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RESEARCH PERSPECTIVES

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Research Perspectives: Improving Action Research by Integrating Methods

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Abstract

Action research (AR) has developed extensively since the 1970s. We reviewed the AR literature within the information systems (IS) discipline and found 16 different methods, which constitutes a problematic situation for researchers. We describe and critique those methods before integrating their strengths to improve the AR method that is most frequently practiced in IS: canonical action research (CAR). The existing set of principles and criteria for CAR is modified and elaborated to enhance the foundation for undertaking AR consistently. We discuss the general implications of this improved form of the method, which we name integrated action research (IAR). We specifically suggest how IAR can be used to investigate the application of disruptive technologies, including those that embody artificial intelligence and enable more flexible and socially distanced work.

Keywords: Action Research, Canonical Action Research, Integrated Action Research, Research Methods, Future Research Opportunities, Disruptive Technologies, Artificial Intelligence

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1 Introduction

Action research (AR) is unique among the methods applied in the information systems (IS) discipline: "it associates research and practice, so research informs practice and practice informs research synergistically" (Avison et al., 1999, p. 94). Indeed, Avison et al. (2018, p. 178) claim that "there is no richer form of engaged scholarship than AR." AR brings together researchers and practitioners in a joint attempt to ameliorate a problematic situation while simultaneously contributing to scholarly knowledge (Avison et al., 1999; Davison et al., 2004).

In order to effect change, a theory-driven research lens is used to intervene in a problematic situation (Davison et al., 2012; McKay & Marshall, 2001). Reflection on this intervention is critical to identify knowledge that should be valuable for both practitioners and scholars. AR is closely tied to the impact and relevance of research. Zmud (1996) suggested a prominent role for AR in demonstrating the validity-in-practice of research findings. Thus, as Wong & Davison (2018) explain, the organizational client in their AR project study took the successful outcome as a proof of concept, demonstrating the validity-in-practice of the researchers' theory-based intervention and the consequent organizational change.

Notwithstanding the benefits of AR-based investigations, the appearance of AR articles in our premier journals has been sporadic (Avison et al., 2018). Special issues dedicated to AR are occasionally commissioned (e.g., Kock & Lau, 2001; Baskerville & Myers, 2004; Avison et al., 2017), but these seem to do little more than spur a modest and temporary increase in enthusiasm for AR. According to Avison et al. (2018), only 1.38% (some 120 articles out of a total of 8719 published in 12 leading journals from 1982 until 2016) could be confirmed as involving AR.

Authors of published AR articles have been surveyed about the barriers to conducting AR. The most frequently reported barriers were: it is difficult to publish AR in top journals; AR requires a lot of time and resources, and is therefore inappropriate for PhD students; AR is less scientific than other methods (Avison et al., 2018). However, a key barrier that was not identified through this process concerns confusion about which AR method to employ. To the best of our knowledge, some 16 different AR methods are recognized by IS researchers, at least as evidenced in the literature.

The existence of many methods is not necessarily problematic if those same methods are precisely described and documented; each method is practiced regularly, with communication of findings to the wider academic community; there are clear criteria about when to apply a particular method and how to undertake a study with that method; and the application of each of those methods leads to positive outcomes in terms of the generation of scholarly knowledge as well as improving circumstances for organizational stakeholders. Although some of the 16 AR methods are precisely described and documented, most are not. In fact, many have only appeared once or twice in published articles before fading into apparent oblivion (Cecez-Kecmanovic et al., 2020). As a result, it is often hard to discern the strengths of a particular method and to know when it should be applied.

We suggest that the overall situation is problematic because although each method has the potential to help action researchers make a useful contribution, the potential is diminished if a method has been neglected in practice. Further, the lack of detailed criteria or guidelines to explain how a particular method should be applied mean that researchers often have no firm basis for action. Stimulated by these circumstances, as well as by the exemplar offered by Klein & Myers (1999) for similar work in interpretive field studies and the call by Lee et al. (1995) "to discuss explicitly the criteria for judging qualitative, case and interpretive research in information systems," Davison et al. (2004) developed a tentative set of principles and criteria for one of the AR methods, canonical action research (CAR). These principles and criteria were validated both by the authors and subsequently by other researchers, to the extent that CAR today is the most frequently applied AR method in the IS literature. It occurs in 32 of the 131 AR articles published in a set of 13 premier journals from 1982 to 2018 (see Appendix A). Davison et al. (2012) further developed their principles and criteria for CAR by explicitly documenting the role of theory. However, the same process of development has not been undertaken for the other AR methods; some lack even rudimentary guidelines or indications as to how they should be practiced.

Our objective in this research essay is to strengthen the praxis of AR. In this, we respond to the call by Cecez-Kecmanovic et al. (2020) to undertake research that advances qualitative methods. We could, in principle, seek to improve any of the 16 AR methods practiced in IS. However, we anticipate that improving an already well-documented method will be less disruptive and more valuable to AR researchers and practitioners than selecting a less well-documented and less frequently encountered or applied method. Pragmatically, we recognize that CAR is both the most well-documented and the most frequently practiced AR method in the IS domain, specifically for problem- solving contexts. CAR is thus the focus of our improvements.

In order to improve CAR, we draw on the diversity of AR methods and integrate their strengths by revising and enhancing the existing principles and criteria of CAR (Davison et al., 2004, 2012). We thus aim to rejuvenate the intellectual contributions of past AR scholars, integrating them into a new method: integrated action research (IAR). Our endeavor is directed specifically at the community of action researchers who are familiar with CAR and eager to undertake further investigations. We recognize that a carefully documented method may, at first glimpse, seem overwhelmingly complicated to a novice researcher. A single article cannot serve as a comprehensive background for all aspects of AR, let alone qualitative methods and the interpretive epistemology that is often associated with AR. Nevertheless, within our article, we do point interested readers to other resources that focus on key aspects in more detail.

Following this introduction, we review the literature on IS AR methods. This includes a description and critique of each of the 16 methods that claim affiliation with AR and have been practiced in IS. This review is followed by an exercise in integration: the principles and criteria of CAR are enhanced by integrating the strengths of the other AR methods. The new IAR method is the outcome of this integration. Finally, we discuss the implications of our new IAR method for conducting IS research and consider how IAR can be further enhanced in the future.

2 Review of the IS AR Literature on Methods

The method that came to be known as action research was first described independently by Lewin (1946) and Trist (1976). For many years, the notion of AR having different methodological variants did not exist and a lot of early research simply refers to AR without any more specific terminology being employed. However, this situation began to change in the 1970s with the introduction of action science (Argyris et al., 1975) and the formalization of canonical AR (CAR) (Susman & Evered, 1978). Two decades later, Baskerville and

Wood-Harper (1998) undertook the first extensive review of IS AR and identified ten independent methods that they suggested are affiliated with AR. In the following two decades, another six methods appeared.

The complete set of 16 AR methods includes, in order of first publication: action science (AS), canonical action research (CAR), soft systems methodology (SSM), action learning (AL), ETHICS (the effective technical and human implementation of computer-based systems), clinical fieldwork (CFW), participatory action research (PAR), participant observation (PO), multiview (MV), IS prototyping (ISP), grounded action research (GAR), collaborative practice research (CPR), dialogical action research (DAR), networks of action (NoA), action design research (ADR), and statistical action research (SAR).

Historically, the AR methods bifurcated into two principal streams. Each was characterized by its own application context, and each was the focus of continuous methodological development. The first application context focuses on problem solving, often including an organizational change effort. This overlaps with the domain of business and management consultants. Ten methods are identified in this group, among them CAR. The second application context focuses on the design and development of software and systems. This is work that is commonly undertaken by both academics and technical specialists. Four methods are identified in this group. Two other methods (participatory action research and action design research) are not closely aligned with either of these two streams. Therefore, they are considered separately.

Our description and critique of the 16 AR methods is organized in three appendices (A, B and C). Appendix A lists all the methods together with their original sources, selected IS articles where they have been applied, and a frequency count of their application in empirical IS AR articles in 13 major journals[1] for the 1982-2018 period (Avison et al., 2018). Among the resulting set of 131 articles, 45 do not refer to any specific AR method at all. These 45 simply mention that they follow the principles of AR, often referencing Baskerville & Wood-Harper's (1998) meta-analysis. Appendix B provides a synopsis of the key characteristics of the 16 methods, including the key focus, the role of theory, the role of the researcher, and the change orientation. Appendix C provides, first, a succinct description of each method with respect to its defining features and, second, our critique. Our description and critique (see Appendix C) of the 16 methods forms the intellectual basis for identifying features from 11 of the methods that we integrate into the new IAR. In the following section, we explain how we have undertaken this process of methodological integration.

3 Methodological Integration

The ecosystem of IS AR methods, with the two distinct streams that were described above, is shown in Figure 1. The problem-solving stream, which includes work undertaken by researchers and business consultants, can be traced back to the early work of Lewin (1946) and the Tavistock Clinic (Trist, 1976). It was later reified as CAR (Susman & Evered, 1978). A rigorous and iterative process model, a spirit of collaboration between researcher and client, and a strong commitment to participation are central to these methods (Baskerville & Wood-Harper, 1998). Theory is also recognized as playing a central role, at least when practiced by academics (McKay & Marshall, 2001; Davison et al., 2012). The second stream traces its heritage to work undertaken on the analysis and design of systems and software (Mumford, 1983, 1993; Wood-Harper et al., 1985).

The problem-solving stream comprises a family of ten methods. CAR is the intellectual parent to three of these methods: SAR, GAR, and DAR. SAR is very similar to CAR, but includes the option to develop and test hypotheses using statistical reasoning. GAR focuses on the development of grounded theory as an outcome of an AR project. DAR focuses on the dialogue that takes place between the researcher and the client, noting that this dialogue can be remote, i.e., mediated through an intermediary. SSM adopts an iterative approach to focus on the analysis of complex situations where there are divergent views. SSM aims at identifying and implementing feasible changes to resolve problems.

NoA is unrelated to CAR and has been developed since the early 1990s as a critique of what Braa et al. (2004) label "Anglo-American action research" and its tendency to force actions into distinct processes and stages. Braa et al. (2004) draw on much earlier AR, notably Elden and Chisholm (1993), to explain that AR should be undertaken in networks, rather than individual units and, further, should be scalable and sustainable over time if it is to be considered effective and successful.

[1] *Database for Advances in Information Systems* (Database), *European Journal of Information Systems* (EJIS), *Information & Management* (I&M), *Information & Organization* (I&O), *Information Systems Journal* (ISJ), *Information Systems Research* (ISR), *Information Technology & People* (ITP), *Journal of the Association for Information Systems* (JAIS), *Journal of Information Technology* (JIT), *Journal of Management Information Systems* (JMIS), *Journal of Strategic Information Systems* (JSIS), *Management Information Systems Quarterly* (MISQ), *Scandinavian Journal of Information Systems* (SJIS).

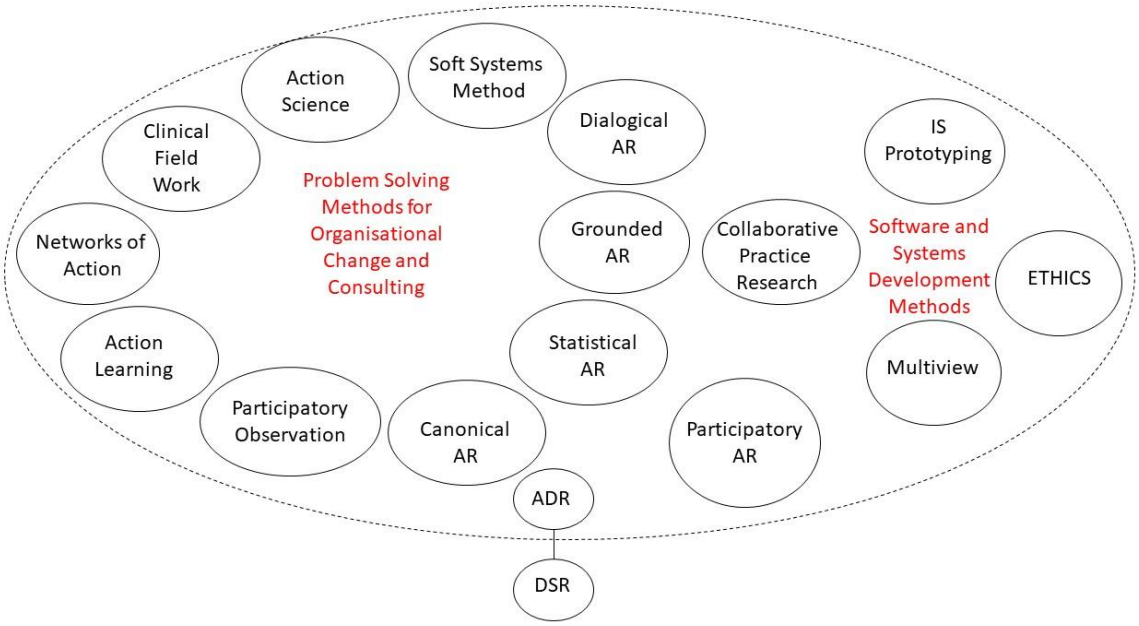

Figure 1: The Action Research Ecosystem

NoA is uniquely positioned for contexts that involve longitudinal interventions. For example, the initial Health IS Planning Project upon which NoA is premised was initiated in 1994 and is still in progress at the time of writing (2020). The architects of NoA are notable for their insistence that AR should lead to sustainable interventions that create long-term value, an aspect of AR that is often neglected.

Two methods that are of great value to the action researcher in an organizational context, with their focus on engaging with client team members in order to learn about their environment, are PO and AL. Two more methods that are occasionally practiced by researchers in consulting projects are AS and CFW yet they are rarely encountered in the literature. CAR itself is also practiced by consultants (see, e.g., Davison & Martinsons, 2007; Wong & Davison, 2018) and there is evidence that its application can lead to beneficial outcomes for various stakeholders. The systems and software development group of methods are represented by ETHICS, ISP, MV, and CPR. These methods are all inspired by AR, notably by its participatory nature, as well as other influences such as sociotechnical design. However, their separation from the problem-solving methods means that they are less suitable for integration into CAR.

In our critique, PAR and ADR stand out as being research methods in their own right yet so different from the other methodological streams as to require separate treatment. PAR constitutes a way of engaging in research in communities, emphasizing participation, action, and research. Practitioners of PAR seek to make sense of the world collaboratively and reflectively by trying to change it. Within a PAR process, "communities of inquiry and action evolve and address questions and issues that are significant for those who participate as co-researchers" (Reason & Bradbury, 2008). PAR thus shares some similarities with AR but is particularly oriented toward neither problem solving nor software or systems development. Indeed, PAR is seldom practiced in IS, being rather more common in the social sciences.

ADR is uniquely positioned by Sein et al. (2011) as a method for the generation of prescriptive design knowledge. It achieves this by constructing and evaluating an ensemble of IT artifacts in an organizational setting. While the principles of ADR overlap with some aspects of AR, notably a focus on participatory collaborative work, ADR focuses on the design of IT artifacts. As a result, we suggest that ADR is conceptually aligned with both AR and design science research (DSR). Figure 1 illustrates this alignment with ADR functioning as a bridge to and from DSR. The implication is that aspects of AR flow across the ADR bridge to DSR, and aspects of DSR flow back to AR. In this spirit, we recognize that there is the potential for action researchers to consider how they can include design aspects such as IT artifacts in their action plans and interventions that may bring significant advantages to their clients. A degree of familiarity with ADR will surely be advantageous to researchers who are eager to explore not only process change in the organization, but also the introduction of new technology-based artifacts

such as software programs or systemic arrangements that are software based, as part of the actions that they propose to ameliorate organizational problem situations. We hope that DS researchers also benefit from the reverse flow from AR.

Drawing on our analyses above and as summarized in Table 1, we suggest the following 12 new criteria (Table 2) to supplement those that were already developed for CAR (see Davison et al., 2004, 2012). We have also modified the text of many of the existing criteria to enhance consistency, removed criteria that are superfluous, and merged criteria that are essentially identical. A key objective here is to ensure that each criterion is distinct: we are all too well aware of the problems that arise when very similar criteria are recommended (Larsen and Hovorka, 2012). As a result, the criteria now total 47. Also, while Davison et al. (2004, 2012) originally presented the criteria as reactive questions in the format: "Has something been done?," we now present the criteria as prescriptive statements, following the format: "Something will be done." This is important because we want the principles and criteria to inform researchers as they design and conduct projects in a manner that is faithful to the intent of IAR. The complete set of five principles and 47 criteria is presented in Appendix D.

4 Discussion

As the field of AR matures, it is reasonable that some methods will prove more popular than others. AR is currently in a state where it could be widely recognized for its contributions to the generation of both practical and scholarly knowledge in the IS discipline as well as in practice. In earlier work (Davison et al., 2004, 2012), five principles and 43 criteria were developed to guide the practice of CAR. The five principles were intended to form the foundation of CAR, with the criteria reflecting specific details that researchers should pay attention to. Recognizing the infinite variety of organizational circumstances, and hence the need for methodological flexibility, adherence to these criteria was never intended to be an absolute or inflexible requirement. A paper should never be rejected solely because its authors omitted one or more criteria. Instead, the criteria were formulated as guidelines to facilitate the conduct of CAR by a variety of stakeholders with vested interests in the practice of CAR. These include the action researchers themselves, organizational clients, the readers of AR reports or accounts, and the reviewers of AR papers. We now establish IAR by building on these principles and criteria. First and foremost, we supplement them with new criteria elicited from 11 of the other AR methods. Second, we note that Davison et al.'s (2004, 2012) criteria were written in a retrospective and interrogative style: "Did the researcher do something?" We have reformulated all the criteria so that they are prescriptive and active: "The researcher will do or will consider doing something." Third, we have deleted or merged some criteria and modified the text of other criteria to enhance their consistency and eliminate overlapping content. Finally, we have resequenced the criteria to ensure that the sequence matches the logical flow of activities in each principle.

Although we agree that a set of 47 criteria may seem daunting, especially to the uninformed or novice action researcher, it is not our intention to daunt. On the contrary, the breadth of circumstances that these criteria cover should be a boon to eager action researchers: the criteria will help them as they engage in project diagnosis, planning, action taking, evaluating and reflecting, while being cognizant of the critical role of theory. The criteria invite attention to specific aspects of AR that might otherwise be neglected, to the detriment of the AR project as a whole, not least the solving of problems for a variety of organizational stakeholders and the contribution to scholarly knowledge. Nevertheless, we do not countenance that an action researcher should approach an organizational problem situation with only the current article in hand or mind: Action researchers have the opportunity to develop considerable methodological knowledge in advance, whether by reading methodological treatises and empirical accounts or through courses in qualitative research methods. The extended set of 47 criteria is thus designed to be used by action researchers who are at least familiar with the basics of the method and have acquired some background knowledge, even if this is vicarious.

We do not recommend that the 47 criteria be engulfed at a single sitting! Instead, they need to be considered at the different stages of the IAR cycle, as is implied by their structure (see Appendix D). Thus, the second principle, relating to the cyclical process model, suggests that it is valuable for action researchers to follow the five-stage process model in a clockwise fashion (Davison et al., 2004, 2012). The 11 criteria associated with this principle address such issues as justifying any deviation from the cyclical process model (2a), conducting an independent diagnosis of the organizational situation (2e), and planning actions based on the diagnosis (2f). Each of the criteria thus explains in more detail some aspect of the implications of the principle.

4.1 The Impact of Action Research

We have aimed to enhance the precision of AR. However, we must also consider the impact of AR. This is an increasingly salient issue because the research evaluation exercises conducted by funding agencies are "sharpening their expectation that our research should have demonstrable impact in the form of societal value" (Davison & Bjørn-Andersen, 2019). We suggest that AR has a unique role to play here.

Table 1: Integrating Methods into CAR to Create IAR

Source	Analysis of the source to demonstrate how IAR may benefit
ADR	Researchers may profitably consider how they can include IT artifacts, such as software programs or other forms of information systems, in their action plans as they seek to ameliorate problem situations.
AL	Focus on conversations with clients to learn more about the organizational situation.
AS	Focuses on the development of both skills and confidence among members of organizational teams. Such skills, and the confidence to apply them, are certainly essential to IAR. We encourage all researchers who engage with clients to ensure that all team members are adequately provisioned with the requisite skills that will facilitate the diagnosis of organizational problem situations, as well as the later action planning, intervention, and reflection. For instance, junior researchers often lack the combination of confidence and diplomacy to deal with senior clients.
CFW	Similar to action science, this method places great emphasis on the professional qualifications of researchers. In a consulting model, where researchers interact with paying clients, behaving in a professional manner is a key to success for researchers. Similarly, researchers must take great care to ensure that their "solutions" are ethical and will not cause harm to the organization. These are principles that action researchers would do well to remember.
DAR	Deep immersion of the researcher in the world of the clients, including extended dialogue with key client stakeholders, in order to understand their world, leading to an intervention that is more in tune with client needs.
GAR	Focus on inductive theory development from data collected during the project.
NoA	Researchers should be aware of an implicit responsibility to ensure that their interventions do not merely satisfy short-term research needs and client requirements. Instead, researchers must ensure the longer-term issue of sustainability is addressed. While this may not be reported in a single IAR paper, it can be reflected on in metastudies, as well as in later derivative work.
PAR	The focus of this method is on collaboration and reflection. Both are explicitly mentioned in the principles for CAR but can usefully be emphasized more. There is always the risk that an IAR project will be dominated either by the research focus (the client is not collaboratively involved) or by the action focus (the researcher loses sight of the research objectives) (Dickens & Watkins, 1999).
PO	Participatory observation requires the researcher to be immersed in the problem situation. This is essential if the researcher wishes to gain a deep understanding of the organizational problem situation and the world of the clients. AR often includes principles of participatory observation.
SAR	Development of a formal theoretical model that can be tested with statistical techniques in order to ascertain whether an intervention has achieved the desired effect. This may be more appropriate in mature research areas where a clear theoretical model can be specified and tested. Adoption of a mixed-epistemology (positivist and interpretivist), mixed-data (qualitative and quantitative) approach to AR.
SSM	The building of conceptual models is a useful technique that could be incorporated in IAR. This may be particularly valuable during problem diagnosis, when researchers attempt to understand the problem situation. Conceptual models that capture the essence of the client situation may bridge the gap before the formal specification of theory (Cunningham, 1993).

Table 2: New Criteria for IAR

Source	New criteria
ADR	The researchers will consider how IT artifacts could accompany the planned actions
AL	The researchers will have rich conversations with the clients in order to understand the problem context.
AS	The researchers will ensure that they have sufficient skills and confidence prior to engaging with the clients.
CFW	The researchers will consciously adhere to the ethical principle of non-maleficence at all stages of the project.
DAR PO	The researchers will immerse themselves into the world of the client prior to and during the project.
GAR	The researchers will consider how theory can be inductively developed from the AR project.
NoA	The researchers will conform with their professional responsibility to ensure that their planned actions are sustainable in the organizational context. The researchers will follow up with the client at a suitable time after project completion to assess continued progress.
PAR	The researchers will consciously reflect on how well their intervention balanced research and action.
SAR	The researchers will consider if relationships between the variables from the problem diagnosis and the planned changes could be tested statistically to triangulate their findings more rigorously. The researchers will consider how combining data sources could strengthen both their action-based intervention and their subsequent contribution to knowledge.
SSM	The researchers will consider developing conceptual models as a form of instrumental theory to help in the problem diagnosis.

AR focuses on producing a positive practical impact. It thus constitutes an approach that researchers can apply to demonstrate their impact in precise and measurable ways (quantitatively and qualitatively). Impact is thus directly associated with relevance since high-impact research must also be relevant for specific stakeholders. Zmud (1996) observed that "strong relevance" is an attribute of research that "not only surfaces findings relevant to practice but also reveals both how the findings would be implemented in practice and the validity-in-practice of those findings. Thus, essentially any research effort claiming strong relevancy would by definition possess an action research component." Validity-in-practice is a useful synonym for impact. As Wong & Davison (2018) explain, the organizational client in their study took the successful outcome of the CAR project as a proof of concept, in effect demonstrating the validity-in-practice of the intervention and organizational change. By applying IAR in problem situations, we will be in a stronger position to develop theories that are themselves better aligned with practice.

The current institutional focus on impact represents a unique opportunity for action research. As demonstrated above, carefully undertaking IAR will generate knowledge that is relevant, measurable, and impactful for both organizational clients and the scholarly community. If researchers accept the legitimacy of the current focus on impact, seeking to improve situations through their theory-driven interventions, then IAR provides an attractive methodological foundation. Applied work of this nature will advance scholarly knowledge even as it also ameliorates problem situations for a variety of stakeholders in organizations.

4.2 Blended Action Research

It may be sensible to blend AR with other methods, such as case studies and surveys, two of the most widely practiced research methods in IS. We suggest that AR will be more widely practiced if it can be demonstrated that it complements these two methods in ways that lead to richer insights and more significant impacts that are appreciated by reviewers and editors. The idea that AR can be combined with other methods is not new yet it is seldom encountered in practice. Our recommendation is consistent with prior work promoting multimethod research. For instance, Mingers (2001) argued for adopting a "pluralist" approach to research methodology, advocating the use of both different paradigms and different research methods. More specifically, Chiasson et al. (2008) suggest that AR can be mixed with other methods in two different ways: a dominant approach and a sequential approach.

With the dominant approach, AR is "chosen and articulated as a primary method of investigation from the very start of the research programme" (Chiasson et al., 2008, p. 42). One obvious way to evaluate an AR project is by using a survey to collect data from key stakeholders both before and after an intervention. This is not dissimilar to the ideas proposed in Durcikova et al.'s (2018) SAR. Another way is to produce a case study as part of the familiarization or diagnosis phase of an AR project.

Even when AR projects are unsuccessful, reflections on their failure and follow-up analysis can lead to one or more case studies. For instance, Martinsons et al. (2017) use a multiple-case study approach to describe how action researchers worked with two different China-based, smaller-sized professional service firms to prepare them for implementation of an IT-based knowledge management system (KMS). However, the KMS implementation significantly improved neither knowledge transfer nor work productivity. An analysis of the project failures identified the significance of specific strategic management deficiencies as well as inadequate employee involvement and incentives.

In contrast to the dominant AR approach, with the sequential approach, "researchers adopt AR as a complementary method that is helpful for additional examination and explanation" (Chiasson et al., 2008, p. 44). We aim to bolster this sequential approach by promoting the combination of complementary approaches to help researchers plan and develop large and impactful programs. In particular, we suggest that a case study (CS) approach to organizational sensemaking can usefully precede a more interventionist approach such as AR. Such a CS approach may also involve subcycles that ground understanding of the problem situation before a full AR cycle commences.[2] We illustrate the sequential approach with a specific example that involved one of the authors of the current paper, during which an unplanned CS-AR combination was undertaken (Malaurent & Avison, 2016). Our account here is designed both to reveal the empirical motivation for our reasoning and demonstrate the potential of this combination for both scholars and practitioners.

In 2007, one of the authors was able to access a multinational firm implementing global ERP software in its Chinese subsidiaries. He concentrated his analysis on the development and spread of workaround practices in reaction to the misfit of the global ERP with the working practices of the Chinese subsidiaries. Through a four-year longitudinal interpretive case

[2] We are grateful to an anonymous reviewer for this suggestion.

study, he observed and interviewed Chinese users and French managers in terms of their engagement in these practices, both in France and in China. In total, thanks to the use of activity theory as a focal theory, 64 workaround practices were identified. Activity theory was found to be insightful for the researcher for capturing and categorizing the ERP micropractices developed by local users. Each workaround was analyzed individually in terms of its creation, diffusion, and impact on the global IS. The objective of this CS was to understand why and how Chinese users developed and used workaround practices. As a consequence, both the firm and the researchers agreed that it would be worth contributing knowledge obtained through this analysis to improve the observed situation in the firm. This is how an AR project emerged as a follow-up to this longitudinal CS.

The initial assumption was that the knowledge gained during the CS could be reoriented into the diagnostic phase of a CAR project. The researcher and the firm agreed on the duration and scope of the project, as well as the establishment of a project team comprising both researchers and practitioners with the following objectives. Both parties also agreed to use the business process management (BPM) approach as an instrumental theory (Davison et al., 2012). The BPM method and philosophy were used to visualize, model, and test the most efficient processes that would satisfy both local and global needs. BPM was found to be a "universal language" shared by all stakeholders. It helped, first, to visualize and measure the impact of the unofficial practices at the multinational level and, second, to find ways to tackle the unofficial practices. This led to a year-long, single-cycle CAR project composed of a four-step process, excluding the "diagnosis" phase that had already been completed as part of the CS. The CAR project ended when 21 of these practices were formalized and accepted within standard organizational routines (Pentland &Feldman, 2008); 28 were curtailed by imposing validation processes, and the remaining 15 remained as informal workarounds.

A representative of the firm argued that this two-phase research project was "extremely helpful and meaningful as it represents a good trade-off after having someone observing us for a long time." He added later that the initial case study approach "really helped us understand the depth and impact of those practices on the system and also guided the resolution." It was reported several times by the practitioners involved in this project that this CS-AR combination helped the firm to address thoroughly a complex issue that required much time and investigation.

4.3 Future Action Research Opportunities

Historically, AR has been applied in organizational contexts where there is a problem that needs to be addressed. We expect that this line of research in IS will continue, but we should not limit AR to this kind of investigation. The methodological strengths of AR make it singularly valuable for investigating technologies that may pose existential threats to incumbent business models (Chan et al., 2019). Our improvements to the AR method should further enhance its relevance to research into the application of disruptive technologies, including those that embody artificial intelligence (AI) and enable more flexible and socially distanced work.

AI and big data are already changing the competitive landscape in diverse domains such as car hire, hotel booking, travel, finance, and even manufacturing. We suggest that a theory-driven AR project could help an incumbent firm, which is facing significant disruptive challenges, to examine how it can respond more effectively. The AR project would follow a systematic diagnosis with the planning, introduction, and institutionalization of transformative changes to its own business. The project would conclude with an evaluation of and reflection on the impact of those changes.

Another AI-centric example involves the development of smart urban infrastructures.[3] Public administrations and private sector firms work together to design automated transportation systems, automated waste management systems, and an assortment of computer-based information systems to manage the supply and use of water, gas, and electricity. These smart infrastructures work because widespread sensors measure the flow of people, materials, energy, and waste. These sensors are connected objects that nurture large datasets used to predict and regulate the needs of a population. IAR is ideally suited to explore the introduction of smart infrastructures, where the social and behavioral parameters related to their use are unclear and the key constructs and variables have yet to be pinned down. We posit that such smart technology applications could benefit greatly from both academic knowledge and structured experimentation or simulation. Indeed, an IAR-dominant approach could include experiments or simulations as contributory methods. A more systematic and structured inclusion of IS scholars in the design and implementation of AI-based systems that are intended to create value for both the public and management practitioners may also help to resolve issues related to ethical dilemmas.

[3] https://www.forbes.com/sites/bernardmarr/2015/05/19/how-big-data-and-the-internet-of-things-create-smarter-cities/#5e9163517677

Meanwhile, the ubiquity of electronic communication technologies has given organizations unprecedented flexibility in when, where, and how their employees work. Consequently, some businesses have adopted flexible worktime and workplace policies in an attempt to reduce employee turnover and increase productivity. The coronavirus pandemic has forced a dramatic and sudden shift in work locations; millions of employees have stayed home instead of coming into the office. However, our understanding of the implications of this radical change remains limited. The obvious benefits include the elimination of commuting time for the employee and reduced office rental costs for the employer. However, anecdotal reports suggest that Zoom meetings are a poor substitute for physically proximate interactions and remote workers are suffering from unprecedented isolation and paranoia (cf. Jacobs, 2020; Davison, 2020).

IAR is ideally suited to study the wide-ranging impacts of changes in employee and team distancing. Action researchers can start a project by having rich conversations with their clients during the diagnostic stage (C2d) in order to understand the aims and objectives of the work location policy. As individuals and teams relocate from offices to homes or vice versa, the AR project can collect data about their social interactions and work productivity. Americans traditionally manage by walking around and interacting with their subordinates while their Asian counterparts tend to be more aloof, based on greater power distances (Hofstede, 2007). Thus, the complex influence of cultural differences may be investigated by conducting AR projects in different contexts.

A work relocation IAR project could also include surveys and observations that examine variables such as the engagement, satisfaction, and work-life balance of individual employees and team members. All of this will enable an evaluation of the benefits and drawbacks to working in the office versus from home for managers and employees with different demographics (young versus old, single versus married without children versus married with children, etc.). At this stage, researchers may also consider how theory can be inductively developed from an IAR project (C3m). Large-scale work relocations are likely to have some impacts that are only evident in the longer term. Thus, action researchers should follow up with the client at a suitable time after project completion to assess those impacts (C4i).

We fully expect that the stream of AR projects driven by specific organizational problems will continue. The revised set of principles and criteria that we have developed in this article aim to foster that research. However, we also foresee more action research opportunities related to the impact of recent technological innovations. We thus encourage the undertaking of IAR projects related to specific information and communication technologies that disrupt the business models of established firms, such as AI and videoconferencing. IS action researchers have a significant role to play in helping practitioners design and use systems based on the accumulated knowledge in our discipline.

5 Conclusion

Our objective in this article has been to strengthen the AR method, especially as it is applied for IS research. We achieve this by integrating relevant practices from 11 other AR methods with the existing principles and criteria from CAR. The relevant practices are manifested as 12 criteria, each of which complements the existing criteria in a constructive way. Taken together, the five principles and 47 criteria constitute IAR. IAR is more precisely described than CAR, which means that there are more opportunities for researchers to demonstrate rigor when applying this method. We suggest that IAR provides a solid basis for researchers to engage in scholarship that focuses on problem solving and change in both traditional organizational contexts and in the emerging contexts of disruptive technology that we have discussed. IAR is more prescriptive, more engaged in problem solving, and more theory-oriented than CAR. The IAR method offers precise guidance on how researchers can connect deeply with the client in the different phases of a AR project, as well as engage more thoroughly with theoretical instruments and concepts. Collectively, IAR will facilitate the diagnosis of problems and the development of theory-based innovative changes that ameliorate problem situations for different stakeholders. We reinforce the reflexivity of the method in order to help researchers trace precisely how their interventions proceeded.

However, the application of specific criteria must ultimately be at the discretion of the researcher. The criteria themselves are open to modification, for instance as new evidence emerges regarding their efficacy. As a community, action researchers must also be open to change. This entire article is an instantiation of such change since we have integrated a dozen new criteria in creating IAR while removing and reformulating some of the original 43 criteria developed by Davison et al. (2004, 2012) for CAR. Furthermore, we have reformulated the principles and criteria for IAR into a prescriptive rather than reactive style. This is important because we want the principles and criteria to inform researchers as they design and conduct projects in a manner that is faithful to the intent of IAR. The previous, reactive nature of CAR's principles and criteria encouraged post hoc evaluation (Has something been done?), rather than focusing on the planning and conduct of change-oriented action in IAR.

The legitimacy of AR depends to a large degree on maintaining appropriate standards of precision when AR-based research is submitted to and accepted by our best journals. If the community of IS researchers is familiar with the principles and criteria for high-quality IAR, they can apply and uphold high standards in writing and reviewing IAR manuscripts. At the same time, we expect that researchers will be reflective in applying IAR. This reflection needs to occur throughout an IAR project. Researchers should reflect on the criteria and their appropriateness for a given set of organizational circumstances. They should also reflect on the method as a whole. Indeed, these two points of reflection are explicitly included as criteria 5b, 5f, 5g, and 5h.

IAR is a powerful method for investigating IS in context. Nevertheless, we also encourage researchers to consider blending IAR with other methods. We have outlined case studies and surveys as two such methods that are mutually supportive of AR (Chiasson et al., 2008). Mixed methods may be most fruitful in contexts where the aim is to recommend organizational changes instead of merely observing and evaluating the status quo. Indeed, the many opportunities to improve organizational practices and processes naturally lend themselves to AR projects. We believe that by improving AR methods and creating IAR, we enhance the prospects for researchers to capitalize on these opportunities and thus benefit both their organizational clients and the scholarly research community.

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Appendix A

Table A1. Origins and Examples of 16 Action Research Methods in 13 Information Systems Research Journals (1982-2018)

Year of first publication	Name of AR method	Original publication	Recent example in the IS literature	Frequency of occurrence
1975	Action science	Argyris et al., 1975	Heiskanen, 1995	1
1978	Canonical action research	Susman & Evered, 1978	Wong et al., 2018	32
1981	Soft systems methodology	Checkland, 1981	Nicholson & Sahay, 2009	5
1982	Action learning	Revans, 1982	Yoong & Gallupe, 2001	1
1983	ETHICS	Mumford, 1983	Mumford, 1993	0
1987	Clinical fieldwork	Schein, 1987	Hatzakis et al., 2007	3
1989	Participatory action research	Argyris & Schön, 1989; Whyte, 1991	Butler et al., 2008	4
1989	Participant observation	Jorgensen, 1989	Jepsen et al., 1989	0
1990	Multiview	Avison & Wood-Harper, 1990	Lesca & Caron-Fasan, 2008	2
1996	Information systems prototyping	Baskerville & Stage, 1996	Yang et al., 2012	4
1999	Grounded action research	Baskerville & Pries-Heje, 1999	Henfridsson & Lindgren, 2005	3
2002	Collaborative practice research	Mathiassen, 2002	Frisk et al., 2014	10
2004	Dialogical AR	Martensson & Lee, 2004	Ou Yang et al., 2017	2
2004	Networks of Action	Braa et al., 2004	Gizaw et al., 2017	7
2011	Action design research	Sein et al., 2011	Spagnoletti et al., 2015	5
2018	Statistical AR	Durcikova et al., 2018		1

Appendix B

Table B2. Key Characteristics of 16 AR Methods

AR method	Role of researcher	Focus of method	Role of theory	Change orientation
Action design research	Engage with the project team	Building IT artifacts	Theory is inscribed in artifacts	Improving problem situations
Action learning	Engage with the client	Problem solving	None	Change oriented actions
Action science	Facilitator	Work skills development	None	None
Canonical action research	Engaged collaboratively with client team	Problem solving	Central to diagnosis and action planning	Change is central to problem solving
Clinical fieldwork	Engaged as a Consultant	Problem solving	None	Change to improve situation for clients
Collaborative practice research	Engaged collaboratively with client team	Software development	None	Change as part of software development
Dialogical AR	Hands-off engagement; no direct intervention	Problem solving	Central to diagnosis and action planning	Change is central to problem solving
ETHICS	Engaged collaboratively with client team	Problem solving and Software development	None	Change is central to problem solving
Grounded action research	Engaged collaboratively with client team	Theory development	Grounded theory	Change is not central: theory can be developed without change
Information systems prototyping	Engaged with software developers	Software development	None	Change is not required
Multiview	Engaged with software developers	Software development	None	Change is not required
Networks of Action	Engaged collaboratively with multiple stakeholders	Problem solving and systems development	As appropriate to the situation	Change is central to the development of scalable and sustainable solutions
Participant observation	Immersion in the world of the client	Appreciation of the client's world	None	None
Participatory action research	Immersion in the community	Social change actions in the community	Not specified	Change is central to understanding
Soft systems methodology	Engaged collaboratively with client team	Problem solving and software/ systems development	Conceptual models for problem diagnosis	Change is central to problem solving
Statistical AR	Engaged collaboratively with client team	Problem solving	Essential for diagnosis and action planning	Central to problem solving

Appendix C

Table C1. A Brief Description and Critique of the Sixteen Action Research Methods

Name of AR method and abbreviation	Key features (description)	Critique
Action design research (ADR)	ADR aims to generate prescriptive design knowledge through building and evaluating ensemble IT artifacts in an organizational setting. This is quite different to the problem-solving (but not necessarily artifact-developing) focus of AR. ADR has four stages and seven principles. There appears to be iteration between the stages, viz.: (1) Problem formulation; (2) building, intervention, and evaluation; and (3) reflection and learning, but no sense of a cycle. (4) Formalization of learning occurs outside the box of (1-3). The role of theory is also absent, a major departure from standard AR.	ADR focuses on the technological artifact but excludes the organizational context. ADR clearly belongs to the broad family of AR methods, yet it is distinct from the problem solving / organizational change and software / system development streams. ADR may facilitate a bridge across the methodological gulf between DSR and AR, enabling the flow of ideas in both directions.
Action learning (AL)	The fundamental idea of AL is for the researcher to engage with the client in an extended diagnosis or conversation, during which the researcher learns about the problem situation in practical terms. Once again, there is no role for theory identified. The conversation is followed by actions based on what has been discussed. After the actions are taken, there should be reflection and learning. A facilitator may be involved if it is impractical for teams to be self-managed. Facilitators are particularly useful for encouraging reflection. However, a significant challenge involves going beyond the conversational diagnosis to actually take actions, and later to reflect. If the problem is solved, there may be little interest in reflecting or learning.	In some respects, AL resembles a simplified version of CAR: the cyclical structure is similar, but AL appears to be designed for self-management by organizational teams that are not familiar with the theory we would expect to see in a CAR project. Even when AL is facilitated, unless the facilitator has a strong academic background, it is unlikely that theory will play a significant role. However, moving from the diagnostic conversation to the taking of actions will not be easy, especially if there is no cause-and-effect theory to drive the action process. AL does offer practitioners some structure, but they are unlikely to reap the full benefit of this structure alone because atheoretical learning is itself an inadequate response to an organizational problem situation.
Action science (AS)	AS is a strategy for increasing the skills and confidence of individuals in groups and to foster long-term individual and group effectiveness. This strategy applies to any form of human relations, whether organizational, group, or interpersonal contexts where individuals work on challenging tasks together. The basic goal of AS is increasing professional effectiveness. It does this by encouraging individuals to shift from technical theories of how to do things to human theories. The latter are asserted to be more effective in achieving real impacts.	The essential principles of AS can usefully be applied to employees who will later be involved in a CAR project. Alternatively, these principles could be embedded into a prediagnostic preparatory phase of an AR cycle. This could lead to much more effective diagnoses.
Canonical action research (CAR)	CAR is the classical five-stage approach to AR initially formalized by Susman & Evered (1978) after earlier work by Lewin (1946) and Schein (1969). Davison et al. (2004, 2012) later specified CAR in more detail with five principles and 43 criteria designed to guide researchers in the conduct of CAR and help reviewers assess the completeness of a CAR project. The role of the action researcher is to undertake an independent diagnosis of the organizational problem situation, before developing a theory-based plan to tackle the situation, implementing changes, evaluating the impact of the actions, and reflecting on what was learned. CAR	CAR is currently the most widely practiced AR method in the IS literature. Its formal prescriptions aid its rigorous application and broad understanding. However, excessive formalization may curb the naturally emergent nature of AR. Davison et al. (2004) suggest that all action researchers who apply CAR should reflect on the method itself and, where appropriate, identify opportunities for improvement. Such reflections are reflected in McKay & Marshall's (2001) dual-cycle models and more recently Wong & Davison's (2018)

	is a collaborative AR method, where the (ideally independent) researcher and organizational client must work together. Instrumental and focal theories are central to CAR (Davison et al., 2012), with the former oriented toward diagnosing problems and assessing their eventual solution, and the latter toward driving the change process.	suggestion of the need for a prediagnostic familiarization stage. In a similar spirit, while the 43 criteria are designed to be helpful, they should not be regarded as sacrosanct: It may be that individual researchers find some or all of these criteria to be unreasonably constraining and seek either to replace or supplement them with other criteria.
Clinical fieldwork (CFW)	CFW (Schein 1987) requires the involvement of highly trained and qualified professionals who play a facilitative role in helping individuals, teams and organizations to solve a problem. Since clients expect to pay for services, CFW closely corresponds to consulting. Indeed, CFW appears to be developed out of the earlier Process Consultation approach (Schein, 1969). The focus is problem solving in the organization and actions that lead to that outcome. Validation comes with a documented improvement in the problem situation. CFW is highly situational as much depends on the precise circumstances and involvement of human actors. There is an ethical obligation to propose actions that will improve the situation. This leads to a linear process model, not a cyclical one, since only appropriate actions should be recommended: there is no room for experimentation or trial and error.	The central principles of CFW closely reflect a few core principles of AR, notably with respect to problem solving and organizational change. However, CFW corresponds more closely to consulting, taking a linear rather than cyclic approach, involving highly trained and professional facilitators (consultants), a client-pays business model, and the sense that the facilitators drive the change process rather than a more collaborative approach. Further, there is no academic involvement or the use of theory, which implies that the focus is more on very relevant action, and less on research. In line with CFW, CAR researchers should consider their own qualifications and professional training when they facilitate interactions with clients.
Collaborative practice research (CPR)	Based on the software process improvement paradigm, Matthiassen initiated a large research initiative that aimed to solve the never-ending rigor-relevance debate, by proposing a new software development approach that he called collaborative practice research (CPR). While Mathiassen (2002) defines CPR as both practice and research driven, he insists that it facilitate researchers to (1) organize collaborations as a loosely coupled system of related agendas, (2) implement full learning cycles of understanding, supporting, and improving practice, (3) combine action research, experiments, and practice studies, and (4) establish basic documentation systems to support longitudinal practice studies. To achieve those different elements, he suggests methods and techniques from a large set of approaches, including AR.	While CPR has led to a number of interesting and highly cited research articles, it does not appear to involve a precise methodology. We view CPR as a metaparadigm within the AR space that facilitates the systematic reconciliation of practitioners and academics, in the context of software development, using any viable means.
Dialogical action research (DAR)	DAR is premised on the idea that the researcher "attempts to speak the language of the practitioner" (Martensson & Lee, 2004), recognizing the practitioner's expertise in the organization and the associated problems, and setting to one side the researcher's own science-based knowledge. DAR proceeds through a series of "reflective one-on-one dialogues between the practitioner and the … researcher, taking place periodically in a setting removed from the practitioner's organization." The purpose of this dialogue is to bridge the worlds of the interlocutors in order to "build a mutual understanding … of the organization and its problems." This is then followed by the researcher drawing on theoretical knowledge to suggest actions that the practitioner may take to remedy identified problems in the organizational context. The practitioner takes actions as appropriate to the context. The success or failure of these actions to achieve the desired results may be indicative of the salience of the theories applied and may lead to the	DAR is firmly positioned in the social construction of reality (Berger and Luckmann, 1991). Anchoring the researcher-practitioner dialogues in the world of the practitioner requires researchers to acclimatize themselves to a new worldview and indeed to make sense of this world, if they are also to offer constructive remarks that facilitate problem solving. This acclimatization will involve, inter alia, an alignment of knowledge between the two interlocutors. Although the structure of DAR closely resembles CAR, upon which it appears to be based, the practice of DAR requires the researcher to take a hands-off approach: the researcher is not permitted to intervene directly and is also dependent on the practitioner for any feedback as regards the impact of any actions taken. While we agree about the value of researcher immersion in the world of the practitioner, the distance that is

	identification of additional actions through "another cycle of action and learning." DAR is thus cyclical, theory based, collaborative, and oriented toward the solving of problems. However, the researcher does not intervene in the problem context: this is the sole prerogative of the practitioner. The process model of DAR bears a very close resemblance to that of CAR.	created between the researcher and the organizational problem situation is perplexing. Although DAR appears to be collaborative, the researcher is held hostage by the extent to which the practitioner is able to enact changes in the organization. It is hard to identify any scholarly advantage that will accrue from this situation: Researchers would normally expect to interact with a variety of stakeholders, not just the project champion, each of whom may perceive the problem situation quite differently. Further, while a DAR approach might lead to solving the problem as perceived by the practitioner, it is less likely to lead to the solving of anyone else's problems. Indeed, it may make situations worse. The strength of DAR is its insistence that the researcher become acclimatized to the world of the practitioner. This can only be good, since researchers who fail to understand the world of the practitioner are unlikely to be able to propose any useful remedy to organizational problems, irrespective of their theoretical understanding and expertise.
The effective technical and human implementation of computer-based systems (ETHICS)	ETHICS is a method used in systems development that emphasizes user participation and principles of sociotechnical design. It clearly requires collaborative involvement with end users and aims to balance both social and technical needs so as to reach a solution that is not only effective and efficient but also humanistic and friendly. The original ETHICS method had seven stages: diagnosis, STS design, set out alternative solutions, identify possible ST solutions, rank possible ST solutions, prepare a detailed work design, accept the best possible ST solution (Mumford, 1983). In later work (Mumford, 1993), the number of stages was expanded to 15, though still along the same lines.	We regard ETHICS primarily as a software/systems development methodology that incorporates some aspects of AR, notably user participation and sociotechnical diagnosis. However, there is no obvious requirement for other key aspects of AR such as theory or reflection, nor is there the sense that work should proceed in a cyclical fashion: if anything, ETHICS adopts a linear approach.
Grounded action research (GAR)	GAR is premised on the CAR cycle but has a particular emphasis on the need to ground a theory out of data collected in the course of a project. Theory has long been associated with AR. Indeed, McKay & Marshall (2001) go so far as to assert that AR without theory is not AR at all. In the original form of GAR, Baskerville & Pries-Heje (1999) focused their attention on systems development issues, but there is no specific requirement for this to be the case, as theory can be grounded out of any type of problem situation.	GAR aims to develop theory, but it seems unnecessary to create a new form of AR to achieve this purpose. The inductive development of new theory is a reasonable outcome for a regular CAR project. However, theory development requires considerable time and resources, which may be beyond the scope of what is achievable in a single journal article.
Information systems prototyping (ISP)	ISP is a method that is used by designers to validate the ongoing developments of an information system. It is difficult to assess this grand approach, as there are different methods of prototyping depending on the degree of user involvement, as well as their orientation toward problem solving. Broadly speaking, prototyping is iterative as it includes cycles of construction and users' evaluation until the targeted functionalities are achieved. Lastly, the design process of ISP aims to be situated in the users' social settings.	Although Baskerville & Wood-Harper (1998, p. 98), admitted that the development of prototyping had "no strong heritage of Action Research," they still classified ISP as a form of AR as they assessed that it represents an intervention in the users' work settings, where the researcher is conducting participatory observation about the suitability of the design, and the researcher is studying the impact of the design changes in the users' work settings.
Multiview (MV)	MV is a framework combining different methodologies. The primary goal of MV is systems design. Wood-Harper et al. (1985) describe MV as "a contingency theory of an information system prior to implementation	Baskerville & Wood-Harper (1998) note that MV is often classified as a form of AR due to the fact that its design was strongly influenced by SSM. Although we classify SSM as a

	of that system." As an approach to systems design, MV is composed of five stages: human activity analysis, entities, and functions analysis, sociotechnical analysis and design, human-computer interface design, and technical design. MV places a strong emphasis on human activities. Based on the taxonomy suggested by Burrell and Morgan (1979) the researcher can occupy four different roles: technical expert, facilitator, agent for social progress, and change catalyst.	problem-solving method, we suggest that MV is firmly located within the software/systems development stream of AR.
Networks of action (NoA)	NoA is the term used by Braa et al. (2004) to describe the specific AR method that has been practiced since 1994 in Scandinavia in connection with a Health IS Planning (HISP) project that is still ongoing. A fundamental premise of NoA is that action needs to be situated "within networks rather than on single units" (Elden & Chisholm, 1993), because "local interventions need to be part of a larger network to be robust" (Braa et al., 2004). "Establishing networks creates opportunities for sharing of experience, knowledge, technology, and value between the various nodes of the experience" (Braa et al., 2004). Scalability is thus a prerequisite … for sustainability. NoA is also remarkable for its rejection of the tendency "in descriptions of action research to separate the process into (more or less) well-defined stages." Braa et al. (2004) suggest that NoA does not easily fit into this processual straitjacket, with clearly defined stages, instead being characterized by "a significant element of flexibility and improvisation" (Braa et al., 2004)	Our reading of Braa et al. (2004) and other sources leads us to the recognition that NoA functions as an overarching set of values that permeate the various HISP projects that Braa and his colleagues describe. These projects have multiple objectives, including software development, building MSc programs and other educational schemes, building interinstitutional linkages to gain funding, etc. In each of these projects, a different research approach might be taken but it would always be subject to the overriding requirement of scalability and sustainability. NoA thus contains a set of parameters under which AR projects are expected to operate, at least within the HISP projects that Braa et al. (2004) describe. A key parameter is what we term the principle of flexibility and improvisation: NoA do not readily fit into the stage-based processes common to many other AR forms, being much more open ended. In this respect, NoA constitutes a valid AR method.
Participatory action research (PAR)	PAR is a way of engaging in research in communities, emphasizing participation, action, and research. PAR involves practitioners as both subjects and co-researchers (Argyris & Schön, 1989). Practitioners of PAR seek to make sense of the world collaboratively and reflectively by trying to change it. Within a PAR process, "communities of inquiry and action evolve and address questions and issues that are significant for those who participate as co-researchers" (Reason and Bradbury, 2008). PAR practitioners are interested in the phenomena that they study, but typically are not concerned about the reproducibility of their findings.	PAR shares some characteristics with AR, notably the emphasis on collaboration, actions, and research that are undertaken with (not on) participants. Wikipedia suggests that there is considerable variance with regard to the intellectual origins of PAR.[4] Indeed, despite the name, PAR is best seen not as a body of ideas and methods but instead as a pluralistic orientation to knowledge making and social change that is undertaken with (not on or for) communities. PAR is a research approach that incorporates some of the basic AR principles, but that is also very different, notably with respect to theory. PAR is widely applied in the social sciences, but relatively infrequently encountered in IS.
Participatory observation (PO)	PO requires the involvement of the researcher(s) in the field he/she observe(s). It provides an excellent basis for accessing the "interior" aspects of people's daily lives through membership of their world (Jorgensen, 1989). Fetterman (1989) regards participant observation as both central and critical to fieldwork, hence it is widely used as a data collection technique. It can be applied during the first stage of an AR project, where the researcher needs to collect knowledge about the world of the clients prior to the development of actions for change. However, while PO may contribute findings	We consider PO to be a highly valuable technique for immersing the action researcher into the world of the client. This can lead to the identification of knowledge that will inform any later diagnosis of problems and recommendation of viable solutions. The principles of PO are commonly applied in the early stages of AR projects.

[4] https://en.wikipedia.org/wiki/Participatory_action_research

	that can be acted upon in organizational change efforts, it does not in and of itself involve such changes.	
Soft systems methodology (SSM)	Checkland used AR principles to develop SSM (Checkland, 1981). The primary goal was to analyze complex situations where there are divergent views. Checkland notes that the intention of SSM is to solve "soft" problems such as: How to improve the fluidity of business workflow in the organization? How to improve the transparency of decision-making processes? SSM incorporates an iterative, process-based approach involving a joint insider-outsider team for systems design in organizational contexts. This approach is composed of seven steps: (1) enter the situation, (2) express the problem situation, (3) formulate root definitions of relevant systems of purposeful activity, (4) build conceptual models of the systems identified, (5) compare models with real-organizational settings, (6) define possible changes that are feasible, (7) take actions to improve the problem situation.	SSM clearly belongs to the problem-solving and organization stream of AR methods. It incorporates a well-defined structure to assess and improve a problem situation. The term "system design" is used in the sense of human activity systems (Baskerville & Wood-Harper, 1998). Therefore, SSM does not necessarily involve technical systems design in the sense of software design, but instead targets the larger organizational scale, where software might be affected in some situations. The extent to which theory is formalized in SSM is opaque. Some theorizing appears to take place given the development of conceptual models, but these may not assume the role of fully fledged theories.
Statistical AR (SAR)	SAR is the latest AR method to be delineated and one of the more controversial. Durcikova et al. (2018) explicitly situate SAR within the broad parameters of CAR but explain that they wish to create a type of AR that "benefits from the richness typically associated with qualitative and interpretive research, but additionally embodies the type of rigor typically associated with positivist research" (241). Durcikova et al. (2018) suggest that the action planning and evaluation stages of CAR can be enhanced with statistical hypothesis testing before and after an intervention. Notwithstanding this inclusion of statistical hypothesis testing, the authors also explain that researchers should conduct "interviews/qualitative fieldwork through an active engagement with a company to diagnose the problem and possible causes, as well as consider desired outcomes." SAR thus appears to include both quantitative and qualitative elements.	We have several concerns with the way Durcikova et al. (2018) position SAR. We are perplexed by the juxtaposition of both positivist and interpretivist elements within SAR. For instance, the situation diagnosis phase incorporates both positivist (statistical theory testing) and interpretivist (interpreting the world of the interviewees through their qualitative comments) elements. Indeed, Durcikova et al. (2018) explain how they interpret the qualitative data that they have collected through interviews. This seems to be completely unrelated to statistical analysis. Given the apparent mixing of data types (qualitative and quantitative) and epistemology (interpretivist and positivist), we suggest that SAR is not an instance of positivist AR as claimed by Durcikova et al. (2018) but rather an example of a mixed-epistemology CAR that draws on mixed data and methods. The structure of SAR is largely based on CAR, the primary difference being the inclusion in the action planning and evaluation stages of a statistical hypothesis-testing component as a way of determining if an action has successfully led to a desired outcome. We regard this component as an innovation but see no reason why such hypothesis testing should not be included in a mixed-epistemology CAR project.

Appendix D

Principles and Criteria for Integrated Action Research

Davison et al. (2004) developed a set of five principles and 31 criteria for the assessment of CAR. This was supplemented in Davison et al. (2012) with 12 additional and revised criteria. We now propose further revisions to the criteria, as clearly indicated below, which now total 47. Following reviewer advice, these criteria are now rendered in a prescriptive rather than reactive style. We have, in many instances, modified the text of criteria to enhance consistency, removed criteria that are superfluous, or merged criteria that are identical. We have also resequenced the criteria to ensure that the sequence logically corresponds to the activities covered by the principle. The numbering of the principles and criteria follows the pattern used in Davison et al. (2004, 2012). New criteria in this study are indicated with a *.

P1:	**The principle of the researcher-client agreement**
C1a	Both the researchers and the client agree that IAR is the appropriate approach for the organizational situation.
C1c	The client has made an explicit commitment to the project.
C1b	The researchers and the client jointly specify the focus of the AR project clearly and explicitly.
C1e	The project objectives and evaluation measures are specified explicitly.
C1d	The roles and responsibilities of the researchers and client organization members are specified explicitly.
C1f	The data collection and analysis methods are specified explicitly.
P2:	**The principle of the cyclical process model**
C2a	The researchers plan to follow the cyclical process model and justify any deviation from it.
C2b*	The researchers will ensure that they have sufficient skills and confidence prior to engaging with the clients in the diagnostic stage.
C2c*	The researchers will immerse themselves into the world of the client prior to and during the project.
C2d*	The researchers will have rich conversations with the clients during the diagnostic stage in order to understand the problem context.
C2e	The researchers plan to conduct an independent diagnosis of the organizational situation.
C2f	The researchers will ensure that they plan their actions explicitly based on the results of their independent diagnosis.
C2g	The researchers will implement and evaluate the planned actions.
C2h	The researchers will reflect on the outcomes of the intervention.
C2i	Following this reflection, the researchers will make an explicit decision on whether or not to proceed through an additional process cycle.
C2j	Both the exit of the researchers and the conclusion of the project will be due to either the project objectives being met or some other clearly articulated justification.
C2k*	The researchers will consciously adhere to the ethical principle of non-maleficence at all stages of the project.
P3:	**The principle of theory**
C3a	The project activities will be guided by a theory or set of theories.
C3b	The domain of investigation is theoretically relevant to the scholarly interests of the research community.
C3c	The researchers will select and apply one or more instrumental theories for the independent diagnosis as they seek to derive the causes of the observed problems.

C3d* The researchers will consider developing conceptual models as a form of instrumental theory to help in the problem diagnosis.

C3e The researchers will identify a focal theory during the problem diagnosis.

C3f The researchers and clients will agree on the appropriateness of the instrumental and focal theories for the organizational context and practices.

C3g* The researchers will consider how combining data from different sources could strengthen both their action-based intervention and their subsequent contribution to knowledge.

C3h The planned intervention will be premised on the focal theory and will address the problems diagnosed.

C3i* The researchers will consider if relationships between the variables from the problem diagnosis and the planned changes could be tested statistically so as to triangulate their findings more rigorously.

C3j The focal theory will be used to evaluate the outcomes of the intervention.

C3k The researchers will evaluate and reflect upon theoretical explanations for the current organizational problem situation.

C3l The researchers will reflect on the focal theory used and its ability to predict the change outcomes.

C3m* The researchers will consider how theory can be inductively developed from the IAR project.

P4: The principle of change through action

C4a Both the researcher and client are motivated to improve the situation.

C4b The problem and its cause(s) will be specified as a result of the diagnosis.

C4c The planned actions will be designed to address the diagnosed cause(s).

C4d* The researchers will consider how IT artifacts could accompany the planned actions.

C4e The client will approve the planned actions before they are implemented.

C4f The organizational situation will be assessed comprehensively both before *and* after the intervention.

C4g* The researchers will conform with their professional responsibility to ensure that their planned actions are sustainable in the organizational context.

C4h The timing and nature of the actions taken will be clearly and comprehensively documented.

C4i* The researchers will follow up with the client at a suitable time after project completion to assess continued progress.

P5: The principle of learning through reflection

C5a The researcher will provide progress reports to the client and organizational members.

C5b Both the researcher and the client will reflect upon the outcomes of the project.

C5c The researchers will report their activities and outcomes to the client clearly and comprehensively?

C5d The researchers will consider the project results in terms of implications for further action in this situation.

C5e The researchers will consider the project results in terms of implications for action to be taken in related research domains.

C5f The researchers will reflect on the results in terms of implications for the research community (general knowledge, informing/reinforming theory).

C5g The researchers will reflect on the results in terms of the general applicability of IAR.

C5h* The researchers will consciously reflect on how well their intervention balanced research and action.

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