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RIGOROUSLY RELEVANT ACTION RESEARCH IN INFORMATION SYSTEMS

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Abstract

Action research is seen as one of the solutions to the lack of relevance in the field of information systems because action research has as its primary goal to combine successful intervention in real-world settings with the development of scientific knowledge. The rigor of action research, however, has been questioned regularly. The IS field lacks a set of generally agreed guidelines and criteria to assess action research. This paper builds on earlier efforts to arrive at a set of principles and criteria to assess the rigor of action research and provides the first comprehensive evaluation of 30 recently published AR field studies in mainstream IS journals to test whether such a set of principles and criteria proves to be useful. The objective is to provide a reference framework on which AR design choices can be made and AR papers can be reviewed. The framework proposed in this paper has proven to be applicable to different types of AR and many of its principles are followed in action research field studies. Based on the framework and the review of the field studies, recommendations are made to increase the rigor of action research to achieve more relevance.

Keywords: action research, evaluative study, relevance, rigor, quality criteria

1 INTRODUCTION

In the relevance and rigor debate that has been going on in the information systems field (Robey and Markus 1998), action research (AR) has been put forward as one of the solutions to the lack of relevance in the field (Baskerville and Wood-Harper 1996, Avison, Lau, Myers and Nielson 1999, Lau 1999, Baskerville and Myers 2004). AR has as its primary goal to combine intervention in real-world settings with theory enhancement. As such AR seems to be an ideal research method for the IS field (Avison et al. 1999), especially in those domains where the researcher can be actively involved and benefits for the organization and research community can be expected; where obtained knowledge can be immediately applied and the research process links theory and practice in a cyclical process (Baskerville et al. 1996).

However, the rigor of AR has been questioned (Lau 1999, Avison, Baskerville and Myers 2001). Many researchers have not made AR design and results explicit (Lau 1999) and lack of generally agreed evaluation criteria complicates the action research publication review process (Baskerville 1999). The IS field is in the need for a set of guidelines or criteria to assess AR (Lau 1999).

From the end of the nineties of last century attention for action research and its rigor has increased and several contributions have been made to arrive at principles and criteria to assess its quality. However, a comprehensive evaluation of recently published AR field studies in mainstream IS journals to test whether a framework of principles and criteria for the quality of AR proves to be useful in practice and to assess how field studies meet these principles and criteria has not yet been done. This study does so with the objective to provide a reference framework on which AR design choices can be made and AR papers can be reviewed. Furthermore this paper provides an overview of recently published AR field studies in IS and provides reference to exemplars of 'following-the-book' practice, extraordinary practice and well-reasoned and non-reasoned 'not-conform-the-book' practice. Similar to the intentions of Lau (1999) and Davison, Martinsons and Kock (2004), it is not my intention to impose adherence to the principles and criteria on action researchers. I leave this to the discretion and justification of the researcher. Well-reasoned deviation from in this paper proposed principles still should be possible.

This paper starts with a brief introduction of AR and its different types. In the following section earlier contributions to arrive at general principles and criteria for action research are discussed and a set of six principles and 24 criteria is build based on these contributions. The next sections discuss the study design and its results, e.g. the extent to which 30 AR field studies, published in mainstream top IS journals since the year 2000, meet these principles and criteria. Due to restrictions in paper size, information on the origin of criteria, categorization of criteria into six principles and on how the field studies meet criteria had to be condensed in 4 tables and could not be elaborated on in text. However, the tables have been designed such that readers can follow the trail from earlier contributions on the rigor of AR and the field studies to the tables, discussion, conclusions and recommendations. For the same reason of paper size discussion, conclusions and recommendations are presented in the same section and I have to refer to de Vries (2007) for the references to the 30 reviewed papers.

2 LITERATURE

2.1 Action research

A frequently cited definition of AR in the information systems field (for example by Baskerville et al. (1996), Baskerville (1999), Davison et al. (2004) and Lau (1999)) is the one of Hult and Lennung (1978): "Action research assists in practical problem solving, expands scientific knowledge, enhances actor competencies, is performed collaboratively in an immediate situation, uses data feedback in a cyclical process, aims at an increased understanding of a given social situation, is applicable for the understanding of change processes in social systems, and is undertaken within a mutually acceptable ethical framework" (Lau 1999, p. 149). The most prevalent description details a cyclical process with

five phases (Susman and Evered 1978): diagnosing, action planning, action taking/intervention, evaluation and learning/reflection. AR that adheres to this rigorous, collaborative and process-oriented cycle has been the most widely adopted in the social sciences (Baskerville 1999, Davison et al. 2004) and has been denoted ‘canonical’ AR (Davison et al. 2004). However, action research in IS is more pluralistic. Baskerville and Wood-Harper (1998) differentiate ten forms of AR based on differences in process model, structure, researcher involvement and primary goals. Canonical AR (CAR), Action Science (AS) and clinical fieldwork (CFW) are the three forms with expansion of scientific knowledge and organisational development/change as their primary goals. The other forms have system design (prototyping and Multiview); system design and organisational development (soft systems and ETHICS); organisational development (process consultation); or training (action learning) as their primary goal. The different forms of AR share characteristics like a multivariate social setting, interpretive assumptions about observation, intervention, participatory observation and the study of change in social settings (Baskerville et al. 1998). Claiming systems development methods as being AR however has been criticized because being similar in problem solving approach and being evolved and developed through AR (and thereby embodying its features) doesn’t make methods like SSM or Multiview being the same as AR in the sense of a research method (McKay et al. 2001). The essence of AR as research method is to solve practical problems and to generate knowledge and as is acknowledged by Baskerville et al. (1998) themselves, only AR types like CAR, AS or CFW have these as their primary goal.

2.2 Rigor of action research

Over the last ten years many papers have put forward criteria for rigorous AR. Lau (1997) is the most comprehensive one in that it describes patterns in epistemological assumptions, traditions (AR types), study designs, data collection and analysis and presentations styles in 20 AR field studies on IS topics and 10 discussion papers published between 1971 and 1995. Only one of these was published in a mainstream IS journal (with five others in the *IFIP Proceedings*). In a following paper, Lau (1999) assessed ten AR papers from the period 1991-1995 with criteria taken from four other papers on AR quality and concluded that none of the four sets of criteria were sufficient to assess the quality of IS action research. He developed a unifying framework combining the strengths of these four sets of criteria that consists of 22 criteria in 4 dimensions: conceptual foundation, study design, research process and role expectations. Lau only assessed two papers (from 1996 and 1998) with this framework. Avison et al. (2001) emphasized an important aspect of AR rigor, controlling AR by procedures for initiation and for determining authority and the degree of formalization of AR control structures. They reviewed seven papers, published between 1993 and 2001. Davison et al. (2004) have put forward a set of five principles particularly for Canonical AR (with 31 criteria): the principle of the Researcher-Client Agreement (RCA), the principle of the Cyclical Process Model (CPM), the principle of Theory, the principle of Change through Action and the principle of Learning through Reflection. They applied these principles on only one field study from 1999. In addition to these studies MIS Quarterly’s special issues on AR had as its purpose to publish empirical studies that can serve as models/exemplars of how to conduct AR and used three requirements for acceptance: demonstration of contribution to practice and research and the explicit provision of AR quality criteria and how these were met by the study (Baskerville and Myers, 2004). The overall picture is that there are two rival sets of principles and criteria which only have been applied to a very restricted amount of (not recently published) field studies and of which the one of Lau (1999) is supposed to be applicable to different types of action research and the one of Davison et al. (2004) only to CAR. Selection of field studies to apply criteria on has not been based on scientometric grounds.

3 THE STUDY DESIGN

I reviewed 30 AR field study papers published from January 2000 to October 2006 in: Management Information Systems Quarterly (*MISQ*, vol. 24-30, no. 3) (6 papers); Information Systems Research (*ISR*, vol. 11-17, no. 3) (0 papers); Communications of the ACM (*CACM*, vol. 43-49, no. 11) (3

papers); Journal of Management Information Systems (*JMIS*, vol. 16, no. 3 - vol. 23, no. 2) (3 papers); European Journal of Information Systems (*EJIS*, vol. 9-15, no. 5) (8 papers) and the Information Systems Journal (*ISJ*, Vol. 10-16, no. 4) (10 papers). The journal selection is based on the recent and comprehensive scientometric study of Lowry, Romans and Curtis (2004). The first four journals belong to Lowry et al.'s global top five. I haven't included the fifth journal (Management Science) because it isn't a 'pure' IS journal. *EJIS* and *ISJ* have been included because these belong to Lowry et al.'s European top five (together with *MISQ*, *ISR* and *CACM*; *JMIS* was sixth).

I follow Shipman (1982) and Avison et al. (1999) in that academics can be distinguished from others in that they make their methods and research procedures public. The unit of analysis (and data source) in this study are the papers, not the actual research processes because papers are the only publicly available material. The intention was not to take a representative sample but rather to get a general overview. I have followed a replication logic, not a sampling logic (Yin, 1994). Field study papers have been included in the review when the authors explicitly mentioned to have applied any type of AR that has the primary goal of scientific knowledge expansion in combination with organisational development (papers on AR types like system development methods are thus excluded). I have excluded short illustrations of particular types of AR and related but different research methods like case studies, ethnographic studies or participant observation. However papers with AR as research method and ethnographic or case-like reporting styles or participant observation as data collection technique have been included.

All papers have been analysed based on the framework in table 1. The framework is derived from Davison et al. (2004, p. 69-78: table 1-5), Lau (1999, p. 160: table III) and nine other papers (see text below table 1). All papers in *MISQ*'s special issue for which explicit provision of AR quality criteria was asked for have been included in this analyses which for instance led to the criterion sustainable success from Braa et al. (2004). Like Lau (1999), I propose that these principles and criteria are applicable to all types of AR that have scientific knowledge expansion and organisational development/change as its primary goal because all types have basic characteristics in common and mainly differ in process model, structure and role expectations (Baskerville et al. 1998). The framework leaves room for differences in process models and structure in the criteria *degree of openness* and *cycle description* and for differences in roles in the criterion *role expectations*. The results of the review are described in table 2, 3 and 4. The cells in these tables contain abbreviations that correspond with the letters and words in *Italics* in table 1. The data analysis is a qualitative content analysis in which the papers have been coded and the findings have been summarized in conceptual ordered data displays (Miles and Huberman 1994), like tables 2-4.

<i>Principle of Foundation</i> (Lau 1999)	
Epistemology	The researcher's epistemological stance: <i>Interpretive, Critical, Post-Positivist</i> (Ic, ^{1,2})
Suitability of the AR type	Determination of the suitability of the action research type: <i>CAR, PAR, NAR, AL, CFW</i> or <i>CPR</i> in terms of the research theme/aim/questions or outcome (5g, Ia, Ic, Id ³)
Ethics	Agreement on the mutual acceptability of ethical issues: <i>Y/N</i> (IVd, ^{4,8})
<i>Principle of Researcher-Client Agreement</i> (Davison 2004)	
Agreement on AR	A <i>Formal / non-formal</i> agreement between researcher and client on the suitability of AR to the organisational situation, eventually including level of <i>Editorial Control</i> of end report and <i>Funding</i> issues (1a, 1e ^{3,6})
Client commitment	The commitment of the client on type, level and extend of access, the researcher's functioning and the client's consent: <i>Y/Formalised</i> (1c, IIh ⁷)
Role expectations	Roles/responsibilities of researchers (<i>Expert /Facilitator/Collaboratively/∅</i>) and client organisational members (<i>Participative/Collaborative/∅</i>); who initiated the project (<i>Researcher/Client/Collaboratively/∅</i>) and what the action warrants were (<i>Consultative/Authority-bearing/Identity/∅</i>) (1d, IVa, IVb ⁷)
Data collection and analysis	Data sources (<i>IV, Observation, Docu</i> , etc), quantitative and qualitative analysis techniques and triangulation (<i>Δ</i>) (1f, IIe ^{1,3,4,5})
Project focus	The focus of the research in terms of <i>unit of intervention</i> (organisational level or

	technology) and <i>context - months of duration - Site Selection Criteria (1b, 1e, IIc, IIId, IIIf)</i>
Principle of Cyclical Process Model (Davison 2004)	
Degree of openness	The extend of following the <i>traditional CPM</i> or justification of any <i>deviation</i> from it (2a, IIg ²)
Cycle description	Description of how the CPM is passed through: <i>Diagnosis - Diagnosis Based Intervention- Intervention implementation-Evaluation-Reflection (2b, 2c, 2d, 2e, IIb, IIIa, IIIb, IIIc^{2,6})</i>
Decision criteria to proceed/exit	Decision criteria to proceed or exit based on the extend to which the practical <i>Problem</i> has been resolved or <i>Research questions</i> have been answered (2f, 2g, 5d, IIIh, IIIId)
Principle of Theory (Davison 2004)	
Relevance	Relevance of the domain of investigation (including the problem setting) to the interest of the <i>Academic community</i> as well as the <i>Client</i> (1e, 3b, Ia ^{3,6})
Theory use	Theories used to <i>Diagnose</i> the cause/ to guide <i>Interventions</i> / to <i>Evaluate</i> / to <i>Reflect</i> during the process or how theories were developed (3a, 3c, 3d, 3e, Ib, IIb ^{2,3,6})
Principle of Change through Action (Davison 2004)	
Cause	Diagnosis leading to problem and its cause: <i>Y/N</i> (4b, IIIa)
Intervention	The design of interventions to address the cause: <i>Y/N</i> (4c, IIb, IIIb)
Client approval	The explicit approval of the interventions by the client: <i>Y/N</i> (4e)
Organisational assessment	A comprehensive and contextual assessment of the organisational situation <i>Before</i> and <i>After</i> the intervention (4e, IIa ⁵)
Document	The documentation of timing and nature of interventions: <i>Y/N</i> (4f, IIi)
Principle of Learning through Reflection (Davison 2004)	
Reporting style	Reporting style (<i>Ethno, Case</i>), eventually as <i>Thick Description</i> leaving room for <i>Multiple Interpretations</i> (5c, IIi ⁴)
Collaborative reflection	Researcher's and client's collaborative reflection on outcomes of the project: <i>Y/N</i> (5b, IIIc)
Project success	Evaluation of the immediate or long term success of the project: <i>Problem Bound</i> criteria, <i>Client Competence</i> enhancement or <i>Sustainability</i> (5d, 1e, IIIe, IVc ^{8,9})
Impli practice	Implications of the study for related domains: <i>Y/N</i> (5e, IIIe ³)
Impli theory	Implications for research (generalization, (re) informing theory): <i>Y/N</i> (5f, IIIe ^{3,5})

1a-5g: criteria taken from table 1-5 from Davison et al. (2004); 1a-IVd: criteria taken from table III from Lau (1999); ¹ Baskerville (1999); ² Baskerville et al. (1998); ³ Baskerville et al. (1996); ⁴ Avison et al. (1998); ⁵ McKay et al. (2001); ⁶ Baskerville et al. (2004); ⁷ Avison et al. (2004); ⁸ Hult et al. (1978); ⁹ Braa, Monteiro and Sahay (2004).

Table 1. Six principles and criteria for the assessment of AR rigor

4 RESULTS

The results of the review are described in table 2, 3 and 4. Blanks indicate no explicit description of the criterion. Paper numbers correspond with the numbers in the reference in de Vries (2007).

4.1 Principle of Foundation

paper	Principle of Foundation			Principle of Researcher-Client Agreement				
	epistemology	AR type	ethics	agreement	commitment	role expectations	data collection and analysis	Project focus
1		AR ¹				F-ø-R-C	IV,D,O, Q, W,F,CLD, Δ ²	1 org., 700 people - 3
2		PAR				E-ø-ø-I	IV, O, D, Rp	IOIS: 6 stakeholder categories, several org
3		CPR		n	Y	C-C-CI-I	Me, O, W, Q, IS, IV	5 units/140 people, 1 org. - 16

4	I	NAR		F Fu	Y	See text	Various interlinked collection processes	many org involved, 9 countries - 120
5						C-C-ø-A	Video	3 groups, 8 professionals and 6 users in 3 org. - 36
6	I	AR		n	Y	C-C-R-ø	Mo	Dprtmnt, 1 org.
7		AR ¹		n Fu	Y	E-ø-R-C	Di, IV, Me, Fn, D, IS, Δ ²	1 org. - 48
8		AR		n Fu	Y	F-C-ø-C	O, IV, D, Q, Dc, Me	Group of 7 - 3
9		AR		Fu		E-ø-Cl-ø	IV, O, D, usability eva, Δ	Team of 11, 1 org. - 21
10	I	PAR		n		F-P-ø-ø	IV, S, OASco	35 people, 3 org.
11		CAR				C-C-Cl-C	IV, Q, Dc, Mo	6 dprtmnt, >100 people, 1 org – several months - SSC
12		AR				C-C-R-I	W, Q	Team of 20 teachers, 1 org
13		AR				F-ø-ø-ø	IV, O, Q, S	132 people, 9 org. - SSC
14	I	CPR		F Fu	Y	F-P-C-A	IV, D, A, O, E, Di, Δ	IT dprmt – 1 org.- 24
15		AR		F Fu	Y	E-C-Cl-A	Mi, IV, D, C, Di	2 groups 5-10, 2 org. - 36
16		AR		F	Y	F-ø-ø-ø	IV, O, Fn, OASco, stat, Δ	38 groups, 3 org. – 40
17	I	CAR		n		C-P-ø-I	O, C	Physicians, 1 hospital - 360
18	I	PAR		F	Y	F-P-ø-A	O, IV, C, W, B, Fn, D, Δ ^{2,3}	1 org. - 9
19		CAR		F EC Fu	Y	ø-ø-R-ø	W, D, Fn, IV, Fg, OASco	IS, 6 (first cycle) / 2 (second cycle) org - 30 - SSC
20		AR				ø-ø-ø-ø	IS, IV	50 prototype users, 1 org. - 3
21		AR		F Fu		See text	IV, P	IS, 2 pilot org. - 18
22		AL				F-ø-ø-ø	IV, D, Em, OASco	Team of 7, several org. - 2
23	I	AR ¹		F EC Fu	Y	F-ø-ø-ø	Qualitative instrument, W, Fn	4 workshops groups, 20-70 people, 1 org.
24		AR		n		F-ø-C-ø	W	28 program E-business, 1 org.
25		CFW				advisor	O, IV, D	IS planners - 2 org. - 48
26	I	AR		F	Y	C-C-Cl-C	B, S, Q, IV, O, Fn, Δ, Q-sort; content analysis	Proj. team of 8, 1 org. - 2
27	I	PAR		F Fu	Y	C-P-Cl-A	Em, A, Fn, IV, O, D, Δ	Mngmt team of 5, 1 SME - 6
28		AR					IV, D, O, Δ	1 org.
29		AR		F		E-ø-C-I	D, Mi, Di, IS	IS, 1 SME - 24
30				F Fu			IV, Q	Datamodel, several org.

ø not stated; A archive; B brainstorm; C conversations; CLD causal loop diagramming; D documentation; Dc discussions; Di diaries; E ethnographical material; Em E-mail; Fn field notes; Fg focus group; Me meetings; Mo models; IS information systems/software; IV interviews; O observation; OASco open, axial, selective coding; P prototyping; Q questionnaire; Rp rich pictures; S sessions; Stat statistics; W workshops; Δ triangulation; ¹ multimethod study; ² including investigator triangulation; ³ inductive and deductive/thematic analysis and selective coding

Table 2. Review of studies on the principle of Foundation and RCA

In ten papers the epistemological stance has been explicitly stated (as being interpretive). Most authors state that they were conducting AR with 3 referring to CAR and 4 to Participative AR (PAR). Braa et al. (2004) used a Scandinavian-based approach, Network AR (NAR), focusing on political agenda's and sustainable success through situating the action within networks rather than single units. Iversen, Mathiassen and Nielsen (2004) and Börjesson, Martinsson and Timmerås (2006) applied Collective Practice Research (CPR), which aims to improve professional practices through close involvement of participants. Pauleen (2004) relied on AL with the objective to come to some general insights. Salmela, Lederer and Reponen (2000, p. 7) stated that their AR “would be best described as clinical field work, where the researcher, as a trained professional, facilitated in finding a normative solution in a problematic situation”. Further specifics on CFW were not given. In many studies the AR type was posited as a suitable research method given the research objective, questions or desired outcome. Agreement on mutual acceptability of ethical issues has not been addressed in any of the papers.

4.2 Principle of Researcher-Client Agreement

Agreements between researcher and client were often mentioned, most being formal, some non-formal. In 12 papers, funding of the study was elaborated on. Commitments of the client on access, the researcher's functioning and the client's consent were described in 13 papers. Simon (2000) describes the initiation phase of his study quite extensively. After being contacted by a senior member of the US Naval Construction Forces, he conducted unstructured interviews with commanders and Chiefs of Staff to broaden his understanding. This led to a meeting in which AR was agreed upon, conditions for the project were negotiated and authority and limits of the AR team were specified as well as the time frame, costs and team member selection criteria.

The roles of the researcher (mostly facilitative or collaborative) and of organisational members (mostly collaborative) are described in many studies, generally with more emphasis on the role of the researcher than that of the client. Initiation came from the researcher in 5 studies, from the client in 6 and was collaboratively done in 3 studies. Fifteen papers specified action warrants. In Braa et al. (2004) the role of researchers and participants cannot be understood in simplistic terms of degrees of involvement or initiation, but mirrors the variety of actions taken over ten years. In Markus, Majchrzak and Gasser (2002), two authors managed the systems development process and Markus stayed on a distance to enable reflection.

Table 2 shows a multitude of data collection techniques. Triangulation of data sources was mentioned in 9 studies with 3 using investigator triangulation as well. Seven papers describe qualitative data analysis techniques (4 used open, axial and selective coding based on Glaser and Strauss (1967)). Two of these seven studies used statistical analysis techniques as well.

AR projects focused on different units of intervention: international (1), inter-organisational (1), organisation (9), department (3), group/team (12) and information systems (4). Duration covered a range from some months to 10 years. The amount of sites involved was often one or a few. Braa et al. (2004) has the broadest focus with many organisations involved over 8 developing countries and Norway, at different administrative levels, with many interventions over a period of ten years and being open-ended. Site selection criteria have been provided in 3 studies, but as most authors described their rationale for AR, reasons for selecting the site were often described implicitly.

4.3 Principle of Cyclical Process Model

paper	Principle of Cyclical Process Model			Principle of Theory		paper	Principle of Cyclical Process Model			Principle of Theory	
	degree of openness	cycle description	proceed	relevance	theory usage		degree of openness	cycle description	proceed	relevance	theory usage
1				A C	D I E	16				A C	²
2	dev			A C	D I	17	CPM	D-DBI-I-E-R	P	A C	D E R
3	CPM	D-DBI-I-E-R		A C	D DBI I E R	18	CPM	D-DBI-I-E-R		A C	D DBI
4	dev	Flexible	¹	A C	D I	19	CPM	D-DBI-I-E-R	P	A C	D I E
5	CPM	D-I-E-R		A C	I	20				A	
6	dev	D-DBI-I		A	D I	21	dev	prototyping		A C	Design E ²
7			P			22	dev	Do-R-share		A C	²
8	dev	Plan-I-Obs-R		A C	I	23	CPM	D		A C	D R
9	dev	D-DBI-E-R		A C	D E	24	dev	D-DBI-I-R		A C	D DBI
10				C		25				A	
11	CPM	D-DBI-I-E-R		A C	D I	26	CPM	D-I-R	P	A C	D I
12	CPM	D-DBI-I-E-R		C		27	CPM	D-DBI-I-E-R	P	A	D ²
13	dev	D-DBI-I			D	28		D-DBI			D I

14	dev	CPR cycle	P R	A C	D I E	29	dev	D-DBI-I-R		A C	D R
15	dev	D-I-E			D I E	30					

¹ Defined as open-ended; ² Theory development

Table 3. Review of studies on the principle of CPM and Theory

In 10 papers the traditional CPM has been followed. Twelve papers deviated from it, some in a quite limited way, like plan-intervention-observation-reflection (Davison and Vogel 2000, Fruhling and de Vreede 2006, van der Hengst and de Vreede 2004). Braa et al. (2004) went through multiple, simultaneous AR processes with high flexibility, including intervention implementation, evaluation and reflection. CPR takes a somewhat different cyclical approach: initiation - iteration (develop-design-apply-evaluate) - close (exit-assess usefulness and research results) (Iversen et al. 2004). Pauleen (2004) uses an action learning cycle: do-reflect-share. Quite some papers were unclear on the CPM because the paper wasn't structured alongside the CPM or the process wasn't described in detail or at all. Decision criteria to proceed or exit are seldom made explicit and if they are, they are based on the extend to which the practical problem has been resolved.

4.4 Principle of Theory

Almost all authors explicitly paid attention to the relevance of their study for the client and the academic community. When it comes to the usage of theory in the different phases, we see a gradual decrease in the reliance on theory along the process. Nineteen studies relied on theory for diagnosis, 13 for intervention, 8 for evaluation and only 4 for reflection. Four studies used AR to develop theory inductively and didn't start with theoretical preconceptions or questioned preconceptions during the process to come to new theories. Kock (2001) inductively derived patterns from statistical and grounded theory-based analysis to arrive at a model. Markus et al. (2002) started from the idea that traditional principles for the design of DSS could be applied to the domain for which they had to design a system (organisational design), but they became aware of specific characteristics of that domain requiring development of a new design theory inductively.

4.5 Principle of Change through Action

paper	Principle of Change through Action					Principle of Learning through Reflection				
	cause	intervention	approval	organisational assessment	documentation	reporting style	reflection	success	implic. practice	implic. theory
1	Y	Y		B A		C		PB	Y	ERP: CSF for implementation
2				B		C, M		PB		
3	Y	Y	Y	B A	Y	C, T	Y	PB	Y	SPI: change agent's role
4	Y	Y	Y	B A	Y	C	Y	S	Y	Sustainable, large scale (health) IS implementation
5		Y	Y	B	Y	C	Y	CC	Y	ISD: collaboration for usability
6	Y	Y	Y	B A	Y	C				ISD: need identification
7						C		PB	Y	ISD: technology use mediation
8	Y	Y	Y	B	Y	C, T, M			Y	GSS
9				B A		C	Y	PB	Y	ISD: eXtreme programming
10						C, T, M	Y	CC		Evaluation of e-learning tool
11	Y	Y	Y	B	Y	C	Y	PB	Y	ISD: methodology evaluation
12		Y		B A	Y	C	Y	CC	Y	

13						D				BPR approach (GSS, simulation)
14	Y	Y	Y	B A	Y	C	Y	PB CC	Y	SPI and software risk mngmt
15	Y	Y	Y	B	Y	C		PB	Y	SPI innovation
16						C		PB	Y	GSS
17	Y	Y	Y	B A	Y	C, T, M	Y	PB	Y	Informating and power relationships
18	Y	Y	Y	B A	Y	C, T, M		PB	Y	ERP: user acceptance
19	Y	Y	Y	B A	Y	C, T, M	Y	PB CC	Y	ISD: design principles
20						C		CC	Y	Interest activated technology
21	Y	Y		B A	Y	D		PB	Y	ISD: design theory
22						D		CC	Y	Virtual teams: relationship building
23	Y	Y	Y		Y	C/D			Y	Information competencies
24	Y					C	Y	PB	Y	Integration architecture
25						C		PB	Y	IS planning
26	Y	Y	Y	B A	Y	C, T	Y	PB CC	Y	Infrastructure management
27	Y	Y	Y	B	Y	C, T, M	Y	PB CC	Y	Organisational growth: transparency
28	Y					C				BPR: analysis model
29		Y		B		C		PB	Y	ISD: Multiview
30						D				ISD: data modelling approach

Table 4. Review on the principles of Change through Action and Learning through Reflection

The diagnose-cause-intervention chain is clearly described in 15 papers. In three papers the diagnosis has not been part of the description except from its outcome or cause in general terms and the emphasis is merely on the intervention. Studies in which the diagnose-cause-intervention chain is clearly described or in which emphasis is merely on the intervention, the interventions and its timing has properly been documented. A contextual assessment of the organisations situation before the intervention is documented more often and in more detail than such an assessment after interventions. Studies with no clear diagnose-cause-intervention chain description or no description of interventions at all, didn't provide clear assessments after the intervention. Fourteen studies describe some approval of the interventions by the client, but mostly in quite general terms. Simon (2000) is an exception.

4.6 Principle of Learning through Reflection

The prevalent style of reporting on AR is the case description, eventually chronologically structured along interventions, like for instance in Kohli and Kettinger (2004) or Simon (2000). Some studies only report a discussion of the research findings. Thick descriptions are provided in 8 studies and 7 studies leave room for multiple interpretations. Collaborative reflection on the outcomes of the project is mentioned in 13 studies. The project's success is mainly described in terms of the solution to the practical problem and client's competence enhancement to solve similar problems in the future. Braa et al.'s (2004, p. 337) paper is motivated by the question: "Why do so many action research efforts fail to persist over time?". Although they don't provide any evidence for AR projects being a failure on the long term, they are the only ones describing success to the extend to which it is sustainable. Implications for theory and practice are given in most studies.

5 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The set of principles and criteria has proven to be applicable to all types of AR focusing on knowledge generation: CAR, PAR, NAR, CPR, CFW and AL. There are no noticeable differences between different types of AR in how principles were followed or criteria were met. On those aspects in which AR types differ, the framework leaves room for such differences, like in the criteria *degree of openness*, *cycle description* and *role expectations*. The principle of Foundation requires addressing the particular kind of AR that has been conducted. Almost all criteria in the framework are met by quite some studies, indicating its congruency with AR practice.

The amount of AR papers published in mainstream IS journals is encouraging if we compare it with Lau (1997) and Chen and Hirschheim (2004). Lau found 30 papers on AR over the period 1971-1995 with only one published in a mainstream IS journal. Chen and Hirschheim counted 32 AR studies in eight major IS publication outlets (including the ones in this study except from CACM) over the period 1991-2001 (with the most between 1995 and 2001). Over the last almost 7 years I found 30 field studies. It seems that Europeans take the lead with 18 studies published in European journals (5/12 of North American publications come from MISQ's special issue) and around two third of the authors having affiliations with European institutions by the time of their study.

The principle of Foundation is only partly followed in the studies. Most papers provide arguments for conducting the particular type of AR but only some state their epistemological stance. Because positivism is the traditional viewpoint from which IS research is conducted, action researchers should make their epistemological orientation explicit to avoid readers from reviewing their papers from the positivist standpoint. As Susman and Evered (1978, p. 600) stated: researchers should be sceptical of positivist epistemology "when the unit of analysis is a self-reflecting subject, when relationships between subjects (actors) are influenced by definitions of the situation, or when the reason for undertaking the research is to solve a problem which the actors have helped to define". Despite frequent recommendations made in the literature to address mutual acceptability of ethical issues and the vulnerability of action researchers to situations of company downsizing, power coercion or work dehumanisation (Avison et al. 2001), none of the studies explicitly addressed these issues. Therefore, more attention to epistemological and ethical issues is recommended.

The principle of CRA has been paid more attention to. Agreements were often mentioned, roles were described and the project's focus and data collection methods were clear in most papers. Nevertheless, more attention is asked for study funding and editorial control issues; client's commitment and data analysis techniques. Funding, editorial control and commitment of the client are important control mechanisms which need to be addressed during project initiation (Avison et al. 2001) and which influence power and control games throughout the project. Many field studies didn't mention to have used qualitative data analysis techniques or triangulation to increase study validity despite available literature on it, like Glaser et al. (1967) and Miles et al. (1994).

When it comes to the principle of CPM, most studies described the cycle and used a process model in the traditional sense or any deviation from it, mainly within the overall Plan-Act-Reflect paradigm. Decisions to proceed or criteria to exit the study should be provided more in the future because these are closely linked to AR's primary goals: successful intervention and knowledge development.

The criterion *theory use* in the principle of Theory deliberately has been defined in such a way that it leaves room for exploratory AR studies. Several authors claim that the validity of AR depends on the presence of a theoretical framework (Baskerville and Wood-Harper 1996), but others disagree with the premise of theory because theoretical preconceptions might be counter-productive especially at the start of the project (Davison et al. 2004) or might restrict multiple interpretations (Walsham 1995). Indeed four studies developed theory inductively. Future field studies should pay more attention to the use of theory in the evaluative and reflective phases of AR. Evaluation might be based on criteria provided by the theories in use for diagnosis or intervention to determine whether problems have been relieved. Reflection could be based on more general theories on reflection and learning, like for instance differences between theories-in-use and espoused theories, single loop and double loop learning (Argyris and Schön 1978) or the concept of reflective practitioner (Schön 1983). The relevance of AR to the client and the academic community has been addressed in most studies.

The principle of Change through Action deserves the most attention in future AR. The diagnose-cause-intervention chain and assessment of the organisation linked to indications for project success is central to both objectives of AR: practical problem solving and theory development. Not all studies provided a clear chain; a thorough and contextual assessment of the organisation before the intervention to support diagnosis; or an a posteriori assessment to support project's success claims. Part of this chain should be a description of client's approval for interventions as well.

Some elements of the principle of Learning through Reflection are well followed: basic reporting, providing indications for project's success and implications for theory and practice. However, more attention should be paid to making acceptable that success is sustainable and that competencies has been transferred to the client to solve related problems in the future. Furthermore, reflection on project's success and the usefulness of theories could be done more collaboratively. Authors are encouraged to provide more thick descriptions, which leave more room for multiple interpretations.

Overall, almost two-third of the 30 AR field studies followed partly or completely the six principles put forward in this paper and about one-third scored quite low on almost all principles. The principles showed to be applicable to different types of AR and provide an extensive and workable framework for the determination of AR quality. The framework is relevant for the current state of AR because in several field studies all principles have been followed and the six principles contribute to the two major goals of AR. Now that this overall picture has been sketched some remarks need to be made on the relevance of rigorous action research.

The last column of table 2 and 4 show the scale, unit of intervention and topics involved in recent AR. Although IS development, GSS usage, software process improvement and BPR were relevant topics at the time these studies were conducted, other topics seem to have been at least as relevant to practitioners over the last 7-10 years. One could think of large scale Internet applications; large scale (inter) organisational ERP systems implementation and supply chain integration; CRM systems implementation; legislation compliance (such as to the Sarbanes-Oxley Act or Basel 1 and 2 regulations in the banking industry); organisation wide enterprise architecture and infrastructure change programs; billion Euro outsourcing and related governance transference; worldwide ICT security issues; software maintenance and legacy systems management; etc. With almost none AR projects addressing these topics and only one project focusing on interorganisational IS and only one international project, it becomes clear that we need to move to a next level of rigorous relevance.

Additional rigor might help to achieve more relevance. Based on the principles put forward in this paper I recommend that action researchers show the practical relevance of their study not only on the basis of relevance to the project's direct client but also to the larger community of practitioners (criteria *relevance* and *implications for practice*). Relevance to the direct client could be shown by describing the client's motivation for project initiation (just 9 papers mentioned client involvement in initiation as part of the RCA). Relevance to the wider community could be shown on the basis of key issue studies like the ones mentioned in Gottschalk (2000). Practical relevance should be shown on the level of the unit of intervention (ranging from individuals to meso and macro levels or ranging from the design of parts of systems to complete enterprise architectures or infrastructures). Furthermore, *theories in use* should be more aligned to the level of the unit of intervention. Intervention in decision making processes for instance should be supported not only by theories on the topic of decision making (like for instance software process improvement) but also on the process of decision making (like for instance the garbage can theory (Cohen et al., 1972)); interventions on group levels could be supported by group intervention theories from social psychology and interventions on interorganisational levels could be supported by institutional theory. Description of the *focus* of the project should be extended with indications of the scale of expected impacts of the intervention, for instance in terms of the amount of people, organisational units, levels or systems that are affected by it (such indication has hardly been found in the review in this paper, except from Börjesson et al. (2006)). Furthermore project's *focus* could be more on the interorganisational, international or multi-systems level. It's obvious that more Network AR studies and more focus on sustainable success could add to AR's relevance as well.

I'm fully aware of the fact that the extend to which criteria like this can be met depends very much on the conditions under which researchers have to work. With careers or tenure tracks on the line, with mainstream journals being reluctant to qualitative methods and AR more specifically and long journal publication lead times; we probably need successful interventions in our own social systems at first.

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