



# Some improvements for action research and information systems development

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UNIVERSITY OF VAASA REPORTS 56



University of Vaasa  
VAASAN YLIOPISTO

**Publisher** University of Vaasa  
School of Technology and Innovations, Information Systems Science.

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**Research article**

ISBN 978-952-395-205-8 (online)

URN <http://urn.fi/URN:ISBN:978-952-395-205-8>

ISSN 2489-2580 (University of Vaasa Reports 56, online)

**Title of publication**

Some improvements for action research and information systems  
development

**Keywords** action research, change, generalization, practice, science

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## Abstract

We study a real, not esoteric, nor imaginary phenomenon. We concentrate on studies with one-directional relationships between variables. They form a majority of studies, and other studies with two-directional relationships are a minority. Burrell and Morgan (1979) found four paradigms for the studies, but half assumed one-dimensional relationships, and others two-dimensional ones. We exclude the latter from further consideration. The former set of studies assumes a stable state, but in reality, there are also phenomena assuming a change, for example, information systems development (ISD) and action research (AR). Baskerville and Wood-Harper (1998) showed that 10 ISD methods are AR methods.

Here, we contribute science by proposing the fifth paradigm (a shared change). We also analyze this paradigm and ISD & AR studies further. In all the studies, there are two groups: 1) traditional studies with the stable state, and 2) the ISD & AR studies trying to cause a change. This differentiation seems to describe the fundamental nature of those two study groups. This differentiation can be called backward- and forward-looking. We shall also contribute by presenting some characteristics of the backward- and forward-looking studies.

The primary development of an IT artifact and standard updates are performed in software houses, requirements of special maintenance and change are carried out in an organization. In the latter and AR efforts, an organization plays a central role in many ISD/AR project activities. We analyze the beginning, guidance, and possible ending of those projects, too. Finally, we present implications for science and practice, limitations, and further research.

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# 1 INTRODUCTION

IS researchers need for theoretical and practical abilities. They can train the former in a work room, library, and conferences the latter in organizations. Researchers can help people in an organization to develop and change organizational efforts. The ISD / AR projects then offer some excellent opportunities. An IS project builds a new IT artifact, AR project tries to make desired changes in an organization.

An object of IS research, for example, an IT artifact can be described with one- or two-dimensional relationships between variables. Burrell and Morgan (B&M) (1979) studied a society and found two types behavior in society: Radical change and regulation. The alternative "radical change" is described with two-dimensional relationships, "regulation" with one-dimensional relationships. The former contains conflicts and contradictions (Chua 1986) where parties continually distort each other. The latter stays in a stable state, or it has a mechanism to easily move itself to a stable state. We exclude the radical change from further consideration because this research object is continually in motion.

Four approaches: Radical humanistic, radical structuralist, interpretive, and functionalist, used B&M (1979) are called paradigms. To understand four paradigms, we give two 'counter-examples': Hirschheim & Klein (1989) and Hann & Weber (1996). Hirschheim and Klein tried to apply Burrell and Morgan's (1979) four paradigms and constructed a particular ISD method for every paradigm. But we showed that in two radical paradigms, there are conflicts and contradictions during the development work. Hence, the development work is impossible. Other paradigms (interpretive, and functionalist) assume a stable state. But an ISD work always contains a change. Researchers cannot follow the assumption of the stable state.

In their article, Hann and Weber (1996, p. 1046) expressed "component values have reached a stable state." If the citation is valid, the planning (design, development) has already ended. Otherwise, the change process should continue. The citation, then, is incorrect. – Both examples concerning the ISD work should assume that the construction work changes a construction under research work, four B&M's paradigms do not assume a shared change. It is lacking from the four paradigms set. Here is a gap (Sandberg & Alvesson, 2011) that we like to 'fulfill' in this study.

Chua (1986) has reported that two radical paradigms are later combined with a critical one. Perhaps Orlikowski and Baroudi (1991) were the first IS researchers who called those three paradigms postivist, interpretivist, and critical. These three paradigms have dominated social research over 30 years. The first ones (postivist and interpretivist) assume a stable state and a one-directional relation between two variables. The third one (critical) does not assume any stable state but a radical change. Critical studies are

excluded from further analysis. In our new paradigm, we assume that a non-radical (shared) change will have a one-directional relation between two variables.

Next, we show that a new non-radical change paradigm brings a new differentiation between studies. In B&M's four paradigms, studies following the positivist and interpretive paradigms are called traditional studies (TS). Studies building IT artifacts follow a new non-radical change paradigm and are design science studies (DS). For example, Gregor (2006) developed a classification of theories with five types: I. Analysis, II. Explanation, III. Prediction, IV. Explanation and prediction (EP), and V. Design and action. Studies aiming to produce theory with Types I, II, III, and IV are TS studies. Measuring the goodness of the study is truth.

Gregor describes Type V: Theory for Design and Action (p. 628) "This type of theory says *how to do* something. It is about the principles of form and function, methods, and justificatory theoretical knowledge that are used in the development of IS" Type V studies are DS studies. She (Gregor) (p. 629) continues with "Their [March & Smith 1995 and Hevner et al. 2004] criteria include utility to a community of users, the novelty of the artifact, and the persuasiveness of claims that it is effective" with. Here, we pay attention to the goodness of the DS studies. It is a utility, not a truth of the TS studies. Another alternative for the division between TS and DS studies is called backward- and forward-looking. We later analyze some other properties that this division brings.

Already, Lientz (1983) stated that original development work in constructing a new IT artifact decreases, and the IT maintenance work increases. These two works are mainly carried out in software houses, a specific maintenance in normal organizations. Hence, an AR / ISD study takes place in an organization. We restrict our study to an organization that plays a central role in an AR / ISD project. Normally, a particular organization initiates, finances, and carries an AR / ISD project. An AR project usually consists of one or two academic researchers and some local practitioners. Concerning an AR / ISD project, we shall show that an organization should make some important core decisions that we analyze in detail later.

Our task in this article is to clarify some properties of a new paradigm, describe some properties of backward- and forward-looking studies and show two aspects of an AR / ISD project decided in an organization. We combine those subtasks thus far as a research question:

*How could we clarify and improve a current AR / ISD project?*

We structure our presentation into sections by analyzing our problem from different points of view, proceeding from the most abstract or philosophical aspects to the most concrete ones. First, we analyze a new non-radical change paradigm, and then backward-

vs. forward-looking qualities of DS & TS studies. After those theoretical views, we consider some necessary and fruitful practical means like the role of an organization, its power, and necessary actions in the development of a new and/or the maintenance of the old IS system. In other words, we emphasize scientific, theoretical, and practical aspects of AR / ISD studies.

## 2 A NEW PARADIGM

According to Nurminen (1997), Burrell and Morgan (1979) used two dimensions to describe an object of study. The first dimension consists of two approaches: subjectivist and objectivist. The second dimension describes how a society is divided into regulation and radical change. By combining two dimensions, we get four paradigms (Table 1): 1) radical humanist, 2) radical structuralist, 3) interpretive, and 4) functionalist.

**Table 1.** Four paradigms (Burrell and Morgan 1979)

Approaches Behavior in society	Subjectivist	Objectivist
Radical change	Radical humanistic	Radical structuralist
Regulation	Interpretive	Functionalist

The set with four paradigms in Burrell and Morgan (1979) (Table 1) does not cover all the cases in a current and expected reality in an organizational environment. Some non-radical changes are lacking. Here, we shall pay attention to a particular one (a shared change), and its some properties. We like to emphasize that an expected reality can also contain other non-radical changes.

In the literature, Van de Ven and Poole (1995) already outlined four theories (life cycle, teleology, dialectics, and evolution) for explaining processes of change in organizations. The authors used two dimensions to categorize them: A unit of change (single - multiple) and a mode of change (prescribed - constructive), but they did not analyze a change from the paradigmatic point of view.

Chua (1986) presented that two radical paradigms were combined and named critical research. In such an object of study, conflicts and disagreements prevail. Orlikowski and Baroudi (1991) probably first called those three paradigms: positivist, interpretive, and critical. In positivism and interpretivism, variables keep their state when observing, and relationships between variables are one-dimensional. In critical research, relationships between variables are assumed to be two-dimensional, and no stable state exists. Here, we are no longer considering critical research.

### 3 BACKWARD- AND FORWARD-LOOKING QUALITIES

The theory type classification in Gregor (2006) is perfect and covers the backward- and forward-looking studies. Theory types I, II, III, and IV are outcomes from backward-looking TS studies, and Theory type V from forward-looking DS studies. Five classes in Gregor's classification should be categorized under two dimensions (backward and forward). However, a reader could create a view of one dimension from a sequential numbering (I, II, ..., V).

Gregor (2006, p. 620) wrote about Theory type V (Design and action): "Says *how to do* something. The theory gives explicit prescriptions (e.g., methods, techniques, principles of form and function) for constructing an artifact." The DS project participants then use a construction method to build the desired artifact. In DS studies, the final state often differs from the initial one. An old artifact is changed when it is developed toward a desired goal. But this work does not always produce a better artifact. A construction process does not guarantee that the desired goal is achieved.

Recently, Wiener et al. (2025) prepared a literature review on digital transformation (DT) studies and examined DT studies realized in 48 organizations. Wiener et al. (2025) followed a definition of DT in Wessel et al. 2021 "[DT] leverage[s] digital technology in (re)defining an organization's value proposition [and] involves the emergence of a new organizational identity..." (p. 102). DT studies caused a change in those organizations. We privately asked Wiener (2025) research methods used in those 48 studies. He replied: case studies, field studies, ethnographies, grounded theory studies, mixed methods, and action research (AR). The latter (two AR articles) are used in forward-looking DS studies, but other methods in 46 DT studies were backward-looking. Researchers did not then know the division between backward and forward. Wiener et al. (2025) did not prepare summaries of 48 DT studies but presented every study one by one. In connection with this LR study, we can again find a difference between backward- and forward-looking ones, now in research methods.

The differentiation between backward and forward can also be seen when data are gathered. In TS studies, the same stable state (status quo) is assumed when all the data are gathered. In the DS studies, a majority of the data are gathered during a change project. These two types of data gathering reflect differences between TS/ backward- and DS/ forward-looking studies.

The differentiation between backward- and forward-looking studies also concerns research questions: In the TS studies, researchers ask: What is a particular phenomenon using an IT component? Researchers like to describe that phenomenon in such a way that it corresponds to reality, i.e., it is truth. It demands that the phenomenon maintains its stable state under observation.

In the DS studies, the research question is: Could we build a better IT artifact that is an essential component of the phenomenon under study? The positive answer to this question is that we can build such an artifact, and it produces utility to a community of users / to an owner organization. In the “cannot” case, a change project must be stopped, or the goal of an artifact must be modified..

To construct a new artifact, it is reasonable to then use the term heuristic than method. Wikipedia (2025-05.05) says: A heuristic<sup>[1]</sup> or heuristic technique (*problem solving, mental shortcut, rule of thumb*) is any approach to *problem solving* that employs a *pragmatic* method that is not fully *optimized*, perfected, or *rationalized*, but is nevertheless "good enough" as an *approximation* or *attribute substitution*. Where finding an optimal solution is impossible or impractical, heuristic methods can be used to speed up the process of finding a satisfactory solution.

We know two heuristics for AR / ISD studies: A problem-solving heuristic and a state-transition heuristic. In the former, a problem-solving process is divided into sequential phases (or stages) for solving a problem gradually, phase after phase. In connection with his spiral model, Boehm (1988) described a background on software process models and started from a history of process models. He referred to Royce (1970) as the initiator of a waterfall model of sequential stages. Feedback loops came to the waterfall model later. Recently, Peffers et al. (2018) proposed five genres in IS design science research: IS design theory, design science research methodology, design-oriented IS research, explanatory design theory, and action design research (ADR). The problem-solving heuristic belongs to the design science research methodology genre, and Peffers et al.'s (2007) waterfall model with six phases is an example of this genre. This example is not the best possible, because its DS process includes six steps: problem identification and motivation, definition of the objectives for a solution, design and development, demonstration, evaluation, and communication. Two steps at the beginning play a minor role in the DS process execution, the main change is performed in the third one, and the last three steps rarely (or not at all) cause any change in the final artifact. – A particular problem-solving heuristic ends when the actual last phase ends.

According to Peffers et al. (2018, p. 46), “the ADR genre (Sein et al. 2011) integrates the action research paradigm (Susman & Evered, 1978) with design science research to create a new methodology.” Boehm’s (1988) spiral model, Susman & Evered’s (1978), and Sein et al.’s (2011) cycle models are state-transition heuristics. This heuristic proceeds from one state to the next state that this transition partially or fully solves the construction problem, i.e., this transition best improves a goodness measure of the desired artifact. Transitions continue until such a state is achieved where it is impossible to improve a goodness measure. The final state is a local or total optimum.

To our mind, an AR / ISD study is not only a non-radical but also a shared change project. Participants must then negotiate for a goal in an AR / ISD project group and an organization. When participants achieve a successful result during negotiations, the project has a shared goal. We name a new paradigm as a *shared change*. We shall next analyze some of its properties.

## 4 SOME PROPOSALS FOR AR AND ISD PRACTICE

When the use of an information system is considered, an AR / ISD project is temporary, not continual. This project is performed in an organization that plays an important role when the project is active. The AR / ISD project can also be canceled at various time points. We present these two topics: the role of an organization in connection with the AR / ISD project, and potential project stops as subsections.

### 4.1 A dominating role of an organization

An organization initiates an AR / ISD project if opportunities from new technological (information technology, IT) and/or social innovations are promising, and/or if new enlargements and/or severe weaknesses of the old IS system are found. The main reason is that pre-calculations of the new system version create positive expectations. On what measures are those expectations based? The *organization decides* on that *measure* of goodness, for example, a utility proposed in the article (March & Smith 1995) based on the AR / ISD project.

In the AR and/or ISD literature, authors in many articles show that an (academic) researcher often acts as a project leader. We propose that the organization *determine a leader for each AR / ISD project* because the organization pays all the costs and/or potential losses of the project. The organization also *accepts a plan* for the ISD *project*. The organization also *accepts a shared goal of the ISD / AR project* plan after the project personnel first discussed and negotiated its goal.

ISD projects and, in general, AR projects are suitable for academic people because they have concrete contact with real problems. But there are also some restrictions. If university people, e.g., doctoral students, participate in an AR / ISD project, the organization can *restrain such students' publications that are secrets* of the organization.

### 4.2 An acceptance or rejection of the AR / ISD project

If an estimate of the project does not seem to produce enough utility *this AR / ISD project must be rejected*. Another early similar finding is when a consensus about the goal of the project is lacking. The organization can ask a project group to discuss and negotiate for a shared goal of the project. If the project group *cannot find a shared goal*, we recommend that the organization immediately cease this *project*. In the organization, there can be one group of workers emphasizing profit (e.g., management) and another group (e.g., union) wanting job satisfaction. These two groups must find such a goal that both can accept the new or old system under maintenance from beginning to end.

Although the AR / ISD project ends successfully, it can, however, become rejected. The organization can then evaluate that advancement in the project is so little that the organization could soon return to its earlier routines.

## 5 DISCUSSION AND CONTRIBUTIONS

We structure this section into four parts: Implications for science, implications for practice, limitations, and new research.

### 5.1 Implications for science

Action research (AR) and information systems development (ISD) are new study types, and they do not have the same high prestige as the traditional study types. Science has long classified studies into three classes (positivist, interpretive, and critical). Positivist and interpretive studies (called traditional studies) assume a stable state. Critical studies are based on a radical change (Burrell and Morgan 1979), and such studies are always in motion. Conflicts and contradictions continually exist in critical studies. AR /ISD studies always try to improve a system and cause a change in the system. But in the scientific literature, there is no paradigm for an accepted change, and hence, a *new paradigm, a shared change*, is developed here.

A new paradigm with its fundamental assumption causes many consequences that we found the following five differences (that might help an academic researcher in her study):

- 1) A differentiation between backward-looking (traditional) and forward-looking (AR /ISD) studies,
- 2) A differentiation between research questions in those two types of studies
  - a. What is a particular phenomenon using an IT component?
  - b. Could we build a better IT artifact that is an essential component of the phenomenon under study?
- 3) Data are gathered:
  - a. Data in traditional studies assume that a stable state holds,
  - b. Data in AR /ISD studies are mainly gathered when a change project proceeds
- 4) Measuring the goodness of the traditional study is the truth in AR /ISD study utility.
- 5) The term "method" is recommended for traditional studies and the term "heuristic" for AR /ISD studies. In AR /ISD studies, we cannot guarantee a total optimum, only a local one.

We repeat that AR / ISD studies cannot be generalized (Baskerville et al. 2023).

## 5.2 Implications for practice

AR / ISD studies take place in organizations. Hence, our results concerning an organization: An organization makes more significant decisions, demands a shared goal after negotiation, and uses a particular measure of goodness in a new system. All the properties above are essential from a practical point of view.

## 5.3 Limitations

Van de Ven and Poole (1995) have already outlined four theories (life cycle, teleology, dialectics, and evolution) for explaining processes of change in organizations. They did not analyze the change from the paradigmatic point of view. They did not consider the fundamental assumptions of a research object. Their analysis might be re-analyzed later to find some new aspects of change.

Does the teleology theory in the article Van de Ven and Poole (1995) follow a shared change paradigm? If it does not follow, why not. Could a researcher supplement it for such a one, and how?

## 5.4 New research

Burrell and Morgan (1979) have only considered a part of the study types (backward-looking ones), and their fundamental assumptions (cf. Table 1) are restricted. They have explicitly or implicitly assumed a stable state in the positivist and interpretive paradigms. We have demonstrated that AR and ISD studies should follow a shared change paradigm. These studies are also forward-looking. But are other forward-looking research approaches that do not follow a shared change assumption necessary?

A differentiation between backward- and forward-looking studies seems to show that the term “method” then has two different meanings. Therefore, “method” in forward-looking studies is called heuristic. Researchers could give more evidence for this differentiation in the future. In addition, researchers could show that there are more than two heuristics: a division of the problem-solving into phases as a problem-solving heuristic and a state-transition heuristic.

We found learning such a study type that could belong to backward-looking studies because no organization controls its goal and presents any measure of goodness. Learning does not have a stable state. However, it is a change and in this case, it must be analyzed from a paradigmatic point of view (cf. Turel 2024).

We have a little studied differentiation between backward- and forward-looking studies, but more studies are needed.

Generally, we can also ask: Are there (in reality or among potential changes) studies not considered in a set of paradigms?

In the section "Backward- and forward-looking qualities", we derived some properties in AR / ISD research. We believe that we did not find all the properties. Hence, somebody might explore more properties in the future.

## 6 CONCLUSIONS

Our paradigmatic analysis found shortages in previous research. We especially developed a new paradigm for AR / ISD studies and improved the theory of AR / ISD studies. We also analyzed what it means for practice. We then found some essential properties of AR / ISD studies for practical work.

## References

- Baskerville, R., vom Brocke, J., Mathiassen, L. & Scheepers, H. (2023). Clinical research from information systems practice, Editorial. *European Journal of Information Systems* 32(1), 1-9, <https://doi.org/10.1080/0960085X.2022.2126030>
- Baskerville, R. & Wood-Harper, A. T. (1998). Diversity in information systems action research methods. *European Journal of Information Systems* 7(2), 90-107.
- Boehm, B. W. 1988. A Spiral Model of Software Development and Enhancement. *Computer* (21:5), 61-72.
- Burrell, Gibson & Morgan, Gareth (1979). *Sociological paradigms and organisational analysis*. Heinemann.
- Chua, W. F. (1986). Radical developments in accounting thought. *The Accounting Review* LXI(4), 601-632.
- Hann, J. & Weber, R. 1996. Information systems planning: A model and empirical tests. *Management Science* 42(7), 1043-1064.
- Hevner, A. R., March, S. T., Park, J. & Ram, S. (2004). Design science in information systems research. *MIS Quarterly* (28:1), 75-105.
- Hirschheim, R. & Klein, H. K. 1989. Four paradigms of information systems development. *Comm. ACM* (32:10), 1199-1216.
- Lientz, B. P. 1983. Issues in software maintenance. *Computing Surveys* (15:3), 271-278.
- March, S. T. & Smith, G. F. (1995). Design and natural science research on information technology. *Decision Support Systems* 15(4), 251-266.
- Nurminen M. I. (1997). Paradigms for sale: Information systems in the process of radical change. *Scandinavian Journal of Information Systems* 9(1), 25-42.
- Orlikowski, W. J. & Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research* 2(1), 1-28.
- Peffer, K., Tuunanen, T. & Niehaves, B. 2018. Design science research genres: introduction to the special issue on exemplars and criteria for applicable design science research. *European Journal of Information Systems* (27:2), 129-139, <https://doi.org/10.1080/0960085X.2018.1458066>
- Peffer, K., Tuunanen, T., Rothenberger, M. A. & Chatterjee, S. 2007. A design science research methodology for Information Systems research. *Journal of Management Information Systems* (24:3), 45-77.
- Royce, W. W. 1970. "Managing the Development of Large Software Systems: Concepts and Techniques." *Proceedings of IEEE WESCON ( Technical Papers of Western Electronic Show and Convention)* (WesCon) August 25-28, 1970, Los Angeles, USA, 1-9.

Sandberg, J. & Alvesson, M. 2011. Ways of constructing research questions: gap-spotting or problematization? *Organization* (18:1), 23-44.

Sein, M. K., Henfridsson, O., Purao, S., Rossi, M. & Lindgren, R. 2011. Action design research. *MIS Quarterly* (35:1), 37-56.

Susman, G. I. & Evered, R. D. 1978. An Assessment of the Scientific Merits of Action Research. *Administrative Science Quarterly* (23:4), 582-603.

Turel, O. (2024). To learn or not learn from AI? Unpacking the effects of feedback valence on novel insights recall. *European Journal of Information Systems* in press, 1-22. <https://doi.org/10.1080/0960085X.2024.2426473>

Van de Ven, A. H. & Poole, M. S. (1995). Explaining development and change in organizations. *Academy of Management Review* 20(3), 510-540.

Wessel, L., Baiyere, A., Ologeanu-Taddei, A., Cha, J. & Blegind-Jensen, T., 2021. Unpacking the difference between digital transformation and IT-enabled organizational transformation. *J. Assoc. Inf. Syst.* (22:1), 102-129. <https://doi.org/10.17705/1jais.00655>

Wiener, M. (2025), A private communication.

Wiener, M., Strahringer, S. & Kotlarsky, J. 2025. Where are the processes in IS research on digital transformation? A critical literature review and future research directions. *Journal of Strategic Information Systems* (34:). <https://doi.org/10.1016/j.jsis.2025.101900>