is that complex social processes can be studied best by introducing changes into these processes and observing the effects of these changes.

This change-oriented contention profoundly shapes the action research approach. Three unavoidable effects are the adoption of an interpretivist viewpoint of research enquiry, the adoption of an idiographic viewpoint of research enquiry, and the acceptance of qualitative data and analyses.

The interpretivist viewpoint follows from the allowance for social intervention into the research setting. When the researcher intervenes, the researcher becomes part of the study, *i.e.* one of the study subjects. Action research empirics therefore incorporate interpretive statements that include the observer's values and a priori knowledge that invariably intrude upon the observation. In other words, the researcher perceives the "meaning" of the observation. As the researcher attempts to understand what is observed, this personal understanding will invade the recording of the observation and the deductions that follow [Kant, 1908]. The inter-subjective meaningfulness of actions, that is, the social meaning of action shared between researcher-subject and other subjects, also must form part of the experimental data. This shared meaning implies that the cognitive framework of the researcher and the other subjects (their "*Weltanschauung*": the structure of world perception as modified by evaluation and ideals) has to be considered [Checkland, 1981].

The idiographic viewpoint follows from the acceptance that each social setting involves a unique set of interacting human subjects. Any meaningful investigation must consider the frame of reference and underlying social values of the subjects. Action research operationalizes an idiographic method of enquiry partly by incorporating the subjects into their research as powerful

collaborators. Action research always involves a team that includes researchers and subjects as co-participants in the enquiry and change experiences.

Since action researchers adopt interpretive and idiographic postures, they must also adopt qualitative data as a medium to the empirics. Idiographic descriptions of the "meaningfulness of actions" often adhere to the cognitive structure of the subjects, thus using the terminology of the subjects. Such data typically defies accurate quantitative analysis. This "soft" data can sometimes be legitimately analyzed in its original state, with a limited set of mathematical and logical transformations. However, the full set of quantitative operations is not entirely legitimate for such use without qualitative interpretation through mapping, indexing and scaling [Halfpenny, 1979]. Qualitative analytical techniques like hermeneutics, deconstruction, and theoretical sampling are common companions to action research [cf. Baskerville and Pries-Heje, 1999]

The key assumptions of the action researcher,

(1) social settings cannot be reduced for study, and

(2) action brings understanding,

imply a philosophy that allows interpretivism, idiographic studies, and qualitative data. Action research methodology is strongly anchored to post-positivist philosophy. Knowledge obtained through the use of this approach is difficult to validate in terms of the natural science view of the philosophy of science. For example, characteristics of scientific enquiry, such as reductionism, repeatability, and refutation are not ideals of valid knowledge from action research [Checkland, 1981]. Susman and Evered [1978] find grounds for action research in phenomenology, existentialism, and hermeneutics. Thus, the action research method approaches information systems research as social enquiry rather than social science. It is an interventionalist's viewpoint: Researchers both observe and participate in the phenomena under study.

III. DEFINING ACTION RESEARCH

The action research literature is rather imprecise in its basic terminology. The term "action research" is itself used, on the one hand, to refer both to a general class of methods in social enquiry, and on the other hand, to a specific sub-class of those methods as distinguished from "action science", "action learning", "participatory action research", *etc.* To a large extent, this profusion of terminology arose because action research began as a unified approach to social enquiry and fragmented through its history. In its origins, the essence of action research is a simple two stage process.

- First, the *diagnostic stage* involves a collaborative analysis of the social situation by the researcher and the subjects of the research. Theories are formulated concerning the nature of the research domain.
- Second, the *therapeutic stage* involves collaborative change experiments. In this stage changes are introduced and the effects are studied [Blum, 1955].

A more precise definition of IS action research can be drawn from the published characteristics of action research in the social science literature. However, this literature is dominated by the canonical form of action research, and tends to emphasize action research characteristics based on goals and objectives rather than characteristics based on the process. Adapting Hult and Lennung's definition [1980] four major characteristics of IS action research are distinguishable:[1]

1. Action research aims at an increased understanding of an immediate social situation, with emphasis on the complex and multivariate nature of this social setting in the IS domain.

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[1]Two characteristics, a cyclical nature and an ethical framework, are excluded in this adaptation.

2. Action research simultaneously assists in practical problem solving and expands scientific knowledge. This goal extends into two important process characteristics: First, there are highly interpretive assumptions being made about observation; second, the researcher intervenes in the problem setting.

3. Action research is performed collaboratively and enhances the competencies of the respective actors. A process of participatory observation is implied by this goal. Enhanced competencies (an inevitable result of collaboration) is relative to the previous competencies of the researchers and subjects, and the degree to which this is a goal, and its balance between the actors, will depend upon the setting.

4. Action research is primarily applicable for the understanding of change processes in social systems.

HISTORICAL BACKGROUND OF INFORMATION SYSTEMS ACTION RESEARCH

Modern action research originated in two independent research programs with the development of action-based social psychology in the 1940s. Kurt Lewin [1947a; 1947b] developed a field-theory version of action research at the University of Michigan Research Center for Group Dynamics in order to study social psychology. The Tavistock Clinic (later the Tavistock Institute) independently developed an operational research version of action research [Trist, 1976]. The Tavistock Institute used action research to study psychological and social disorders among veterans of battlefields and prisoner-of-war camps. The two developments converged when Lewin joined Tavistock.

Lewin and Tavistock inspired a vast stream of work in action research, although adherents developed slowly. The post-war funding structure of social science research did not encourage action research because it was largely sponsored by public money. Leading researchers tended to seek projects that relied on "hard" quantitative data and the computer analysis that satisfied the governments' vision of science. This post-war emphasis on professionalism and

precise data collection methods led to a general decline in qualitative research skills. As a result, action research methods were seldom applied, and often of marginal scientific quality [Clark, 1972; Sanford, 1976].

The marginalization of action research helped mature the recognition that action research operated with a different epistemology than traditional science [cf. Blum, 1955; Susman and Evered, 1978]. Further, the conflicts that the approach raised were recognized [Rapoport, 1970]. This trend also linked action research closely to systems theory. Action researchers clearly recognize that human activities are systematic, and that action researchers are intervening in social systems. Early work by Mumford [Mumford and Weir, 1979], brought her Tavistock experience into the information systems field as a systems development technique called ETHICS. Peter Checkland's use of action research in connection with systems analysis is another landmark for the technique in the information systems community [Checkland, 1981; Checkland and Holwell, 1998; Checkland and Scholes, 1990]. Checkland used action research to develop soft systems methodology, and as a result, action research concepts for gaining professional knowledge permeate the soft systems approach itself. Checkland also explicitly linked action research to the philosophy of science and systems science [Checkland, 1981].

Action research was explicitly introduced to the information systems community as a purely research methodology by Wood-Harper [1985]. Like Mumford and Checkland, Wood-Harper also incorporated action research concepts into an action-based systems development methodology called Multiview [Wood-Harper et al., 1985].

Lewin's work was also one of the inspirations for research into double-loop organizational learning [Argyris and Schön, 1978]. This work eventually closed back to action research, although this closure included apologies for the corruption of action research over the years since Lewin [Argyris et al., 1985]. Argyris observed that, during the post-war development of action research, it gradually became separated from theory building and testing. The method became further corrupted by positivist attempts to introduce the rigor of more

traditional scientific experiments into action research projects. The effect of this rigor too often disconnected theory from reality, making the research results largely irrelevant.

FORMS OF ACTION RESEARCH

Action research refers to a class of research approaches, rather than a single, monolithic research method. As a class, the various forms of action research share some agreed characteristics, and these characteristics distinguish action research from other approaches to social enquiry. A careful survey of the action research literature finds widespread agreement by action research authorities on four common characteristics:

(1) an action and change orientation;

(2) a problem focus;

(3) an "organic" process involving systematic and sometimes iterative stages; and

(4) collaboration among participants [Peters and Robinson, 1984].

There are a variety of different research forms within this class of action research approaches. With regard to information systems, these forms were inventoried and analyzed from different perspectives. One perspective recognized ten distinct forms of action research in information systems, along with four distinguishing characteristics [Baskerville and Wood-Harper, 1998]. These forms and characteristics are summarized in Table 1. From another perspective, specific characteristics are used to identify research project reports as members of a class of action research methods. For example, Lau [1997] developed a four-class taxonomy: action research, participatory action research, action science and action learning. Lau then uses this taxonomy, along with other characteristics, to analyze three decades of significant IS action research articles.

Action research has been described as a technique characterized by intervention experiments that operate on problems or questions perceived by practitioners within a particular context. Participatory action research is

distinguished by the additional characteristic involvement of the practitioners as both subjects and co-researchers. "It is based on the Lewinian proposition that causal inferences about the behavior of human beings are more likely to be valid and enactable when the human beings in question participate in building and testing them" [Argyris and Schön, 1991, p. 86]. Action science is distinguished by the additional characteristic of a central emphasis on the spontaneous, tacit theories-in-use that participants bring to practice and research.

Table 1. IS Action Research Forms and Characteristics

Forms of IS Action Research	Characteristics of IS Action Research

• Cannonical
 	
• IS Prototyping
 	
• Soft Systems Methodology
 	
• ETHICS
 	
• Multiview
 	
• Action Science
 	
• Participant Observation
 	
• Action Learning
 	
• Clinical Field Work
 	
• Process Consultation
	• Process Model
	
	    Iterative
	    Reflective
	    Linear
	
	• Structure
	
	    Rigorous
	    Fluid
	
	• Typical Involvement
	
	    Collaborative
	    Facilitative
	    Expert
	
	• Primary Goals
	
	    Organizational Development
	    System Design
	    Scientific Knowledge
	    Training

DOMAINS OF ACTION RESEARCH

The type of learning created by action research represents enhanced understanding of a complex social-organizational problem. The domain of information systems action research is clearest where the human organization interacts with information systems. The domain must also be one where a contingent value can be attached to the findings. The research addresses a specific social setting, although it will generate knowledge that enhances the development of general theory. Action research aims for an understanding of a complex human process rather than prescribing a universal social law.

The domain does not include settings where the goals of the researcher and client differ seriously. The researcher must be of value to those being researched, and both parties must successfully negotiate their goals, or the tension will destroy the participative validity of the research. Both sets of goals must be satisfied in the study [Warmington, 1980].

The domain excludes settings where explicit theoretical frameworks become excluded as the basis for action. A practical implication of this exclusion means that highly emotional social settings, where rational action planning cannot be shared among the participants, will interfere with the learning from the research. The researcher must impose a clear, mutually agreed theoretical framework on the situation, in order for explicit, general lessons to emerge from the research.

The ideal domain of the action research method is characterized by a social setting where:

1. the researcher is *actively involved*, with expected benefit for both *researcher* and *organization*,

2. *the knowledge obtained* can be *immediately applied,* there is not the sense of the detached observer, but that of an active participant wishing to utilize any new knowledge based on an explicit, clear conceptual framework,

3. the research is a (typically cyclical) process *linking theory and practice* [Baskerville and Wood-Harper, 1996].

One clear area of importance in the ideal domain of action research is new or changed systems development methodologies. Studying new or changed methodologies implicitly involves the introduction of such changes, and is necessarily interventionist. From a social-organizational viewpoint, the study of a newly invented technique is impossible without intervening in some way to inject the new technique into the practitioner environment, i.e., "go into the world and try them out" [Land as quoted in Wood-Harper, 1989]. Action research is one of the few valid research approaches that we can legitimately employ to study the effects of specific alterations in systems development methodologies in human organizations [Baskerville and Wood-Harper, 1996].

DISTINGUISHING ACTION RESEARCH FROM CONSULTING

Action research processes and typical organizational consulting processes contain substantial similarities because the main streams of both action research and consulting literature can be traced back to the work of Kurt Lewin. Much of the scholarly work in management consulting is partly rooted in process consultation [Schein, 1969]. Schein borrowed heavily from Lewin's action research concepts, and the cycles are very similar. However, much of the literature that follows [e.g., Kubr, 1986; Lippitt and Lippit, 1978] discards the iterative process in favor of the linear "engage-diagnosis-action-disengage" that Schein also allowed.

Action research and consulting differ in five key ways:

1. Motivation. Action research is motivated by its scientific prospects, perhaps epitomized in scientific publications. Consulting is motivated by commercial benefits, including profits and additional stocks of proprietary knowledge about solutions to organizational problems.

2. Commitment. Action research makes a commitment to the research community for the production of scientific knowledge, as well as to the client. In a consulting situation, the commitment is to the client alone.

3. Approach. Collaboration is essential in action research because of its idiographic assumptions. Consulting typically values its "outsider's," unbiased viewpoint, providing an objective perspective on the organizational problems.

4. Foundation for recommendations. In action research, this foundation is a theoretical framework. Consultants are expected to suggest solutions that, in their experience, proved successful in similar situations.

5. Essence of the organizational understanding. In action research, organizational understanding is founded on practical success from iterative experimental changes in the organization. Typical consultation teams develop an understanding through their independent critical analysis of the problem situation.

In summary, consultants are usually paid to dictate experienced, reliable solutions based on their independent review. Action researchers act out of scientific interest to help the organization itself to learn by formulating a series of experimental solutions based on an evolving, untested theory [Baskerville, 1997].

IV. THE ACTION RESEARCH APPROACH

The most prevalent action research description [Susman and Evered, 1978] details a five phase, cyclical process. The approach first requires the establishment of a client-system infrastructure or research environment. Then, five identifiable phases are iterated:

(1) diagnosing,

(2) action planning,

(3) action taking,

(4) evaluating and

(5) specifying learning.

Figure 1 illustrates this action research structural cycle. Each of these phases is reviewed below [Baskerville, 1997].
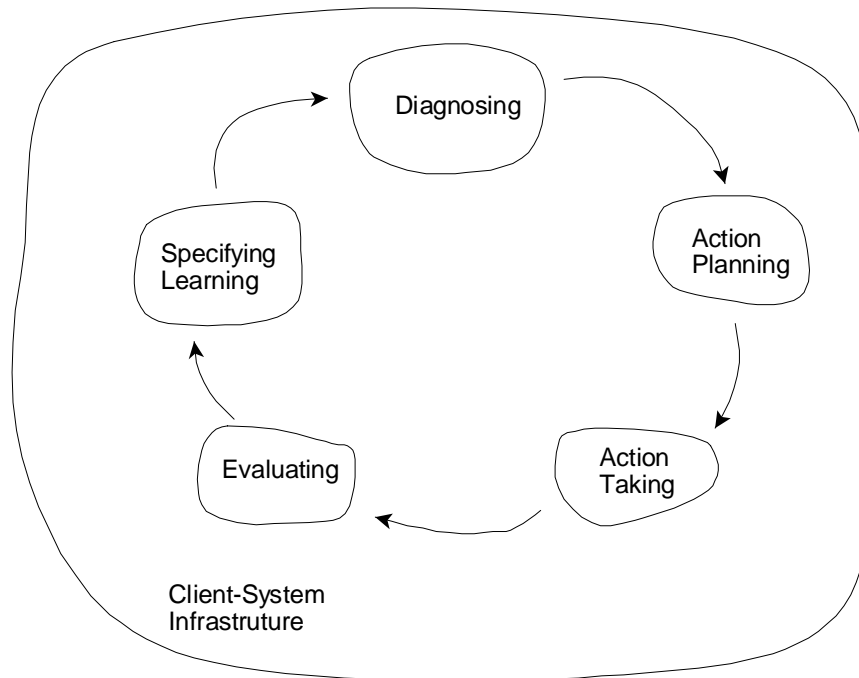

Figure 1. The Action Research Cycle

Client-System Infrastructure

The client-system infrastructure is the specification and agreement that constitutes the research environment. It provides the authority, or sanctions, under which the researchers and host practitioners may specify actions. It also legitimates those actions with the express expectation that eventually these will prove beneficial to the client or host organization. Considerations found within the agreement may include the boundaries of the research domain, and the entry and exit of the scientists. It may also patently recognize the latitude of the researchers to disseminate the learning that is gained in the research. This infrastructure should

also define the responsibilities of the client and the researchers to one another. For example, the infrastructure will probably assume that the researchers will not purposely specify actions that are harmful to the organization.

A key aspect of the infrastructure is the collaborative nature of the undertaking. The research scientists work closely with practitioners who are located within the client-system. These individuals provide the subject system knowledge and insight necessary to understand the anomalies being studied:

> "For convenience it is useful to think of the practitioner as part of a set of actors who are oriented to solution of practical problems, who are essentially organizational scientists rather than academic scientists." [Clark, 1972, p. 65]

Diagnosing

Diagnosing corresponds to the identification of the primary problems that are the underlying causes of the organization's desire for change. Diagnosing involves self-interpretation of the complex organizational problem, not through reduction and simplification, but rather in a holistic fashion. This diagnosis will develop certain theoretical assumptions (i.e., a working hypothesis) about the nature of the organization and its problem domain.

Action Planning

Researchers and practitioners then collaborate in the next activity, action planning. This activity specifies organizational actions that should relieve or improve these primary problems. The discovery of the planned actions is guided by the theoretical framework, which indicates both some desired future state for the organization, and the changes that would achieve such a state. The plan establishes the target for change and the approach to change.

Action Taking

Action taking then implements the planned action. The researchers and practitioners collaborate in the active intervention into the client organization, causing certain changes to be made. Several forms of intervention strategy can

be adopted. For example, the intervention might be directive, in which the research "directs" the change, or non-directive, in which the change is sought indirectly. Intervention tactics can also be adopted, such as recruiting intelligent laypersons as change catalysts and pacemakers. The process can draw its steps from social psychology, e.g., engagement, unfreezing, learning and re-framing.

Evaluating

After the actions are completed, the collaborative researchers and practitioners evaluate the outcomes. Evaluation includes determining whether the theoretical effects of the action were realized, and whether these effects relieved the problems. Where the change was successful, the evaluation must critically question whether the action undertaken, among the myriad routine and non-routine organizational actions, was the sole cause of success. Where the change was unsuccessful, some framework for the next iteration of the action research cycle (including adjusting the hypotheses) should be established.

Specifying Learning

While the activity of specifying learning is formally undertaken last, it is usually an ongoing process. The knowledge gained in the action research (whether the action was successful or unsuccessful) can be directed to three audiences:

- First, what Argyris and Schön [1978] call "double-loop learning," the restructuring of organizational norms to reflect the new knowledge gained by the organization during the research.

- Second, where the change was unsuccessful, the additional knowledge may provide foundations for diagnosing in preparation for further action research interventions.

- Finally, the success or failure of the theoretical framework provides important knowledge to the scientific community for dealing with future research settings.

The action research cycle can continue, whether the action proved successful or not, to develop further knowledge about the organization and the validity of relevant theoretical frameworks. As a result of the studies, the organization thus learns more about its nature and environment, and the constellation of theoretical elements of the scientific community continues to benefit and evolve.

Participatory Action Research

The traditional action research approach described above has been extended into a form known as "participatory action research". An important change is the realignment of the roles of researcher and subject into more collaborative and synergistic forms. Formerly, responsibility for theorizing rested primarily on the shoulders of the researcher. In participatory action research, this responsibility is shared with client participants. In other words ". . . members of the organization we study are actively engaged in the quest for information and ideas to guide their future actions." [Whyte et al., 1991, p. 20].

This increased client participation is a major change. The single most distinguishing characteristic that contrasts participatory action research from earlier forms is the "co-researcher status" that is accorded to the client participants [Elden and Chisholm, 1993]. Researchers and clients bring their own distinctive sets of theoretical knowledge into the action research process. Action researchers bring their knowledge of action research and general information systems theories. Client participants bring situated, practical theory into the action research process. As a result, control over the social setting is realigned. The setting is free to self-reorganize rather than be artificially determined by the external researchers. In this way, participatory action research is based on assumptions that reality is situated [Berger and Luckmann, 1966] and social systems are self-referencing [von Foerster, 1984]. Participatory action research can be seen as being founded on more recent organizational philosophy.

In participatory action research, it is not necessary for researchers to extensively research theories surrounded the immediate problem setting in

anticipation of action planning. It is assumed that the researcher cannot acquire the depth of understanding that client professionals will have already achieved through years of living within the social context under study. An indirect effect of the full collaboration of all participants is that participatory action research extends the social scope of action research. This extension has been noted both in studies beyond the level of a single production unit or plant, and in studies beyond the Anglo-American culture [Elden and Chisholm, 1993].

STRATEGIES FOR ACTION RESEARCH

Seven key strategies in conducting action research are known to improve the rigor and contribution of the research [Baskerville and Wood-Harper, 1996]. Each of these is described below.

Consider The Paradigm Shift

Since action research does not occur in the traditional positivist philosophy of science and has a domain of ideal research questions, be sure that action research is appropriate for the research question and will be of interest to an audience that accepts post-positivist learning.

Establish A Formal Research Agreement

Ensure the human subjects of the study give "informed consent". Some human subjects research review boards might view the conduct of action research disguised as consulting as an unethical practice. The consent and disclosure agreement is only part of the client-system infrastructure. The researcher should also clearly arrange for the "warrants" that will authorize the research team to initiate action within the organization.

Provide A Theoretical Problem Statement

The theoretical framework must be present as a premise, otherwise the intervention action is no longer valid as research. The diagnosis document should include explicit theoretical foundations. As the research progresses, the emergence of theory should be recorded carefully in the research notebooks.

Plan Data Collection Methods

Action research is empirical, though the collected data is typically qualitative and interpretive. Data can be collected through audio-taped observations, interviews, action experiments and participant-written cases. Action experiments entail discussions with subjects "on the spot" during action taking, while participant-written cases are the written recollections of the subject following action taking [Argyris et al., 1985]. Researchers or teams may also keep structured diaries [Jepsen et al., 1989]. Carefully design and specify the data collection techniques clearly when setting up research infrastructure and revisit this issue when planning action.

Maintain Collaboration And Subject Learning

Action research requires careful preservation of collaboration with subjects. Particularly for participatory action research, the subjects will have key knowledge, both of theory and the practical setting, that is critical to the discovery of important aspects of the theory under test. Avoid dominating the diagnosis and action planning phases (i.e., assuming the authoritative role of the external consultant).

PROMOTE ITERATIONS

Action research is also typically cyclical. Action failures (in terms of the immediate problem situation) are as important as, perhaps more important than, action successes. Action should continue until the immediate problem situation is relieved. Actions that relieve an immediate problem setting are powerful evidence of the practical effectiveness of an underlying theory.

Generalize Accordingly

The generality of theories developed in action are founded in deductive generalizations [Baskerville and Lee, 1999]. This type of generalizability is shared with laboratory experiments. General statements cannot be made on the basis of the number of observations (a statistical notion), but rather on a representative sample of one. Generalities must be tempered with an

interpretation of the extent of similar settings to which the theory can be expected to apply.

V. ACTION RESEARCH IN ACTION

As an example of this kind of research, we will expand the details of a published IS action research project that regarded semantic database prototyping [Baskerville, 1993]. The research setting involved two organizations: the special projects division of a consortium of universities, and a military-related government organization.   The immediate problem situation regarded the failure to complete a systems analysis. The government organization had undergone two rather unhappy and failed attempts at analysis of their information requirements. A complicated data base and analysis requirement had befuddled two earlier teams. These failures complicated further requirements analysis, because the users had grown hostile and suspicious of analysts and designers. The government approached the consortium because it appeared that the IS design problems were practically unsolvable.

PROJECT INFRASTRUCTURE

The consortium tasked their special projects division with the problem. This division contacted an information systems action researcher within the consortium universities. The researcher had worked with this division on earlier projects. Working with the researcher, the division formed a team. The team included an experienced team leader from the consortium with a strong practical background in the application area: logistics and information systems. The team also included an analyst, also with a strong background in the specific setting (a procurement system). The researcher was the single academic on the team, commissioned as an action researcher with the title "scientific advisor". Later the team expanded to include a programmer and a second analyst.

Figure 2 is a rich picture of the action research team formation. It may seem that a more ideal formulation of the research team would have included participants from the target system (see Figure 3). The decision was taken by

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the team *not* to include participants from the government organization, but rather enroll all team participants from the consortium. This was done because of the particular social setting, one in which the potential government participants were extremely occupied with a heavy workload, and frustrated and demoralized by earlier attempts at resolving the immediate problem. These users were instead viewed as customers, and the action research problem setting focused instead on the consortium's projects division.
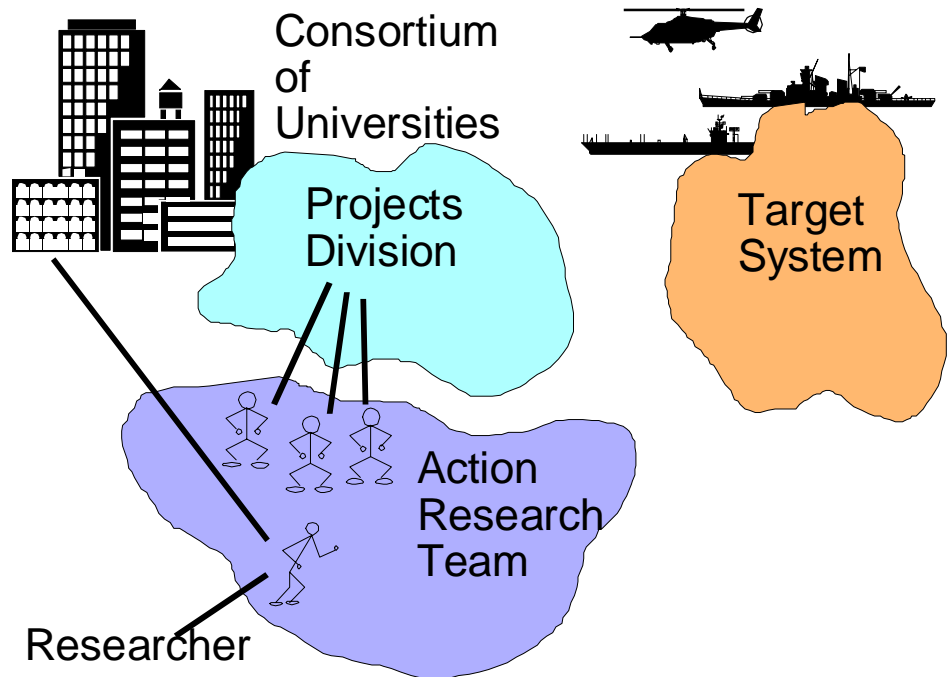
Figure 2. Action Research Team Formation
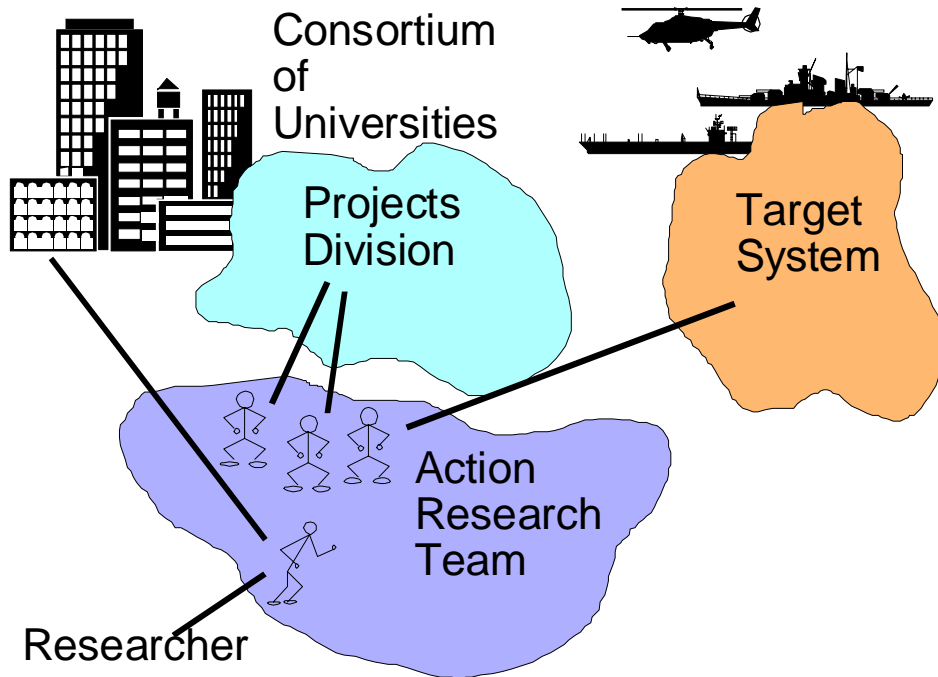
Figure 3. A More Ideal, but Unachievable Team Formation

INTERVENTION DIAGNOSIS

The initial diagnosis discovered that the early projects were defeated by the large set of data classes, the large volume of data, and the high degree of volatility in the organizational environment. The team closely attended the need for highly flexible applications, and turned to information engineering theory. According to this theory, such organizations should center their requirements on the data model, because of the inherent stability of the data relationships compared to the volatility of processes.

However, the team realized that there were practical problems with the adoption of information engineering. First, there were no trained, experienced database designers available, and database design is rather esoteric in nature.

Higher government or consortium management was not committed because of the earlier failures. Information engineering requires a large interval of initial database analysis, which would not prove acceptable to either organization. Relief from neither problem was predicted by the team. Management of both organizations wanted quick, measurable, and highly visible results. The inability of previous database specialists to communicate with the users had created user alienation. Further, a tight budget and the temporary nature of the project prevented assimilation of database specialists into the team, or extended training of the existing team.

FURTHER INITIAL DIAGNOSIS

As a result, the team focused on the lack of interactive user validation of database designs, turning to prototyping theory. According to this theory, successful systems development through prototyping should lead to:

- immediate artifacts that would gratify management's need for prompt,
- visible results,
- build the study team's database design experience,
- constantly and interactively validate specifications under the acute realities of user reviews,
- improve user-designer communications,
- lead to shared understanding,
- increase user participation in the design process, and
- heighten the initial acceptance and effectiveness of a new system.

ACTION PLANNING

The action plan was to apply prototyping (normally a vehicle for application development) solely for the purposes of database design. This process included a formal group and individual interview process, pre-specification standards for prototype components, video screen prototypes, printed report prototypes, and a parallel application prototyping cycle. The latter was to help the users distinguish between the data prototypes and future application prototypes

ACTION TAKING

The team acquired hardware and software, and implemented the action as a group. They began rapid, brief interviews with the users, and started an initial rapid prototyping cycle of the database design.

OUTCOME

The initial outcome met with only mixed success. The organizations' management and users were positively impressed, intrigued, and motivated to pursue the proposed development approach. Their future participation was achieved. However, the technical process was less successful. There was an Herculean design and programming effort. The deadline effect as the promised prototype demonstration date approached was crushing. The programmers found that the specification for the prototype was largely a moving target that was impossible to achieve or track. Indeed the programmers were threatening to quit. In addition, process-oriented features infected the database specification as a result of user preoccupation with process.

SPECIFYING FIRST CYCLE LEARNING

The prototypes were called a "success" because they revealed the design feasibility, created user enthusiasm because of their control over system design elements, and the rapid progress pleased management. However the prototypes were called "unsuccessful" because of the programming workload that was impossible to sustain, the complex and volatile specification, and the infection of process into the data design. The development process could not be continued in its initial form to project completion. Some further adjustments were necessary.

ADJUSTING THEORY

In subsequent cycles, the team introduced semantic database theory into the process. Programming rules replaced functional specifications. These rules defined how the relationships and constraints illustrated in a data model should appear in data manipulation screens. As a result, only the entity-relationship diagram was retained as the prototype specification and medium of analyst-

programmer communication. This change eliminated algorithms from the specification, relieved the deadline effect, and mechanically prevented the infection of process into the data design. In addition, the team decided to drop the complicated report programs in favor of a few simple listings (the users had ignored these), eliminated group interviews (little value was added by group interviews to the information gleaned from the individual interviews), and eliminated the parallel application prototype development (this parallel effort only seemed to confuse the users).

Theory Emergence

The need to adjust the theory shows how theory emerges through iterations of action research cycles. The initial theoretical focus was on software engineering and socio-technical participation. However, as action revealed more and more about the nature of the problem setting, the team developed theory in the direction of user-designer semantics. The resulting theoretical contribution: use of prototypes for capturing semantic database design, proved significant to the field [see Baskerville, 1993 for complete details of the scholarly contribution]. In addition, the immediate problem setting was resolved, and the data analysis project was completed, accepted by the government, and over the following years was used successfully as the infrastructure for application development.

VI. LIMITATIONS OF ACTION RESEARCH

Action research is not without its problems for the researcher. In the constellations of available information system research methods, action research is among the more qualitative approaches. It is parked solidly outside of valid positivist techniques. Its qualitative and interpretive foundations make journal-length articles difficult. The lack of generally agreed criteria for evaluating action research further complicates the publication review process. These constraints make the approach a difficult choice for academics tied tightly into the journal system of scholarly communication.

The research intentionally seeks to achieve valuable goals for the research subjects, and is popular among consultants as a technique for organizational development. As a result, action research "looks like" consulting. Financial research support from the client is common, and these payments only serve to further cloud the distinctions between the two domains. Indeed, a scholar who consults as a sideline may see a research opportunity in their consultancy setting. Both ethical and professional problems ensue. For example, researchers who do not carefully explain their research orientation may mislead clients who are expecting consulting-type performance, creating an ethical breech regarding informed consent. Professionally, researchers may become to embroiled in the problem setting, and lose contact with their obligations to develop general knowledge about related theories.

The action research collaborative framework diminishes the researcher's ability to control the process and the outcomes of the research. The lack of control makes it difficult to apply action research as an instrument in an orchestrated research program. Practitioners with serious problems typically drive the venue for action research. Scholars are not as free to "pick and choose" the problem they wish to investigate. This initiation problem makes action researchers appear opportunistic in their research programs. Further exacerbating this control issue, participatory action research empowers client members of the research team with partial control over theoretical developments. A researcher who does manage to find a problem suitable to their predefined research program may find that the theoretical emergence twists the research in an entirely different direction. Keeping their ethical responsibility to the client and their problem setting in the fore means that the researchers cannot merely walk away from an unfinished project simply because they lost interest in the shifting theoretical domain.

Despite these problems, action research responds directly to the pronounced needs for relevance in information systems research, and provides a rewarding experience for researchers who want to work closely with the practitioner community. It can be used in many research modes, both to

generate new theory and to reinforce or contradict existing theory. It can be combined with other research methods for diversifying a research program. Participatory action research also enriches the research community by drawing researcher-practitioners into the research process.

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REFERENCES

Argyris, C., R. Putnam and D. Smith. (1985) *Action Science: Concepts, Methods and Skills for Research and Intervention*, San Francisco, CA: Jossey-Bass.

Argyris, C. and D. Schön. (1978) *Organizational Learning: A Theory of Action Perspective*, Reading, MA: Addison-Wesley.

Argyris, C. and D. Schön. (1991) "Participatory Action Research and Action Science Compared." in W. F. Whyte, (ed.) *Participatory Action Research*, Newbury Park, N.J.: Sage, pp. 85-96.

Baskerville, R. (1993) "Semantic Database Prototypes," *Journal of Information Systems*, (3) 2, pp. 119-144.

Baskerville, R. (1997) "Distinguishing Action Research From Participative Case Studies," *Journal of Systems and Information Technology*, (1) 1, pp. 25 - 45.

Baskerville, R. and A. Lee. (1999) "Distinctions Among Different Types of Generalizing in Information Systems Research." in O. Ngwenyama et al., (eds.) *New IT Technologies in Organizational Processes: Field Studies and Theoretical Reflections on the Future of Work*, New York: Kluwer Academic Publishers.

Baskerville, R. and J. Pries-Heje. (1999) "Grounded Action Research: A Method For Understanding IT in Practice," *Accounting, Management and Information Technology*, (9), pp. 1-23.

Baskerville, R. and A. T. Wood-Harper. (1996) "A Critical Perspective on Action Research as a Method for Information Systems Research," *Journal of Information Technology*, (11) 3, pp. 235-246.

Baskerville, R. and A. T. Wood-Harper. (1998) "Diversity in Information Systems Action Research Methods," *European Journal of Information Systems*, (7) 2, pp. 90-107.

Berger, P. and T. Luckmann. (1966) *The Social Construction of Reality: A Treatise in the Sociology of Knowledge.*, New York: Anchor Press.

Blum, F. (1955) "Action research--A scientific approach?," *Philosophy of Science*, (22) 1, pp. 1-7.

Checkland, P. (1981) *Systems Thinking, Systems Practice*, Chichester, UK: J. Wiley.

Checkland, P. and S. Holwell. (1998) *Information, Systems and Information Systems: Making Sense of The Field*, Chichester, UK: John Wiley.

Checkland, P. and J. Scholes. (1990) *Soft Systems Methodology in Practice*, Chichester, UK: J. Wiley.

Clark, P. (1972) *Action Research and Organizational Change*, London: Harper & Row.

Elden, M. and R. F. Chisholm. (1993) "Emerging Varieties of Action Research: Introduction to the Special Issue," *Human Relations*, (46) 2, pp. 121-142.

Halfpenny, P. (1979) "The Analysis of Qualitative Data," *Sociological Review*, (27), pp. 799-827.

Hult, M. and S. Lennung. (1980) "Towards A Definition of Action Research: A Note and Bibliography," *Journal of Management Studies*, (17), pp. 241-250.

Jepsen, L., L. Mathiassen and P. Nielsen. (1989) "Back To The Thinking Mode: Diaries for The Management of Information Systems Development Projects,," *Behaviour and Information Technology*, (8) 3, pp. 207-217.

Kant, I. (1908) "The Critique of Pure Reason (1781)." in B. Rand, (ed.) *Modern Classical Philosophers*, Cambridge, MA: Houghton Mifflin, pp. 370-456.

Keen, P. (1991) "Relevance and Rigor in Information Systems Research: Improving Quality, Confidence Cohesion and Impact." in H.-E. Nissen, H. Klein, and R. Hirschheim, (eds.) *Information Systems Research: Contemporary Approaches & Emergent Traditions*, Amsterdam: North-Holland, pp. 27-49.

Kubr, M. (1986) *Management Consulting: A Guide to the Profession 2nd Ed.*, Geneva: International Labour Office.

Lau, F. (1997) "A Review On The Use of Action Research in Information Systems Studies." in A. Lee, J. Liebenau, and J. DeGross, (eds.) *Information Systems and Qualitative Research*, London: Chapman & Hall, pp. 31-68.

Lewin, K. (1947a) "Frontiers in Group Dynamics," *Human Relations*, (1) 1, pp. 5-41.

Lewin, K. (1947b) "Frontiers in Group Dynamics II," *Human Relations*, (1) 2, pp. 143-153.

Lippitt, G. and R. Lippit. (1978) *The Consulting Process In Action*, San Diego, CA: University Associates.

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

Peters, M. and V. Robinson. (1984) "The Origins and Status of Action Research," *Journal of Applied Behavioral Science*, (20) 2, pp. 113-124.

Rapoport, R. (1970) "Three Dilemmas of Action Research," *Human Relations*, (23) 6, pp. 499-513.

Sanford, N. (1976) "Whatever Happened to Action Research?" in A.Clark, (ed.) *Experimenting with Organizational Life: The Action Research Approach.*, New York: Plenum, pp. 11-18.

Schein, E. (1969) *Process Consultation: Its Role in Organizational Development*, Reading, MA: Addison-Wesley.

Susman, G. and R. Evered. (1978) "An Assessment of The Scientific Merits of Action Research," *Administrative Science Quarterly*, (23) 4, pp. 582-603.

Trist, E. (1976) "Engaging with Large-scale Systems." in A. Clark, (ed.) *Experimenting with Organizational Life: The Action Research Approach*, New York: Plenum, pp. 43-75.

von Foerster, H. (1984) "Principles of Self-Organization -- In a Socio-Managerial Context." in H. Ulrich and G. J. B. Probst, (eds.) *Self-Organization and Management of Social Systems: Insights, Promises, Doubts and Questions*, Berlin: Springer-Verlag, pp. 2-24.

Warmington, A. (1980) "Action Research: Its Method and Its Implications," *Journal of Applied Systems Analysis*, (7) 4, pp. 23-39.

Westfall, R.D. (1999) "An IS Research Relevance Manifesto" *Communications of the Association for Information Systems* (2)14, September http://cais.isworld.org/contents.asp (Current as of 30 September 1999)

Whyte, W. F., D. J. Greenwood and P. Lazes. (1991) "Participatory Action Research: Through Practice to Science in Social Research." in W. F. Whyte, (ed.) *Participatory Action Research*, Newbury Park, CA: Sage, pp. 19-55.

Wood-Harper, T. (1985) "Research Methods in Information Systems: Using Action Research." in E. Mumford et al., (eds.) *Research Methods in Information Systems*, Amsterdam: North-Holland, pp. 169-191.

Wood-Harper, T. (1989) "Comparison of Information Systems Definition Methodologies: An Action Research Multiview Perspective. University of East Anglia Ph.D. Thesis.

Wood-Harper, T., L. Antill and D. E. Avison. (1985) *Information Systems Definition: The Multiview Approach*, Oxford: Blackwell Scientific.

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