Furthering Information Systems Action Research: A Post-Positivist Synthesis of Four Dialectics

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Abstract

As authors of Information Systems (IS) Action Research (AR) studies attempt to report their results, the calls for AR research design, conduct, presentation, and evaluation guidelines must be answered to advance the maturation process of AR and move it into a more prominent position in mainstream publications. AR is a research approach that is most often associated with researchers who subscribe to an interpretive epistemology and collect qualitative data and is more common in Europe and Australia than in North America. To further IS AR, especially in North America, we offer ten recommendations based on a post-positivist synthesis of four dialectics: rigor/relevance, positivist/interpretive epistemology, quantitative/qualitative methodology, and confirmatory/disconfirmatory evidence. Any researcher may profit from developing his or her own synthesis of these four dialectics. Our synthesis reveals an innovative view of falsifiability, grounded theory methodology, triangulation, and recommendations for presentation of findings to a broad audience in mainstream research journals.

Keywords: Action research, research paradigm, synthesis, dialectic, triangulation framework, epistemology, falsifiability, Front-end-loaded Grounded Theory Method (FGTM), multiple methods, mixed methods

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I. Introduction

Overview

In 2007, the overall theme of the European Conference on Information Systems (ECIS) was "Relevant rigour – Rigourous relevance." This theme reiterates the demand for and shortage of IS research relevant to practitioners (Paper 2001; Benbasat and Zmud 1999; Davenport and Markus 1999; Robey and Markus 1998; Tranfield and Starkey 1998). This shortage may be addressed by performing more research on business problems in natural settings. Action research (AR) is one type of research that occurs in natural settings; however, as an emerging research approach, it is not yet widely disseminated. The ECIS theme also reflects the acceptance of AR and qualitative methodology in Europe, Australia, and European journals to a greater degree than in North America and North American journals (Gallivan and Benbunan-Fich 2007). Since North Americans represent over 70% of top producing researchers (Gallivan and Benbunan-Fich 2007), addressing this difference is key to furthering AR, which is the overall goal of this paper.

AR has been conceptualized by several researchers in different fields, with credit often going to Kurt Lewin (1946), who was concerned that traditional research approaches were not helping resolve critical social problems. He conceived AR as combining theory generation with changing a social system as a result of the researcher "acting" within it. AR has the potential to be applied to an enticing variety of relevant business and social situations. Hult and Lennung (1980) provide a complete definition of AR:

> Action research simultaneously assists in practical problem-solving and expands scientific knowledge, as well as enhances the competencies of the respective actors, being performed collaboratively in an immediate situation using data feedback in a cyclical process aiming at an increased understanding of a given social situation, primarily applicable for the understanding of change processes in social systems and undertaken within a mutually acceptable ethical framework.

AR is an exemplar research approach for investigating broad organizational issues (Baskerville and Wood-Harper 1996). The importance of IS AR has been recognized, and the shortage of published AR has been highlighted by special issues for AR in *Information Technology & People* (2001) and *MIS Quarterly* (2004).

There are many forms of AR (Baskerville and Wood-Harper 1996; DeLuca and Kock 2007; MISQ 2004). The focus of this article is on canonical AR (Davison et al. 2004), also known as classical or traditional AR. From this point forward, when we refer to AR, we mean canonical AR, but that does not preclude application of our recommendations to other forms of AR and other IS research. AR is generally conducted for multiple cycles of a five-step process (Davison et al. 2004; Susman and Evered 1978):

    1) Diagnosing the problem
    2) Planning the action
    3) Taking the action
    4) Evaluating the results, and
    5) Specifying lessons learned for the next cycle.

Researchers and practitioners collaborate during each step. Throughout each cycle, AR is focused on both organizational improvement and the generation of knowledge (Baskerville and Wood-Harper 1998).

Yet, with such tremendous potential to advance organizations and knowledge, few IS AR articles are published. With the goal of furthering AR, we will summarize eight issues surrounding AR that must be addressed, using the principles of dialectics and synthesis as our philosophical basis for addressing these issues in this Introduction (Section I). Section II provides a post-positivist synthesis for AR of the four dialectics of: 1) rigor/relevance objective; 2) positivist/interpretive epistemology;

3) quantitative/qualitative methods; and 4) confirmatory/disconfirmatory evidence. In the Discussion and Recommendations Section (III), we summarize the result of the synthesis – our ten recommendations for action researchers. The contributions of the paper and outlook for AR are summarized in the Conclusions, Section IV.

Difficulties, Misunderstandings, and Criticisms of AR

We must address the obstacles facing action researchers in order to further AR. We summarize below the issues surrounding AR – eight difficulties, misunderstandings, and criticisms.

A. Some academic departments, more so in North America, discourage new scholars from conducting AR, criticizing that AR is not yet recognized by some as "mainstream" research. To facilitate moving AR into a more prominent position in mainstream journals, we address specific concerns that may hinder that goal; notably that mainstream research tends to be positivist. Post-positivism (Lincoln and Guba 2000) has positivist roots, but with an expanded acceptance of falsifiable, common-sense hypotheses (not null hypotheses) and qualitative methods to support a study. When considered from a post-positivist perspective, AR may be more readily accepted into the mainstream.

B. A common misconception of AR (and other research approaches where the researcher interacts with the participants) is that it is not valid research because it is not conducted "behind the glass." As one can clearly see from the definition above, AR is conducted in concert with practitioners. We will examine several epistemological perspectives and demonstrate the need for understanding research approaches, such as AR, whose *strength* is that they occur in natural settings. A natural setting may be a contribution to satisfying the goal that a study have both conceptual and practical significance (Straub et al. 1994).

C. Lack of consistent research paradigm vocabulary plagues IS in general, but with the vulnerable state of AR, this misunderstanding must be addressed in order to allow readers of AR studies to clearly position AR relative to other IS research. Is AR a "method," an "epistemology," or a "research approach?" AR is a *research approach* that can be conducted from a variety of epistemological perspectives using a variety of methods.

We reiterate the call for a description of research paradigms (Lau 1997) and suggest consistent language around research paradigms including: axiology (ethical, aesthetic, and spiritual considerations); ontology (nature of reality/people); epistemology (relationship between inquirer and the known); methodology (means for gaining knowledge); and research approach (type of involvement with participants). We believe in conducting research in a natural environment (axiology), and that there are patterns that are repeatable and some that are context-based (ontology). We subscribe to a post-positivist epistemology, multi-methodology, and the AR approach. We recommend that each empirical AR article contain a consistent and deliberate description of the research paradigm employed for the study.

D. To add to the difficulty of presenting an AR study, *there are multiple forms of AR, and authors are criticized for failing to mention the form of AR they are using.* This criticism can be remedied by authors and reviewers systematically addressing the form of AR (Baskerville and Wood-Harper 1996; DeLuca and Kock 2007; MISQ 2004) as part of the description of the research paradigm as well as informing the reader of the criteria for AR of that type and the role of the researcher in the study (Lau 1997).

E. A criticism of AR is that often the theoretical basis is not evident. AR has the dual goal of benefiting the research client and generating relevant research knowledge for the research community, making the synergistic outcomes desirable for practitioners and theoretical development (Avison et al. 1999b; Kock and Lau 2001). A largely positivist audience expects a theoretical component to be at the forefront of a study. Relevant guidelines for qualitative researchers (Klein and Myers 1999; Dube and Pare, 2003) and action researchers (Baskerville and Myers 2004; Davison et al. 2004; Davison 2001;

DeLuca and Kock 2007; Eden and Huxham 1996; Lee 2005; Lau 1997) have emphasized the need for an explicit theoretical component, without leading to extraordinary length.

Our approach to theoretical development is designed to provide knowledge and disseminate results from AR studies in a manner that will inform an audience wider than that presently engaged in this line of research (Eden and Huxham 1996). In a related tutorial (DeLuca and Kock 2007), we emphasize the theoretical component of AR and offer guidelines for presenting AR results in a format similar to that employed in positivist studies. We believe that using a more post-positivist perspective (Lincoln and Guba 2000) may help to bridge the gap to a largely positivist audience, for example by specifically stating hypotheses and including qualitative data in support of them. In this paper, we offer several additional recommendations for effectively informing a largely positivist audience.

F. A common criticism, whether warranted or not, of studies using qualitative methods is that they are not rigorous enough. Qualitative methods have the "power to explain what goes on in organizations" (Avison et al. 1996b, p. 94) and are ideal for IS studies, especially as the focus shifts to managerial and organizational issues (Myers 1997) that may be less suited to quantification. Yet, as the 2007 QualIT Conference (on qualitative research) theme heralds, "From The Margin To The Mainstream," research based on qualitative data is still under-represented in some mainstream journals (Avison et al. 1999a; Lee and Liebenau 1999; QualIT 2007) while in others "serious challenges to the legitimacy of such research no longer arise." (Markus and Lee 1999, p. 37). Various definitions of rigor are investigated in this article. Systematic approaches to processing qualitative data are relatively new (e.g., Langley 1999) compared to quantitative methods, leaving a great deal of variability in quality. We contribute recommendations both to improve the quality of qualitative methods and to reduce risks to validity by combining them with other methods.

G. One reason for the difficulty in publishing AR journal articles is that AR *studies tend to amass large amounts of primarily qualitative data, multiplied for each cycle, ushering articles to unwieldy lengths.* Studies that need to process intense amounts of qualitative data, regardless of epistemological perspective or research approach, are referred to as "intensive" research (Markus and Lee 1999). To showcase this valuable and intensive research, special issues of AR have made special provisions for the unusual length of the articles. It is often the case that a full description of an AR study would require a *book*. To facilitate journal-article-length dissemination of findings, we offer several recommendations for condensing the presentation of large amounts of data across multiple AR cycles.

H. Effective dissemination of AR results may also help to overcome the IS field's communication deficit (Hirschheim and Klein 2003). Standards for IS research (Straub et al., 1994) include demonstrating adequate care in the conduct and presentation of the research. Yet, a need for specific guidelines for action researchers is noted by Avison et al. (1999b, pp. 96-97):

> … there is still a lack of detailed guidelines for novice IS researchers and practitioners to understand and engage in action research studies in terms of their design, process, presentation and criteria for evaluation. There is a need for an action research … methodology that can serve as a comprehensive framework and guide for the larger community.

Pursuant to providing criteria for evaluation, Davison et al. (2004) published principles for conducting canonical AR. Yet, even when the principles are followed, *the diverse presentation styles found in the most exemplary special issues present the studies in varied and often difficult-to-follow, inconsistent formats.* AR results are typically reported by steps of the cycle (Street and Meister 2004; Kohli and Kettinger 2004; Yoong and Gallupe 2001), by distinct research sites (Braa et al. 2004), or based on chronology of events (Chiasson and Dexter 2001). We recommend a reporting format that is more consistent with that expected by a largely positivist audience – by *hypotheses* as in DeLuca and Valacich (2006), or proposition as in Straub and Welke (1998). We seek to contribute presentation techniques for the rich and varied data that AR generates.

By using a philosophical approach based on dialectics described in the next section, we address the *difficulties, misunderstandings, and criticisms* found in IS AR research and synthesize recommendations regarding: article length and formatting, the misunderstandings of what constitutes valid research, research paradigms, forms of AR, criticisms of AR regarding the handling of theory, rigor, and moving AR into the publication mainstream.

Using Dialectics and Synthesis

To engage in an innovative discussion with the goal of furthering the maturation process of IS AR, we looked to other cultures for inspiration (Marshak 1993). Dialectic logic, as in the complementary polarity of *yin* and *yang*, is historically Chinese (Lao Tzu, 480 B.C.) and has been applied in a variety of contexts. We build upon the concept of dialectics where "development depends on the clash of contradictions and the creation of a new, more advanced synthesis out of these clashes" (Penguin's Dictionary of Sociology, p. 70). Dialectics have taken various forms in IS research, including *dialogical reasoning* (Klein and Myers 1999), *logic of opposition* (Robey and Boudreau 1999; Robey et al. 2002), and *dialogical AR* (Martensson and Lee 2004). In the next section, we will make recommendations based on the synthesis of dialectics in four spheres: research objective, epistemology, methodology, and evidence.

Rather than characterize dialectics as "opposites," a "clash of contradictions," or a "hotly polarized debate" (Paper 2001), we extend the metaphor of the *yin-yang* symbol. It refers to "harmonizing factors of the universe," … "neither could live without the other," … "yin energy can always be found inside yang, and vice versa as the white spot (*yang*) inside the *yin* and black spot (*yin*) inside the *yang* of the popular *yin-yang* symbol testify" (Webster 1999, p. 6). We argue that each contrasting element of our research dialectics is analogous to either the white or black, but not separate from it. First, rigor is found inside relevance; second, different epistemologies can be harmonizing; third, qualitative and quantitative methods can complement each other; and fourth, to advance a given theoretical model, confirmatory evidence cannot live without the attempt to find disconfirmatory evidence. Regarding the methodology dialectic, many researchers who collect solely quantitative or solely qualitative data seem to have "not only a preference for one but also a distrust of the other" (Kidder and Fine 1987, p. 57). We strive in all our recommendations to become "bicultural," sustaining the discussion around the differences in order to achieve "synthesis, collaboration, and cooperation between the two cultures" (Kidder and Fine 1987, p. 57).

Synthesis provides "the common ground for the intermingling of the divergent philosophical schools" (Chan 1967, p. 51). Consistent with the *yin-yang* principle, the opposing schools that represent the contrasting research objectives, epistemologies, methodologies, and forms of evidence are considered necessary. Although one view is typically more prevalent in any given research study, incorporating some of the complementary view is also important in creating a balanced research approach. To arrive at a synthesis (which is the objective of dialectic reasoning), one must determine the dynamic "laws of operation" that create harmony from contradiction (Chan 1967) with consideration of the "interdependent meaning of parts and the whole" (Klein and Myers 1999, p. 72).[1] Below, we develop ten "laws of operation" (recommendations) that can be applied in a manner appropriate to each unique research environment.

In the overview, we enumerated various difficulties, misunderstandings, and criticisms of AR, the result of which is that few AR studies are actually published. We now examine four dialectics that lie at the root of the problem, and we provide a synthesis of the forces within each dialectic – even though the forces seem to be at odds with each other.

Table 1 provides a summary of the dialectics and a characterization of how AR might achieve a synthesis from each set of forces described in more detail in the following sections. This approach to AR is a contribution of the paper.

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[1] All seven principles for conducting interpretive field research enumerated by Klein and Myers (1999) have been incorporated throughout the text.

Table 1. A Summary of The Synthesis of Four Research Dialectics			
Aspect of Research	**Dialectic**		**Synthesis**
	Prevalent View	*Complementary View*	
Objective	Rigor	Relevance	Conduct AR on business problems in their natural environment in a rigorous manner, with a theoretical basis and using the Front-end-loaded Grounded Theory Method (FGTM).
Epistemology	Positivist	Interpretive	Frame AR results in an atypically post-positivist manner with hypotheses, while incorporating guidelines for both good positivist and good interpretive research.
Methodology	Quantitative	Qualitative	Design research to include multi-methodologies for each hypothesis.
Evidence	Confirmatory	Disconfirmatory	Seek both confirmatory and disconfirmatory evidence and use triangulation to integrate all evidence. Consider employing presentation tools – the modified fishbone diagram, Triangulation Framework, and a Graphical Conceptual Framework to depict knowledge gained.

Table 1 serves as the template around which we organize the next section of the paper, which examines each dialectic in turn, describing the benefits to be achieved from synthesis, and offering examples within an AR context.

II. The Four Dialectics

Dialectic 1: Synthesizing the Rigor/Relevance Objective

Relevant Action Research
Rigor and relevance are both important research objectives (Benbasat and Zmud 1999; Davenport and Markus 1999; ECIS 2007). For many researchers, the term *rigor*, unfortunately and mistakenly, means "measurement rigor rather than rigorous study of phenomena" (Paper 2001). *Rigor* can be achieved by analyzing data and theory from a variety of sources and by using multiple methods, including measurement. We assert that rigor also "requires critical reflection of the social and historical background of the research setting" (Klein and Myers 1999, p. 72), which highlights the complementary objective in this dialectic – relevance, defined as being of importance to both practitioners and researchers (Benbasat and Zmud 1999; Davenport and Markus 1999).

AR seeks dual relevance objectives – conducting research relevant to the client while generating relevant knowledge for the research community (Baskerville and Myers 2004; Kock and Lau 2001; McKay and Marshall 2001). The answers to research questions result in solutions to an organizational problem as well as expanded research theories relevant to the field of IS.

The appropriate balance point for any dialectic is unique to the specific situation, but Martensson and Lee (2004) argue that studies with little relevance and strong rigor may be no more valuable than relevant studies with little rigor. Like *yin* and *yang*, rigor is found inside relevance. With "relevance first, rigor next" (Paper 2001), both objectives are considered integral to the synthesis.

> *When designing a study, consider relevance to the practitioners in their natural environment and relevance to the researchers with the advancement of knowledge and theory.*

Mason (1988) described a similar balance desired (in the context of experimental research) as a dialectical tradeoff between tightness of control and richness of reality, the goal of which is generating "plausible" knowledge. AR is but one approach that can bring relevance to the forefront, or at least to a state of balance, thereby making it readily "consumable" (Robey and Markus 1998).

The synthesis of the rigor/relevance objective dialectic is to conduct AR on business problems in their natural environment in a rigorous manner, grounded in theory. Both rigor and relevance are addressed by: a primary focus on the concerns of practice, a study that is theory-based as well as context-rich, and results that are actionable (Davison 2001). By conducting AR on a business problem, we apply "practical action" (Baskerville and Myers 2004) and by conducting the research in a natural environment we have research that is "socially situated" (Baskerville and Myers 2004). Rigor may also be improved with more formalized control of an AR project (Avison et al. 2001).

Rigor is further addressed in this paper in several other ways: 1) through informing theory described in the epistemology section; 2) through multiple methods, as discussed in the methodology section; 3) by seeking both confirmatory and disconfirmatory evidence as discussed in the section by the same name; and 4) through recommendations that are specific to AR, its conduct, presentation, and principles designed to apply to the more typical interpretive research. Techniques generally applied relative to AR cycles also contribute to rigor and are discussed below.

Action Research Cycles Address Rigor

Structure and rigor are elemental in each of the five steps of AR, which are repeated over multiple cycles. In the *diagnosing* stage, an initial organizational problem is identified, and a framework that is mutually acceptable to researcher and participants is agreed upon. In the *action planning* stage, leaders and members are selected by the organization to participate in the research, and the chosen intervention is prepared. *Action taking* is the actual conduct of the research. In the *evaluation* stage, participants are interviewed and the data are summarized and analyzed. Finally, in the *specifying learning* stage, researchers and practitioners reflect on and articulate lessons learned and identify opportunities for improvement for subsequent research cycles. This reflection is perhaps the most important step in the process and contributes to knowledge (Lau 1997) and should also include reflection on the techniques and methods used (Davison 2001). Thus ends the first "cycle" of an AR study and begins the second cycle. The same basic steps are germane to the simultaneous cycles for practice and research, the "problem solving interest cycle" and "research interest cycle" (McKay and Marshall 2001). To leverage the rigor added by AR cycles, there must be at least two iterations of these five steps in any AR study.

Important contributions to rigor can be made by cyclical research. By using similar and tested instruments and consistent protocol in each cycle for *reliability,* and generalizing at the group level for *internal validity*, *generalizability* is improved. Use of consistent data and units in each AR cycle aids *replication* and *external validity*. By seeking both confirmatory and disconfirmatory evidence in successive iterations as well as considering problem solving as part of learning, additional *checks against bias* are provided. *Construct validity* is gained by multiple sources of evidence, either from multiple cycles or from a combination of quantitative and qualitative methods.

Quantitative Rigor

Quantitative data is rarely mentioned within the context of an AR study. In most AR studies, data are gathered via observation and interaction with participants, and these data are thereby largely textual. Questionnaires may be developed to add rigor, to aid in structuring interviews of participants, and to collect both quantitative and qualitative data relevant to each construct as well as to discover emergent constructs.

While survey items that are published in scholarly journals often employ scales of Likert statements (Nambisan et al. 1999), questions asked of participants can also be worded in a manner that yields categorical data (e.g., increased, same, decreased), which may be analyzed using a chi square test of association (Rosenthal and Rosnow 1991) with effect size (Howell 2002). Structured

instrumentation can both generate quantitative measures and ask the "how" and "why" questions recommended by Yin (1994).

The design of a study could be constructed so that evidence can be analyzed with both statistical methods and a systematic approach to qualitative data, such as grounded theory or other structured methods (e.g., Langley 1999). The goal is to achieve a combination of methods whose threats to validity differ (Cook and Campbell 1979). Qualitative data allows for *clarity* of a phenomenon but without a measure of *amplitude*. Quantitative measures yield numerical results but with the risk of measuring the *unintended*. In combination (multiple methods), the overall risk to validity is reduced and the overall rigor of the study is increased. The results are more robust and form a fuller picture from a wider range of coverage (Kaplan and Duchon 1988). Although multi-method studies are not new, they are still relatively rare and underappreciated (Gable 1994; Mingers 2003).

Qualitative Rigor

When collecting qualitative data from sources such as open-ended interview responses, explanations given by participants for their perceptions, and general observations, we must include consideration of the impact of the interaction between researcher and participant. Researchers need to be sensitive to "biases" and "distortions" that they bring to the scenario (Klein and Myers 1999). To this end, researchers should note their role and be continually aware of their interactions with participants. Also, researchers should obtain written permission from participants and management to use the data for research purposes, while protecting the anonymity of the participants.

As part of a rigorous approach to interpreting qualitative data (Allan 2007), techniques (Strauss and Corbin 1998) applied in traditional grounded theory methodology (GTM) (Glaser and Strauss 1967) may be applied. Use of GTM generally begins with the researcher coding text into phrases with the goal of uncovering theory.

Strictly speaking, traditional GTM does not accept independent, pre-existing reality and is therefore not part of theory testing (Suddaby 2006) or a positivist approach (Mingers 2003). When Strauss and Corbin (1998) suggested the use of pre-categories, Glaser strongly objected (1992), calling it "forcing." However, amid the controversy, there is a call to improve the quality of IS research through greater use of theoretical bases. The National Science Foundation (NSF), a major financial resource for IS researchers, pronounced its objection to the use of GTM, in its more extreme form, because it begins with an "area of study" rather than a theoretical basis (NSF 2004). Yet the techniques of GTM can be applied in a variety of valuable ways (Allan 2007; Urquhart and Fernández 2006) and should not be dismissed.

GTM has been extended in many ways. Baskerville and Pries-Heje (1999) offered a variation from traditional GTM with "grounded AR," arguing that AR is "somewhat predefined" by the problematic situation. Urquhart and Fernández (2006) addressed the traditional inductiveness of grounded theory method and referred to the "researcher as a blank slate" as a "myth." Goldkuhl and Cronholm's (2003) "multi-grounded theory" method also challenged the strictly inductive approach used in traditional GTM and suggested that the grounding should apply to three processes: the traditional empirical *data* (Glaser and Strauss 1967), *external theories*, and congruence between elements *internal to the theory*, adding the theory grounding after inductive coding.

Our recommendation applies a multi-grounded theory method approach, but goes one step further to make "grounding" more generic, suggesting the *a priori* use of a "start list" of codes (Maxwell 1996; Miles and Huberman 1994). In this context, the start list would be constructs based on all of the following: literature review, the chosen theoretical basis, and previous cycles of AR. We recognize that this kind of start list is so fundamentally different from the inductive roots of traditional GTM that this GTM requires a new name. We call this the Front-end-loaded Grounded Theory Method and use a single letter "F" to create a simple mnemonic variation on GTM (FGTM), rather than a longer acronym.

> *For qualitative data processing, consider use of the Front-end-loaded Grounded Theory Method (FGTM) with a start list of codes derived from literature, theory, and previous AR cycles.*

The start list is an additional step and does not replace the next step of "open coding" (Strauss and Corbin 1998) – searching for constructs grounded in the data. The start list enhances the next step of "axial coding (Strauss and Corbin 1998) with a basis for relating explanations provided by participants if those relationships exist in the data. "Selective coding" (Strauss and Corbin 1998) (in which the researcher would tell the integrative story) would include constructs from the start list only if found in the data. Throughout the phases of any GTM, including FGTM, "constant comparison" and "theoretical sampling" are performed iteratively to ensure grounding (Glaser and Strauss 1967). Codes are carefully checked and rechecked along with interpretations of new codes so that they accurately represent the emergent data. As an additional check against bias, codes should be independently generated by a second and/or third coder and discrepancies discussed, and inter-rater reliability recorded.

The process of systematic summarization adds discipline to interpretations. Rigor may also be improved through use of concise summary formats. To this end, presentation tools are suggested in the Discussion and Recommendations sections.

> *Address rigor in many ways: through theory, multiple cycles, multiple methods, confirmatory and disconfirmatory evidence, triangulation, noting researcher interactions, formalized project controls, and concise presentation formats.*

Following the above recommendations will likely lead to higher quality results and yield quantitative and qualitative, confirmatory and disconfirmatory data. Action researchers of any epistemological persuasion may benefit from these rigorous practices, which may enhance the ability to communicate relevant findings and persuade others of their significance. The misconception that rigor is linked to positivism is further dispelled in the next dialectic.

Dialectic 2: Synthesizing Positivist/Interpretive Epistemology

Differences
To distinguish between what is traditionally viewed as positivist or interpretive, the following are identifiable characteristics of each (Orlikowski and Baroudi 1991, p. 5):

> Positivist studies are premised on the existence of a priori fixed relationships within phenomena which are typically investigated with structured instrumentation … primarily to test theory, in an attempt to increase predictive understanding of phenomena … (Positivist studies are characterized by) evidence of formal propositions, quantifiable measures of variables, hypotheses testing, and the drawing of inferences about a phenomenon from the sample to a stated population …
>
> Interpretive studies assume that people create and associate their own subjective and intersubjective meanings as they interact with the world around them … attempt to understand phenomena through accessing the meanings that participants assign to them … reject the possibility of an 'objective' or 'factual' account of events and situations, seeking instead a relativistic, albeit shared, understanding of phenomena… generalization to a population is not sought … the deeper structure of a phenomenon can be used to inform other settings … (Interpretive studies are characterized by) evidence of a nondeterministic perspective … increase understanding of the phenomenon within cultural and contextual situations … examined in its natural setting … researchers did not impose … a priori understanding on the situation.

Since the premises, assumptions, role of the researcher, and characteristics of positivist and interpretive epistemologies are so different, purists might argue that the epistemologies are mutually exclusive, not synthesizable or, as Mingers (2001) refers to that viewpoint, "incommensurable." From a *positivist* perspective, research takes place "behind the glass," where the researcher observes but does not interfere with a phenomenon. *Interpretive* studies generally acknowledge the researchers' interaction with subjects and attempt to reflect their biases as integral to the insights derived.

AR is most often employed by researchers who use qualitative methods and analyze their observations through an interpretive lens (Iversen et al. 2004); however, neither is essential for AR. AR is a research approach, not an epistemology (just as surveys, experiments, and case studies are other research approaches). Any given research approach may be conducted from a range of epistemological perspectives – positivist, interpretive, or critical (Klein and Myers 1999). [2] Conflating AR with interpretive epistemology would be like comparing a painting technique (e.g., oil painting) with a school of painting (e.g., Impressionism) (Kock and Lau 2001). Similarly, we believe it is *not* appropriate to refer to AR as a "methodology" or to tie it solely to qualitative methods. Instead, we specify that AR is a research approach, and we use the term "methodology" to refer to both quantitative and qualitative data analysis methods.

"Synthesis"

In the interest of increasing the ability of action researchers to inform a broad audience regarding their contributions, we employ a "synthesis" of this dialectic, which, strictly speaking, is decidedly post-positivist. *The synthesis of the positivist/interpretive dialectic is to report AR results in a post-positivist manner following a hypothesis-testing structure, while adhering to other guidelines for good positivist and good interpretive research.*

Studies grounded in external and internal theory (Goldkuhl and Cronholm 2003) contribute more readily to a general body of knowledge, and indeed, AR should inform theory (Baskerville and Myers 2004). The misconception that there is a necessary link between the *traditional* theoretical underpinnings of positivism and quantitative methods may set unfounded expectations for readers of *non-traditional* studies. The perception of a similar link appears to exist between use of research questions and qualitative methods. Post-positivism (Lincoln and Guba 2000) may hold the key to bridging these perspectives. It is similar to positivism, but with an expanded acceptance of falsifiable non-null hypotheses (as in psychology (Kluger and Tikochinsky 2001)) and qualitative methods to support a study. We assert that this brings us to a place where an area of study, research questions, theory, hypotheses, quantitative, and qualitative methods can co-exist as in DeLuca and Valacich (2006) and Straub and Welke (1998). Rather than viewing positivist and interpretive epistemological perspectives as incommensurable, some researchers claim epistemological differences may not be large (Weber 2004); and some action researchers regard different epistemologies as potentially compatible (Alderfer 1993).

> *Consider employing a post-positivist perspective.*

In this section, we have offered recommendations for good research conduct that have been synthesized from both positivist and interpretive perspectives. Our aim is to facilitate moving action researchers toward a form of positivist inquiry that still captures the rich knowledge generated by AR studies, but in a manner that may be more persuasive to positivist scholars than traditional interpretive reporting. Prior researchers have convincingly shown that it is possible to integrate the benefits of positivist and interpretive epistemologies (Lee 1991; Mingers 2001), process and variance theories (Sabherwal and Robey 1995; Shaw and Jarvenpaa 1997), and qualitative and quantitative evidence (Jick 1979). Calls for studies to be both theory-based and context-rich imply a desire for the

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[2] Note that, strictly speaking, since there is a third recognized epistemological approach (critical), this is not a true dialectic; however, for our purposes here and based on the volume of each in published research, it is approximately a dialectic in spirit.

synthesis of the strengths of positivist and interpretive epistemologies (Bharadwaj 2000; Davison 2001).

With the strictest definition, both epistemologies may be applied to an AR study only *in separate* cycles/phases, as in a times series of events (Brockwell and Davis 1993) in the action. Theory may emerge from a more exploratory cycle and be tested in another cycle, using hypotheses based on formal propositions as in DeLuca and Valacich (2006).

We have shown that it is possible to combine positivist and interpretive "analyses" *within the same* research study (Trauth and Jessup 2000). Like *yin* and *yang*, the strengths of the two epistemologies can be harmonizing. By combining elements of each perspective, we can capture strengths of each (falsification from positivist and social context from interpretive) while minimizing their limitations.

We believe that any AR cycle may be approached with theory derived from a literature review and the lessons learned from a previous cycle. Use of existing theory is not in conflict with either epistemology, but is instead a key element of each (Davison et al. 2004). Benefits are gained by guiding and focusing activities – helping position the research in the larger body of knowledge, making the scope of the data more manageable, and maximizing the potential for advancing theory based on insights gained from analysis. The risk of overlooking relevant information can be reasonably offset by employing multiple methods and open-ended inquiry, as discussed in the third dialectic, below. Interpretive inquiry can advance from *implicit* hypotheses to *explicitly* stated hypotheses, constructs, and variables based on a research question and theory. We recommend that explicit hypotheses and measurable constructs be incorporated into AR studies.

Philosophically, we believe the use of the term "premise" is more logical and versatile than "hypothesis" (Lee 2005), and some studies approximate this approach with the use of propositions (Kohli and Kettinger 2004; Straub and Welke 1998). However, at this time, we are attempting to bridge the gap to a mainstream audience that expects "hypothesis," so we recommend use of hypothesis for now. As in all scientific research, hypotheses must be stated in a manner that is falsifiable (refutable) (Popper 1992), or worded in a way in which it is possible to find evidence to refute it. A hypothesis need not be designed in the form of a null hypothesis (H_o); it may simply employ common-sense language. A well-stated hypothesis would also include a comparison and a prediction (Briggs and Dean 2005).

> *Use falsifiable, common-sense hypotheses that contain a comparison and a prediction.*

Whatever the chosen epistemology, underlying values and beliefs, and role of the researcher, they should be stated so that readers may frame the contribution of the study relative to a broader research stream. Likewise, the reader should be provided information on the research approach (AR), the form of AR, and the criteria for evaluating that form of AR.

> *To position a study relative to the IS field, the study should inform the reader of axiology, ontology, epistemology, methodology, research approach, and criteria for evaluation of the form of AR.*

We describe the synthesis of the positivist/interpretive epistemological dialectic by providing guidelines specific to action researchers for incorporating positivist techniques, such as: specifying research questions, stating an underlying theory and *a priori* hypotheses, then searching for evidence relevant to those hypotheses using multi-methods as discussed in the next section.

Dialectic 3: Synthesizing Quantitative/Qualitative Methodology

Multiple Methods

This section examines the dialectic between quantitative and qualitative methodology, the synthesis of which is to *design studies that employ both methodologies to collect multiple types of data as appropriate to each hypothesis and use triangulation to integrate results*. We can then take advantage of the strengths of each, as summarized by methodologist Michael Patton (1987, pp. 9-10):

> Quantitative methods … use standardized measures that fit diverse various opinions and experiences into predetermined response categories. The advantage of the quantitative approach is that it measures the reaction of a great many people to a limited set of questions, thus facilitating comparison and statistical aggregation of the data. This gives a broad, generalizable set of findings.
>
> By contrast, qualitative methods typically produce a wealth of detailed data about a much smaller number of people and cases … Qualitative methods permit the evaluator to study selected issues, cases, or events in depth and detail: … through direct quotation and careful description of program situations, events, people, interactions, and observed behaviors, … collected as open-ended narrative without attempting to fit program activities or peoples' experiences into predetermined, standardized categories such as the response choices that constitute typical questionnaires or tests.

Since AR occurs in natural environments, it is particularly suited to collecting qualitative data that arise naturally (e.g., conversation). Qualitative methods have gained broader acceptance; however, there is still an under-representation of qualitative studies in some IS journals (Avison et al. 1999a; Lee and Liebenau 1999), particularly in leading North American journals (Hirschheim and Chen 2004; Vessey et al. 2002). Qualitative methods are less established in IS research than analogous quantitative methods. To bring studies based on qualitative data to the forefront, careful attention to rigor is required, as discussed in the first dialectic.

When choosing the methods for a study, methodological experts have long advised researchers to select methods with minimal biases and with biases in different directions (Mark and Shotland 1987) or with different threats to validity (Campbell and Stanley 1966; Cook and Campbell 1979). It is commonly argued that multi-method research produces richer and more reliable results, yet there is still a paucity of published multi-method research studies, as lamented by IS scholars (Gallivan 1997; Orlikowski and Baroudi 1991) who estimate the frequency at a mere two to three percent. As in our philosophical basis of yin and yang, quantitative and qualitative methods can be designed to complement each other. While quantitative results provide numerical value and may be assessed as to their statistical significance, they cannot account for "possible differences in interpretations among the participants," which is a strength of qualitative research (Klein and Myers 1999, p. 72).

Multiple methods for data collection and analysis may be employed to improve the integrity of the results of a particular study. It is estimated that as much as 40 percent of the time an important relationship among constructs *may go undetected* when researchers employ traditional quantitative empirical techniques, due to the problem of low statistical power (Baroudi and Orlikowski 1989). In contrast, a latent relationship *may be discovered* using qualitative methods, based on interviews with open-ended questions (Kaplan and Duchon 1988).

Questionnaires and interviews paired together to measure the same constructs can provide convergent validity of measurement (Kidder and Fine 1987). For example, in a study of computer-supported groups (DeLuca 2003), analysis based on a questionnaire containing scales of Likert statements previously validated in a different context yielded non-significant results (no effect). The analysis of interviews of the same participants was more revealing. Some participants reported that the negative influence of individuals on their team members was reduced by the technology, while others indicated that the positive influence of individuals was increased by the technology, the net result of which was two beneficial effects. The interview results were an alert to the ambiguity of Likert statements. The value of multiple methods in that study was that two important relationships were

documented that would have been erroneously reported or overlooked based on quantitative methods alone.

> *Design studies with rigorous and complementary quantitative and qualitative methodology to mitigate risks to validity.*

Studies are sometimes characterized as either deductive or inductive, but the two need not be mutually exclusive (Kidder and Fine 1987). To contribute to "telling the story" of a study, quantitative methods are more standardized for measurement, while qualitative methods are more likely to unearth multiple points of view (different accounts of process, effects, and causes).

Multiple Methods Caution

We advise researchers to consider three potential problems when using multiple methods: 1) partisanship and conflicting results, 2) different methods biased in the same direction, and 3) different methods examining different questions (Shotland and Mark 1987). In the first case, when two different methods yield converging results, there is more confidence in conclusions. When results do not converge, a puzzle emerges and, if not resolved, adds doubt to the results. In the worst case scenario, it may leave controversial evidence for both sides of partisan issues. In the second case, the possibility that two different methods may converge simply due to having similar biases cannot be ruled out. In the third case, if the methods employed are very different, they may be focused on different questions and, thus, no real convergence or triangulation is possible. The potential hazards of multiple methods should be considered and brought to the attention of readers – both in terms of careful attention to research design and in stating the potential limitations of a study.

Triangulation

To generate integrative conclusions from a multiple methods study, we recommend that researchers use triangulation.[3] Triangulation is defined as "the combination of methodologies in the study of the same phenomenon" (Denzin 1978, p. 291). In the context of an AR study, it means using two or more distinct methods or points of evidence to enhance the belief that convergent results between methods are due to the intervention (phenomenon) itself and not an artifact of the methods employed (Jick 1979). The value of triangulation lies in researchers going beyond simply using two methods to collect data – to report and analyze the findings from both methods (Gallivan 1997). Of course it is also possible that results derived from two different methods may *diverge*, in which case alternative explanations for observed outcomes are required. This ability to *converge* on a single explanation or to produce multiple explanations is a key feature of triangulation of multiple methods. Another feature of triangulation in AR is its use "as a dialectical device which powerfully facilitate(s) the incremental development of theory" (Eden and Huxham 1996, p. 269).

The concept of triangulation has been previously described in the literature in at least three different contexts: 1) triangulation of different measurements; 2) triangulation of conclusions within a study; and 3) triangulation of conclusions across studies (Kidder and Fine 1987). Our focus is on triangulation across multiple AR cycles within the same study, which is similar to the second context listed above. In this regard, the action research may include several exploratory rounds of study, followed by explicit formulation of hypotheses and one or more rounds of data collection that are deductive in nature. Of course, the notion of triangulation can also apply to attempts to compare results across different studies (Robey and Boudreau 1999). We incorporate all three meanings of the term "triangulation" in this paper, although our focus is on the second one.

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[3] Briefly, distinctions among triangulation terms relate to the purpose for employing multiple methods: the "triangulation model" seeks to converge on the answer; the "bracketing model" attempts to provide "a range of estimates that is likely to include the right answer" (Mark and Shotland 1987, p. 97); and the "complementary purposes model" seeks to employ different methods for alternative tasks, to assess threats to validity of the various techniques, or "investigate alternative levels of analysis" (Mark and Shotland 1987, p. 99). We use the term "triangulation" to include the purposes of all three models.

> *Use triangulation to analyze evidence for each hypothesis – confirming and disconfirming – across data types, AR cycles and studies.*

The synthesis of the quantitative/qualitative methodology dialectic is to draw from both sets of methodologies and "adopt different but compatible methods of achieving perspective" (Kidder and Fine 1987, p. 58) on the hypotheses and variables and to use triangulation to integrate results. Triangulation can reveal patterns and contradictions from multiple sources and aid in weaving them into a coherent theoretical contribution. It is a tall order to perform triangulation in limited space. To assist researchers in doing so, we advise that they organize and report their findings by hypothesis, not by methodology. We include other recommendations and examples in our Discussion section. Beyond collecting both qualitative and quantitative data, researchers should seek to provide both confirmatory and disconfirmatory data of each type (if available). We discuss this challenge in the fourth and last dialectic.

Dialectic 4: Synthesizing Confirmatory/Disconfirmatory Evidence

Here, we advocate the value of *seeking both confirmatory and disconfirmatory evidence and synthesizing all evidence in each AR cycle and across cycles using triangulation*. Unfortunately, researchers often present only one side of the case: the evidence that confirms their hypotheses. Confirmatory evidence demonstrates that a theory has "survived" (Popper 1992) only if there has also been an attempt to falsify it. In addition to looking for evidence to support each hypothesis, it is critical to the scientific process that researchers seek disconfirmatory data as well. According to Popper's Falsifiability criterion (Popper 1992), it is impossible for a researcher to *prove* a theory (or hypothesis) to be true. Rather, the researcher may, at best, demonstrate that the theory or hypothesis "survives" any attempts to disconfirm it – which increases our confidence in the theory.

Just as researchers who employ GTMs search for all latent constructs in their data, the falsifiability criterion reminds researchers to be sensitive to contradictions between preconceptions and findings (Klein and Myers 1999). If disconfirmatory evidence is discovered, researchers should not avoid open conflict or frank discussion relative to their hypotheses. In challenging their prior assumptions, researchers may identify insights that are more sensitive to the data and, hence, more plausible and more verifiable by others in the future.

When interpreting results, disconfirmatory data must be carefully evaluated and presented, since an instance of disconfirmatory evidence may hold greater weight to refute a hypothesis than an instance of confirmatory evidence does to validate the hypothesis. As with the principles of *yin* and *yang*, a theory cannot survive without the attempt to disconfirm it and, by thoroughly testing a theory, we may gain new knowledge.

> *Search for all evidence relevant to each hypothesis, both confirmatory and disconfirmatory.*

In AR, the totality of evidence may be overwhelming. The *patterns* in the data will be central to summarizing, triangulating, and integrating the evidence. Once all patterns of evidence are noted, the spectrum of evidence may confirm or dispute the hypotheses or bring to light other variables, including moderating variables. The presentation of evidence presents a challenge. Results must be crafted so as *not* to overwhelm the audience, as well as in a format consistent with the reader's expectations – by hypothesis. Of course, the researcher normally expects that the majority of the evidence will *corroborate* each hypothesis, but all evidence deserves attention. One device that may aid the researcher in data reduction is an overall ratio of the number of observed patterns that support and contradict each hypothesis. We identify tools to organize and present the copious evidence in the next section.

III. Discussion and Recommendations

Summarization and Integration

AR "needs to be supplemented by the development of a comprehensive set of criteria by which AR in IS might be conceived, designed, conducted, presented and evaluated" (Avison et al. 1999b, p. 97). Below, we suggest several organizational and presentation tools for summarization and integration of copious amounts of data from an intensive study. To perform the difficult task of triangulation, the evidence must eventually be organized by hypothesis, rather than solely along AR cycle or qualitative/quantitative or confirmatory/disconfirmatory lines. For action researchers, this may represent a significant change in presentation style. We believe that several tools will be helpful in making this transition —for example, a *modified fishbone diagram, a triangulation framework* and *graphical conceptual framework*.

> *Use concise presentation formats that are derived from systematic analysis and serve a broad audience.*

When the volume of textual data is so large and diverse that it would not be clear how a summary table was accomplished, we recommend an intermediate step such as a modified fishbone diagram borrowed from the quality assurance literature (Ishikawa 1968). The "vertebrae" of the fish are the constructs from the hypotheses and the "fins" or "bones" are those constructs or participant explanations that are associated with each construct. This technique and others in FGTM are illustrated in DeLuca (2003).

Once the connections among intermediary data are illustrated, we recommend that researchers provide a one-page consolidated summary of the evidence relative to the theoretical basis displayed in tabular form, such as the triangulation framework shown in Table 2, as in DeLuca and Valacich (2006), or other tabular form, as in Lindgren et al. (2004). Using a table for the parsimonious presentation of a study will facilitate interpretation and integration of both quantitative and qualitative data with respect to evidence both confirming and disconfirming hypotheses from all AR cycles. Using Table 2, researchers will be able to aggregate evidence that can provide a rich and more focused interpretation of events. The original hypotheses as well as those added for subsequent cycles are summarized in the left column. Then, for each hypothesis, confirmatory evidence and disconfirmatory evidence are specified. Evidence may be delineated as quantitative or qualitative or by a specific data source, and should be concisely stated in short and consistent statements. For example, a numerical may take the form of mean values or a chi-squared with effect size. Participants' perceptions may be summarized in terms of those reporting an increase in some variable, those reporting a decrease, or no perceived change as reported by a majority of teams. The researcher may have observed a pattern of behavior relative to the hypotheses. Also evidence from one cycle may generate new hypotheses for the next cycle. Since AR studies should consist of multiple AR cycles, the evidence may be further subdivided by cycle. If multiple cycles of data are collected from the same participants, the researcher can report changes in each variable or construct over time.

Table 2. Triangulation Framework				
H	**Evidence in Support**		**Evidence Questioning**	
	Cycle 1	**Cycle 2**	**Cycle 1**	**Cycle 2**
H1	1) Perceived … 2) Perceived … 3) Numerical Value	1) Perceived … 2) Perceived … 3) Observed … 4) Numerical Value	1) Perceived	
+ H2	1) Observed …	1) Perceived … 2) Perceived … 3) Numerical Value		1) Perceived … 2) Observed …

If there are too many statements to reasonably fit in one table, the statements may be given a shorter abbreviation to simplify the appearance of the framework, but then an expanded key is also needed. For example, in DeLuca (2003), Likert scale items were grouped into scales that reflected respondents' perceptions about directional changes (i.e., increased, decreased). A summary of results from a scale was reported in a single row of the table (i.e., "respondents perceived that use of x appears to increase y" and abbreviated in the table as the acronym LA (Likert Analysis) LA1). When the same subjects are involved in two or more cycles, their responses can be compared over time. A scale whose average increased more than a certain threshold (e.g., more than a half point) could be coded into a results such as "respondents perceived that use of the system appears to increase variable x" and represented in the table by the acronym LT1 (Likert analysis over time). When appropriate, results could be coded to include significance levels or effect sizes. For example, data from chi square analysis (CS) where difference among categories was significant at the $p<.05$ level and with an effect size of at least 0.5 were coded as "respondents perceived that use of x increased y was statistically significant with a large effect" (DeLuca 2003) and can be abbreviated as CS1. An effect size of at least 0.3 can be similarly coded as a medium effect.

> *Use hypothesis-based presentation tools that summarize multi-method, multi-cycle data onto one page.*

Condensing results into a one-page table also serves to provide structure for the discussion and conclusions. A summary framework could be used to synthesize the evidence at the end of each cycle, but is most significant when employed to synthesize the evidence relative to the hypotheses for an entire multi-cycle AR study. The researchers themselves (and subsequently, their readers) can easily ascertain that the preponderance of evidence in the confirmatory column, combined with a lack of evidence in the disconfirmatory column, readily indicates support for the hypotheses. A mixed pattern of equal numbers of confirmatory and disconfirmatory results would readily suggest that the hypotheses lack support and can provide the impetus for exploring a new theory.

Generalization

Finally, an "interpretation" of the entire study would include generalizing the main relationships identified in the overall results (Lee and Baskerville 2003; Klein and Myers 1999; Orlikowski and Baroudi 1991; Walsham 1995; Yin 1994). The common theme from various views on generalizing is to describe patterns of relationships among constructs, based on specific instances observed in the data. To illustrate these generalizations to a reader, a graphical conceptual framework would be helpful. It would include the relationships among constructs, including cause-effect relationships, depictions of how processes unfold, or other type of relationships among constructs and events, as in Langley (1999).

> *Generalize the theoretical contribution and patterns found in the research for a broad audience of researchers and practitioners.*

Suggestions for theory diagrams (Axelsson and Goldkuhl 2004; Strauss and Corbin 1998) are often complex and, therefore, not widely implemented. A simple diagram indicating that an increase in x may be a cause for an increase in b, as in Davis (1985), may be depicted, as in Figure 1. Positivist researchers often use summary diagrams of this nature, but they may not include constructs that emerge during the study. Emergent constructs are those not originally planned, but which appear from study of the data, as in a study of quality of a virtual team effort (DeLuca 2003). The constructs of disruption to operations, balance of contributions, effect of status, and several others "emerged" from participant comment data. Interpretive researchers may be more likely to "tell the story" including all constructs in text, without a diagram. We recommend that researchers of both epistemologies adopt the use of diagrams that depict both the hypothesized and emergent constructs.

Figure 1. Conceptual Framework
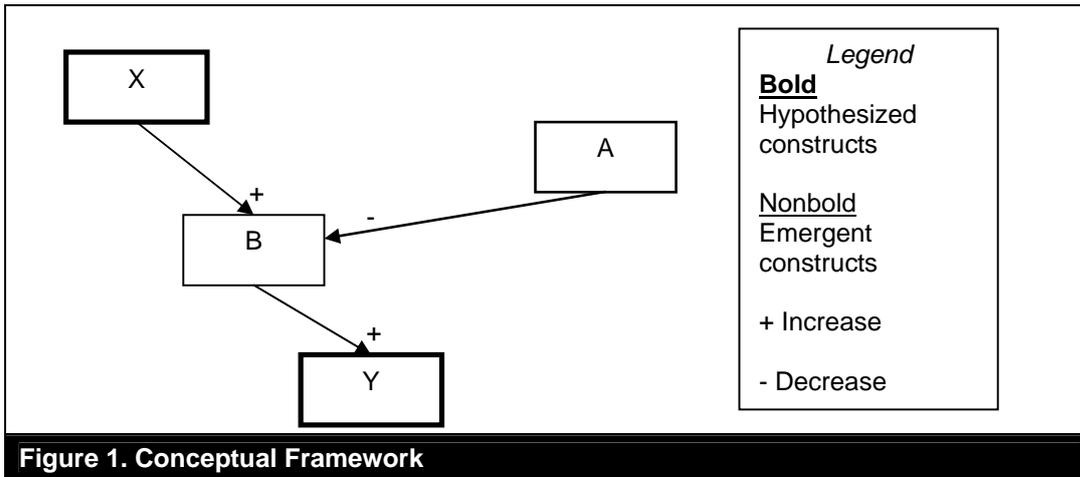
In the graphical depiction, hypothesized constructs could be indicated in bold to distinguish them from emergent constructs. Researchers could indicate positive and negative relationships with appropriate mathematical symbols (e.g. + and -) or through other conventions such as solid lines for increase and dashed lines for decreases (Davis 1985), with all symbols indicated in a legend.

> *Include a graphical conceptual framework to illustrate generalizations from the study.*

By using a graphical representation, as in Figure 1, the knowledge gained from the study is more readily reviewed and digested by a wide audience. The modified fishbone diagram, the triangulation, and the graphical conceptual framework provide a "trail of evidence" from multiple data sources to a graphically illustrated theory and are a significant contribution toward filling the need in IS for AR research presentation techniques.

Finally, it is necessary to reflect on the lessons learned, inform stakeholders in those lessons, and update theory and recommendations for future researchers. There may be additional propositions, hypotheses, variables, constructs, and methods specified for the next cycle of AR.

> *Based on lessons learned, update theoretical frameworks for future researchers.*

Summary of Recommendations

In order to parsimoniously demonstrate that we have addressed the difficulties, misunderstandings, and criticisms of AR that were identified in the introduction, we offer Table 3. We associate each identified concern for AR with the dialectic in which it was discussed and the recommendations for addressing the concern. By way of the philosophical basis of *yin* and *yang*, our synthesis of four research dialectics is aimed at furthering AR and moving it into the mainstream of IS research by improving the quality, presentation, and publication of AR studies.

Table 3. Summary of Recommendations	
Difficulties, Misunderstandings, and Criticisms of AR	**Recommendations**
A. AR is not viewed as "mainstream" IS research (discussed in all four dialectics). B. IS research approaches, including AR, that are conducted by a researcher who is not "behind the glass," are somehow not viewed as valid (discussed in second dialectic). C. Lack of consistent research paradigm vocabulary. D. Lack of understanding of types, characteristics, and vocabulary regarding various forms of IS research, including AR and its forms (discussed in first and second dialectics).	(All recommendations below are designed to facilitate the maturation process of AR and position it among mainstream research.) 1. Investigate problems and theory that are mutually agreed upon as relevant to both practitioners and researchers, and conduct AR in an environment natural to the chosen problem. 2. Position the study relative to the IS field by stating the axiology, ontology, epistemology, methodology, and research approach. Also state the form of AR, criteria for evaluation of that form of AR, and the role of researcher, noting all interactions.
E. Theoretical basis is not evident (discussed in all four dialectics).	3. Consider employing a post-positivist perspective, with explicit *a priori* hypotheses and a "start list" of codes (constructs), derived from a review of the literature, theory, and previous cycles of the AR study, and the Front-end-loaded Grounded Theory Method (FGTM). 4. State each hypothesis in a manner that is falsifiable and contains a comparison and prediction. 5. Search for all evidence relevant to each hypothesis, including, but not limited to data both confirmatory and disconfirmatory of each hypothesis.
F. Qualitative data processing is not rigorous enough (discussed in first dialectic).	6. Design studies with multiple methods for assessing each construct, using rigorous and complementary quantitative and qualitative methodology to mitigate risks to validity.
G. Unwieldy amounts of qualitative data (discussed in third and fourth dialectics). H. Varied and inconsistent presentation of AR studies not in a form expected by a largely positivist audience (discussed in second, third, and fourth dialectics).	7. Summarize the copious data using hypothesis-based display tools such as a modified fishbone diagram and the Triangulation Framework or similar tabular method. 8. Use triangulation to analyze the evidence for confirming and disconfirming each hypothesis across data types, AR cycles, and studies. 9. Generalize at least to theory and use graphic display such as the Graphical Conceptual Framework to illustrate the theoretical contribution to a general audience of researchers and practitioners, showing the patterns found in the data with both the hypothesized variables and emergent constructs. 10. Based on the results, analysis, and lessons learned from the above steps and shared with all parties, update the theory, propositions, hypotheses, variables, constructs, and methods for the next cycle of AR.

Limitations

As with all research approaches in which the researcher interacts with the participants, objectivity is relative to the level of immersion. For others to put the knowledge gained from intensive research into perspective relative to potential bias, the role of the researcher must be known. We believe that various biases exist in all studies. What is important is that they are understood.

Our recommendations are meant to apply to post-positivist canonical AR studies, but may be relevant to other forms of AR as well as other IS research approaches. We believe that each researcher could benefit from conscious and deliberate examination of the four dialectics to determine their own synthesis.

IV. Conclusions

By combining action and research into one research approach, conducting AR projects is doubly *challenging*. Since AR has such potential to add to knowledge while making a practical difference, it is particularly *valuable*. Since it is relatively *new and unfamiliar to many readers*, especially in North America, contributions to its natural maturation process may have tremendous impact, increasing both the quality and number of studies published.

In this paper, we have provided recommendations based on our own research and recommendations from acknowledged AR leaders. In doing so, we hope that our paper succeeds in answering the call for more theory, rigor, relevance, and clear guidelines. We addressed the many difficulties, misunderstandings, and criticisms of AR that we have observed. Our ten recommendations are intended to serve as a concise set of criteria to which future post-positivist canonical action researchers can refer. When combined with our tutorial, which provides a section-by-section breakout of a suggested structure for a journal article (DeLuca and Kock 2007), we hope that researchers will be better-positioned with guidelines to assist them in designing and conducting AR studies and in disseminating their results.

Drawing from the philosophical principle of *yin* and *yang*, we have also provided a discussion and synthesis of four research dialectics: rigor/relevance objective, positivist/interpretive epistemology, quantitative/qualitative methodology, and confirmatory/disconfirmatory evidence. Researchers using any approach may wish to develop their own synthesis of the four dialectics and in doing so may become more attentive to the quality of their research. Understanding and performing the synthesis that we described in this article will also help researchers become more informed of the diversity of types of scientific IS research, allow them to position their work within the IS field, and, as reviewers, to understand others' research paradigms. Our synthesis is post-positivist and reveals an innovative view of falsifiability, grounding, and triangulation. We introduced the Front-end-loaded Grounded Theory Method (FGTM). We aim to further the design and presentation of AR studies to move AR into a more prominent position in mainstream research.

Because of the difficulties, misunderstandings, and criticisms of AR, its acceptance into mainstream journals is somewhat limited at this time. The goal of our ten recommendations for canonical AR is to facilitate and accelerate the natural maturation process of AR by building a bridge between IS scholars who conduct AR and the largely positivist readership of some journals. We accomplish this by employing a post-positivist perspective and providing specific guidelines for researchers. We believe that more researchers will understand and leverage the benefits of AR if they follow the recommendations that we offer.

Because AR is so well-suited to examine relevant business problems as well as to contribute to theory, we believe that it is important to move the field forward at an increasing pace. A shift in philosophy, combined with articulated guidelines herein, is a stride in that direction. After decades of pioneering AR, Mumford (2001, p. 26) referred to it as "among approaches and tools for the future." We anticipate increasing use of the AR approach over the next ten years, accompanied by a gradual infusion into mainstream IS journals over that time.

Acknowledgements

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that
1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
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List of Abbreviations

AR	Action Research
ECIS	European Conference on Information Systems
FGTM	Front-end-loaded Grounded Theory Method
GTM	Grounded Theory Method
H1	Hypothesis 1
MISQ	Management Information Systems Quarterly
NSF	National Science Foundation
QualIT	Qualitative Information Technology Conference
IS	Information Systems
ISWorld	Information Systems World
IT&P	Information Technology and People

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