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Empirical Evaluation of Action Design Research

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Abstract

There has been a growing interest in information systems (IS) research as design research. One popular methodology is Action Design Research (ADR). Despite the popularity, ADR lacks proper evaluation based on primary data. We claim that the existing empirical evidence justifying ADR is either fragmented or based on reconstructions of prior studies conducted for other purposes. Our claim is supported by the authors of ADR who state that " ... because the VIP project was not conducted explicitly as ADR, it cannot be viewed as an exemplar of its application". The purpose of this study is to provide empirical evidence. Examples of empirical evidence show that ADR is highly relevant for an applied discipline such as IS, it creates a bridge between user-oriented perspectives of the IT artefact and technological perspectives and it supports a conceptual movement from a specific instance to a search for a class of problems.

Keywords Action Design Research, ADR, design science research, evaluation, primary analysis.

1 Introduction

Design science research (DSR) is widespread, popular and often viewed as the paradigm in the discipline of information systems (IS) (e.g. Iivari 2007; Winter 2008; Baskerville et al. 2009; Gregor & Hevner 2013). Over the last 10-15 years, there has been a growing interest in IS research as design research and many scholars have contributed to the development of DSR (e.g. Gregor & Hevner, 2013; Hevner et al. 2004; Hevner 2007; March & Smith 1995; March & Smith 1995; Markus et al. 2002; Peffers et al. 2008; Sein et al. 2011; Vaishnavi & Kuechler 2007; Walls et al. 1992). According to Simon (1996), DSR has roots in the science of the artificial and constitutes a problem-solving paradigm that seeks to create innovations. One purpose of DSR is to guide the design and evaluation of IT artefacts (Hevner et al. 2004; Sein et al. 2011). Another purpose is to build artefacts to address heretofore unsolved problems (Hevner et al. 2004). The increasing popularity of DSR has required new IS research methodologies. According to the number of citations, one of the most popular research methodologies is Action Design Research (ADR) (Sein et al. 2011). ADR is defined as a "research method for generating prescriptive design knowledge through building and evaluating ensemble IT artefacts in an organizational setting" (Sein et al. 2011, p. 4). Despite the popularity of ADR, it lacks a thorough empirical evaluation based on primary data (Cronholm and Göbel 2015). We claim that the empirical evidence that justifies ADR is based on reconstructions of prior studies conducted for other purposes. This claim is supported by the authors' own words: a) "*… we illustrate how ADR can be applied by describing a research project conducted at Volvo IT*" (Sein et al. 2011, p. 45), b) "… the VIP [Volvo Information Portal] project was not conducted explicitly as ADR …" (Sein et al. 2011, p. 52) and c) "*The case was previously published as AR* [Action Research] *with a design orientation*" (Lindgren et al. 2004, p. 45).

To use an existing data set, such as previously conducted studies, to answer new research questions is called secondary analysis (Schutt 2011). A secondary analysis on an existing data set means an analytic expansion (Thorne 1998). Two methodological issues can be raised when conducting a secondary analysis of a qualitative data set (Hinds et al. 1997): a) the degree to which the data generated is amenable to a secondary analysis, and b) the extent to which the research purpose of the secondary analysis can differ from that of the primary analysis without invalidating the findings. Moreover, Corti & Bishop (2005) discuss the importance of the context and claim that there is a risk that the contextual information can be lost which means the information about previously conducted studies is de-contextualised. That is, to use data for other research purposes requires a number of methodological considerations. In Sein et al. (2011) there are no such methodological discussions. We do not assert that the reconstructions of prior studies conducted for other purposes have invalidated ADR. However, we claim that a popular and widely accepted DSR methodology such as ADR should be properly evaluated and should rest on empirical evidence that is grounded in primary data. Thus, the purpose of this paper is to provide empirical evidence for ADR based on primary data. The purpose of the next section is to present the state of the art with respect to ADR evaluation. We then present a general discussion of primary and secondary analysis. In section 4, we describe the research method and in section 5 we present the findings. Finally, conclusions are drawn in section 6.

2 The State of the Art Concerning the Evaluation of ADR

In our literature research we have searched for studies containing ADR reflections or evaluations. We have found several studies that have used ADR to suggest design principles of some kind (e.g. Saarinen 2012; Göbel and Cronholm 2013) Often these studies have focused on artefact development and do not provide any ADR reflections. We have also found studies that propose modifications or extensions of ADR. Bilandzic and Venable (2011) suggest Participatory Action Design Research (PADR), which has been influenced by several other approaches beside ADR. One purpose of PADR is to incorporate technological innovation within methods in order to shape design according to the socio-cultural context. PADR contains no empirical evaluation of ADR. However, there are some similarities with ADR, such as the phase 'Reflection and learning'. Mullarkey and Hevner (2015) discuss challenges with how to enter into the ADR research stages effectively. The authors suggest an expansion of ADR with two up-front activities and multiple entry points. The extended ADR model is applied and evaluated in an empirical study. The purpose of their study was not to conduct a broad evaluation of ADR. According to the authors the purpose "*…was to build a nascent design theory that would guide the emergence of a practically useful IO SNIS* [inter-organizational social network information system] *artifact*" (Mullarkey and Hevner 2015, p. 126). Haj-Bolouri et al. (2016) propose Participation Action Design Research (PADRE). The purpose of PADRE is to extend and elaborate the ADR method by adopting principles and philosophy from participatory action research and participatory design.

Their empirical study was focused on the stage 'Reflection and Learning' and the extension consists of incorporating activities for reflection and learning from the beginning to the end in ADR.

We have also found studies that provide interesting ADR reflections. Mustafa and Sjöström (2013) provide reflections from an empirical study. One reflection maintains that "*Although ADR postulates that reflection and learning occur continuously during ADR research, they conceptualize formalization of learning as an activity of its own*." (p. 45). Moreover, the authors argue that it is possible to generalise design principles outside a single case. Harnesk and Thapa (2013) have conducted a theoretical study and propose a framework for classifying the DSR methods by providing conceptual clarity about DSR outcomes and DSR research processes. ADR is classified as a typical design research method representing the view of continuous stakeholder participation in the research project. Maccani et al. (2015) have conducted a theoretical study that discusses the philosophical underpinnings of ADR. They claim ADR can be considered as a particular case of Design Science Research rather than a methodology closely related to Action Research, although they can assume two different epistemological positions. The purpose of the paper written by Rogerson and Scott (2014) is to explore the effectiveness of ADR. Based on a study concerning classroom-based training, they conclude that ADR appears to be an extremely effective research tool. However, their study reports from an ongoing project and conclusions are based on the first stage and parts of the second stage in ADR. Lempinen et al. (2012) also report from an on-going ADR study in a public organisation. With respect to the evaluation of ADR, their main contributions consists of an illustration of design principles that can be applied to a class of similar problems and the following conclusion "*The ADR method is useful both in supporting the research process along the way, and in helping to make a theoretical contribution by creating results that are generalizable also outside the case conte*xt" (p. 55). Tate and Furtmueller (2013) have similar to Sein et al. (2011), applied ADR retrospectively on an e-recruiting service design system. They found that many of the principles of ADR, such as defining the problem as an instance of a class of problems, practice inspired research, mutually influential roles and guided emergence, are not only synergistic with service design, but in fact, the effective design of services embeds and requires a similar approach. Overall, Tate and Furtmueller (2013) found that "*ADR is likely to be a highly appropriate approach for framing and deriving learning from innovative service design projects, but may require further enhancement*." (p. 1). Finally, Maccani et al (2014), have demonstrated the usefulness of ADR in a research project concerning smart cities.

All the studies discussed above show interesting results, methodological insights and several have contributed with either ADR reflections or ADR extensions. Although they are all promising, they either use ADR to develop design principles (without reflection or evaluation of ADR), suggest extensions to ADR, evaluate certain aspects of ADR, or they have conducted reconstructions of prior studies which have been carried out with a research design that did not explicitly support an evaluation of ADR. We have not found any report that contains a systematically documented evaluation of ADR methodology based on primary data.

3 Primary vs. Secondary Data Analysis

Primary analysis is defined as the original analysis of data in a research study (e.g. Glass, 1976). Secondary analysis is the re-analysis of primary data (e.g. Hinds et al., 1997). Secondary analysis is the use of an existing data set either by the original researcher or another researcher who addresses new questions or asks the same research questions with different analysis methods (Hinds et al, 1997; Szabo & Strang, 1997). According to Hinds et al. (1997), Szabo & Strang (1997) and Thorne (1998), there are both advantages and disadvantages with secondary analysis. The advantages are: it takes less time and requires less funding; it is cost-effective (maximises the usefulness of collected data); and there is no need to spend time on administration of respondents and data collection. The disadvantages are: it undoubtedly creates the potential to intensify or exaggerate the researchers' bias in either a positive or negative direction; salient features of the context obvious to a primary researcher may not be obvious to a secondary researcher who is one step removed from the data source; there may be tacit knowledge which is impossible to reconstruct; the phenomenon of interest is not accurately studied since it was not part of the research question in the primary analysis; and the researcher is unable to ask questions that come to mind during the analysis.

These disadvantages require a number of methodological considerations. Since the empirical justification of ADR in Sein et al. (2011) is based on secondary analysis, the methodological issues related to secondary analysis need to be transparent. We fully agree with Heaton (2008) and Thorne (1994) who claim that a description of how methodological issues with respect to secondary analysis were addressed has to be included in the final report. However, we recognise that there are format restrictions for publishing papers which might prevent a joint publication of analysis, design and

evaluation in the same paper. Despite these possible restrictions, we strongly believe that methodological issues have to be transparent.

4 Research Method

According to Venable & Baskerville (2012), research methods should be evaluated for their utility in achieving their goals, including primary goals of rigour and relevance, suitability to type of research questions or research domain and topic, as well as secondary, practical goals. Moreover, "*to assess the performance/utility of research methods in achieving goals in other, practical areas one could survey users of various research methods about their perceptions of ease of learning and ease of use of research methods, tools, and techniques*" (ibid. p. 149). To evaluate ADR on the basis of empirical evidence consisting of primary data, we have conducted an ADR research project concerning support for the enhancement of service innovations in IT Service Management (ITSM). In this paper, it is the experiences from the use of ADR that have been of primary interest and the ITSM artefacts developed in the research project have been of secondary interest.

We used the following process. First, we searched for ADR propositions consisting of objectives, purposes or prescribed actions. We collected propositions from Sein et al. (2011) and only included those stated by the authors. The result from this exercise was a long unstructured list of propositions. Secondly, to bring order in the list of propositions we organised them according to the four stages in ADR (Problem Formulation; Building; Intervention and Evaluation; Reflection and Learning, Formalization of Learning, see Sein et al. 2011 for an exhaustive description). We also added a category of general experiences consisting of propositions which overlapped several stages. Then, we used the ADR propositions as a lens for the collection of empirical experiences from the participants in the ADR research project. We collected a wide range of empirical experiences from the use of ADR over a three-year period by taking notes on: 1) Specific comments with respect to ADR from both practitioners and researchers during project meetings and workshops; 2) Results from prescribed actions. This has meant that we analysed: ADR in relation to the attributes of the ITSM artefacts, the benefit of created documents that supported the development process, and the process of researcher-practitioner collaboration. We collected these data from 25 tests conducted at the participating organisations' real environments. Each test lasted for approximately two hours. The analyses of the ITSM artefacts in relation to business goals were conduced by researchers and practitioners in collaboration. The analyses of ADR experiences were conducted by the researchers. 3) Interviews of the researchers who participated in the project. The reason for not interviewing the practitioner is that ADR is a research method and the main target group is researchers. The interviews contained two open-ended questions: 'what are the strengths in ADR?' and 'what are the weaknesses in ADR?'. Three of the four researchers who participated in the project are the same as the authors of this paper. The analysis of the collected ADR experiences has followed the recommendation of Eisenhardt & Graebner (2007). That is, we have created an explicit link between the identified propositions in ADR and the collected empirical experiences from the ADR research project. In this way, we created constructions consisting of pattern-matched propositions and empirical experiences (see table 1-8 in section 5). Finally, we classified the pattern-matched constructions as strengths or weaknesses. Due to limited space, the findings constitute a representative selection of the constructions.

The ADR research project comprised four researchers and 15 practitioners from nine organisations. The research project which lasted for three years, included organisations facing similar challenges concerning ITSM. That is, they experienced problems related to service design and service operation. ITSM can be regarded as a subset of service science that we define as a process- and customer oriented approach for the management of IT as a service. ITSM is customer oriented and relies on several well-defined processes that enable IT services to fulfil the needs and requirements in the service ecosystem (e.g. Göbel and Cronholm 2016). Besides the evaluation of ADR, the purpose of the research project was to design IT artefacts supporting a digital assessment model for service delivery and service innovation. The participating organisations represented IT consultants, municipalities, communication technology and services, and a European Clearing House. The organisations had a high level of pre-knowledge with respect to IT projects, but a low level of pre-knowledge concerning ADR. The researchers had a high level of pre-knowledge with respect to IT projects and a high level of pre-knowledge concerning ADR.

5 Analysis of Empirical Experiences

5.1 Stage 1: Problem Formulation

The purpose of the first ADR stage Problem Formulation is to identify problems perceived in practice or anticipated by researchers (Sein et al. 2011). An identified strength in this phase is that users are encouraged to decide the roles and responsibilities between researchers and practitioners, and to establish a formal researcher-client agreement (see table 1). We perceive these collaborative recommendations as important for supporting the interests of both researchers and practitioner. No doubt, the agreement regarding the roles and responsibilities can affect the research design since how research can be carried out can differ significantly depending on available resources and whether the practitioners act as information providers or as active co-creators of knowledge. Another strength is related to that one purpose of an ADR project is not only to develop innovative IT artefacts, but also to create knowledge about other instances of IT artefacts that belong to the same class as the developed IT artefact (Sein et al. 2011). The analysis has revealed positive experiences concerning the creation of classes of problems, since the recommendation legitimises research as a profession and advises against an IT consultant behaviour consisting of solving an instance of the problem. We have experienced that ADR is useful for open-ended IS research problems that require repeated intervention in organisations to establish the in-depth understanding of the artefact–context relationship. An experienced weakness is that the formulation of researchers' and practitioners' competences is too dichotomised (see table 2). Contrary to the authors of ADR, we have found that researchers as well as practitioners can have both theoretical and practical knowledge.

ADR proposition	Empirical experience from the research project
"Set up roles and responsibilities" (Sein et al. 2011, p. 5)	To establish roles and responsibilities in advance has reduced possible misunderstandings and it ensured that the roles (competence) needed to solve the problem were appointed.
"A researcher–client agreement similar to AR efforts (Davison et al. 2004) can become the basis for mutual understanding of the scope, focus, and mode of inquiry" (Sein et al. 2011, p. 4)	To create a formal researcher–client agreement is a good advice and has clarified both parties' expectations.
"… the action design researcher should generate knowledge that can be applied to the class of problems that the specific problem exemplifies" (Sein et al. 2011, p. 4)	This recommendation emphasises the researcher interest and prevents the researcher from acting as a consultant.
"ADR is useful for open-ended IS research problems …" (Sein et al. 2011, p. 16)	ADR supports the identification of answers to open-ended research problems.

Table 1. Problem formulation: experienced strengths

ADR proposition	Empirical experience from the research project
"Action design researchers bring their knowledge of theory and technological advances, while the practitioners bring practical hypotheses and knowledge of organizational work practices" (Sein et al. 2011, p. 7)	The distinction between researchers' knowledge and practitioners' knowledge is too dichotomised.

Table 2. Problem formulation: experienced weaknesses

5.2 Stage 2: Building, Intervention, and Evaluation

The second stage, Building, Intervention, and Evaluation (BIE), adopts the problem formulations and the theoretical premises developed in stage one. The purpose of BIE is to carry out an iterative process that interweaves the building of the IT artefact, intervention in the organisation, and evaluation. An experienced strength is the recommendation to articulate a class of systems. This recommendation supported us in searching for generic systems' attributes instead of focusing on a restricted solution fitting one organisation. This process was supported by the fact that several organisations participated

in the project.

We viewed each organisation's specific need as an instance, which provided a base for generating the class of systems (see table 3). We have found a similar discussion in Mustafa and Sjöström (2013) who use several cases to make generalisations. Mustafa and Sjöström (2013) claim that "*The iterative character of ADR and the design context including stakeholders representing different RCTs* [randomized controlled trials] *is comparable to three different empirical contexts. This is coherent with the idea of abstracting our work from one case to another …. We thus argue that the principles are generalized outside a single case …*" (pp. 46-47). Another second identified strength is that the iterative process in this stage has supported the shaping of design principles. This is important since design principles represent knowledge about artefacts that belong to the same class (e.g. Purao 2002).

An experienced weakness identified in the analysis is that the process of finding classes should be more detailed (see table 4). Another experienced weakness is that some of the participating organisations were primarily interested in a business solution (instance) that solved their own specific problem (instance). They were not primarily interested in finding a class of problems or solutions. In a collaborative researcher-practitioner environment, this observation constitutes a potential conflict between the researcher's and the practitioner's interests.

ADR proposition	Empirical experience from the research project
"During BIE, the problem and the artifact are continually evaluated, and the design principles are articulated for the chosen class of systems." (Sein et al. 2011, p. 6)	The articulation of the class of systems was supported by the fact that several organisation participated in the project. The iterative process supported the shaping and articulation of the design principles.
" … the action design researcher actively inscribes theoretical elements in the ensemble artifact, thus manifesting the theory "in a socially recognizable form" (Sein et al. 2011, p. 5)	The inscription of theory into useful artefact design closed the gap between theory and practice.

Table 3. Building, intervention, and evaluation: experienced strengths

ADR proposition	Empirical experience from the research project
"… seeks to develop prescriptive design knowledge through building and evaluating innovative IT artifacts intended to solve an identified class of problems." (Sein et al. 2011, p. 3)	The use of the concepts of class and instance indicates that Sein et al. (2011) are inspired by the field of object orientation. Another important object-oriented concept is inheritance. Inheritance means that a subclass inherits certain characteristics or properties of a parent, the super class. ADR encourages users to identify properties in the sub-class (or instance) that should also be valid for the super class, which is a bottom up approach. This is a good way to create the super class. However the new property in the super class needs to be tested against other sub classes to verify that it should be in the super class. The process of working with instances and classes should be explained in more detail. Due to lack of time and sometimes motivation the practitioners were primarily interested in a solution that addressed their own specific business problem.

Table 4. Building, intervention, and evaluation: experienced weaknesses

5.3 Stages 3 and 4: Reflection of Learning and Formalization of Learning

We have chosen to merge the two last stages since they are closely intertwined. The purpose of Reflection and Learning is to apply learning to a broader class of problems. That is, this stage

emphasises that the research process includes more than simply solving a specific problem. The purpose of Formalization of Learning is to use the knowledge from the situated learning in an ADR project and to further develop general solution concepts for a class of field problems. The experiences from our project confirm this purpose since we were able to develop general solution concepts (see table 5). Sein et al (2011, p. 8) claim that the process of generalisation means to *"… move from the specific-and-unique to the generic-and-abstrac*t" but the authors also fully recognise that "*Generalization is challenging because of the highly situated nature of ADR outcomes …*" (p. 8). The problem of generalising from qualitative studies is well known. Rogerson and Scott (2014) have used ADR to conduct a single qualitative case study to structure the research design and they argue making statistical generalisations from the findings is questionable. Lee and Baskerville (2003, p. 230) state that "*In interpretivism, a theory's pertaining only to the setting where it was developed would not detract from its validity or scientific status. At the same time, interpretivism would not prohibit the researcher from extending his or her theory to additional settings*". We do not interpret the recommendation in ADR as statistical generalisation. Rather, we interpret the recommendation as similar to successive expansion (Alvesson and Sköldberg 2009). Successive expansion of the empirical field of theory application within a certain possible domain is both possible and desirable, even for qualitative studies (ibid.). In our study, the class of problem (IT artefacts supporting service providers and customers throughout the entire service lifecycle) has been generalised from several organisations' unique settings and the fact that they belong to different sectors. Another experienced strength is that the emphasis on generalisation is stronger in ADR than in traditional Action Research. In the comparison between positivist science and action research, Susman and Evered (1978, p. 600) claim that action research is "*narrow, situational and bound by contex*t" while Sein et al. (2001) claim that "This move from the specific-and-unique to generic-and-abstract is a critical component of ADR".

We have also experienced that the example provided (ADR at Volvo) could in more detail inform *how* the generalisation processed has been carried out (see table 6). Moreover, we have found that ADR applies a single-organisational perspective and that the generalisation process would be better supported if ADR applies a multi-organisational perspective. As mentioned above, our project included several organisations. Our experience is that these situational organisational contexts have provided a bridge for the process of generalisation.

ADR proposition	Empirical experience from the research project
"ADR project should be further developed into general solution concepts for a class of field problems" (Sein et al. 2011, p. 8)	ADR supports the generation of general solution concepts for a class of problems.
"Generalization is challenging because of the highly situated nature of ADR outcomes that include organizational change along with the implementation of an IT artifact. The resulting ensemble is, by definition, a bundle of properties in different domains. This ensemble represents a solution that addresses a problem. Both can be generalized. This move from the specific-and-unique to generic-and-abstract is a critical component of ADR" (Sein et al. 2011, p. 8)	The process of generalisation has strengthened the design principles from a theoretical perspective. The emphasis on generalisation in ADR is stronger than in traditional AR methods.

Table 5. Reflection of learning and formalization of learning: experienced strengths

ADR proposition	Empirical experience from the research project
"Generalization is challenging because of the highly situated nature of ADR outcomes …" (Sein et al. 2011, p. 8)	The provided example, "ADR at Volvo" is too vague since it could, in more detail, describe the process of generalisation. The process of generalization was supported by the fact that several organisations participated in the project. ADR seems to be developed for a single organisation context.

Table 6. Reflection of learning and formalization of learning: experienced weaknesses

5.4 General Experiences

As mentioned in section 1, IS research must respond to the dual mission of: 1) making theoretical contributions and 2) assisting in solving the problems of practitioners. According to our overall experience, ADR manages to balance the dual mission of making theoretical and practical contributions (see table 7). This experience is in line with Lempinen et al. (2012, p. 55) who claim *"The ADR method is useful both in supporting the research process along the way, and in helping to make a theoretical contribution …"*. Moreover, ADR stresses the need for empirical input from the participating organisation(s). Sein et al. (2011, p. 37) state that existing DR methods *"… value technological rigor at the cost of organisational relevance, and fail to recognize that the artefact emerges from interaction with the organisational context …"*. No doubt, this proposition is considered as a strength, since our experiences are that the organisational context has improved the design of the IT artefact. Another general experience is related to the claim that the IS field continues to lament the disconnection between research and practice (Sein et al. 2011). Gallupe (2007) adds that there is a conflict between responding to practitioner concerns and the methodological rigors required for academic contributions. We have found that ADR has supported us in paying attention to the research interest and the practitioner interest, which provided us with excellent opportunities to combine theoretical knowledge with empirical findings. With respect to rigour, Hevner (2007) states that one purpose of rigour is to connect the research project with the knowledge base to ensure its innovation. Thus, the combination of theoretical knowledge and empirical findings has also meant that research rigour has been supported.

One weakness in a true collaborative researcher-practitioner context is that ADR is written by researchers for researchers (see table 8). Due to this observation, we found that practitioners sometimes experienced the language used in ADR as too abstract. Examples of such abstract concepts are: construct, ensemble artefact, and theory-ingrained artefact. Of course, such concepts are not common in the vocabulary of practitioners and in order to improve the collaborative aspect ADR needs in some respects to be de-academized. Another observation is that the definition of artefact used in Sein et al. (2011) seems to be redefined compared to prior definitions in DSR. Sein et al. (2011) use the term 'ensemble artefact' which is borrowed from Orlikowski and Iacono (2001) and defined as "*…the material and organisational features that are socially recognized as bundles of hardware and/or software"*. Prior definitions in DSR defines artefacts as consisting of constructs, models, methods, and instantiations (e.g. Hevner 2004; March and Smith (1995). We agree with the organisational aspect of the definition used by Sein et al. (2011) but find the definition as too limited since our project, besides a digital tool, also developed other types of artefacts such as models and methods for assessment.

ADR proposition	Empirical experience from the research project
"There is a broad consensus that Information Systems research must respond to a dual mission: make theoretical contributions and assist in solving the current and anticipated problems of practitioners" (Sein et al. 2011, p. 2)	ADR manages to balance the dual mission of making theoretical and practical contributions.
"ADR reflects the premise that IT artifacts are ensembles shaped by the organizational context during development and use" (Sein et al. 2011 p. 1)	The emphasising of the organisational context has improved the design of the IT artefact.
"Identify contributing theoretical bases and prior technology advances" (Sein et al. 2011, p. 5)	The recommendation of viewing practice-inspired problems in combination with theoretical insights has provided excellent knowledge-creation opportunities and it has improved research rigour.

Table 7. General experiences: strengths

ADR proposition	Empirical experience from the research project
"construct", "ensemble artefact" "theory-ingrained artifact"	Concepts used in ADR constitute a communication barrier for researchers and practitioners.
"By ensemble artifact, we specifically mean the material and organizational features that are socially recognized as bundles of hardware and/or software." (Sein et al. 2011, p. 2)	The view of Sein et al. (2011) is that an IT artefact consists of software and hardware. This view is too limited since it excludes other important contributions to theory and practice, such as constructs, models and methods (e. g. Hevner 2004)

Table 8. General experiences: weaknesses

6 Conclusions

As mentioned in section 1, the purpose of this paper is to provide empirical evidence to validate ADR based on primary data. Our literature research has revealed that prior studies reporting empirical evidence on ADR are either fragmented, based on secondary analyses or have had other primary purposes, such as contributing with design principles for specific artefacts. In this paper, we have 1) presented a structure of empirical evidence, 2) based empirical evidence on primary data, 3) anchored empirical evidence to specific ADR stages and 4) classified the evidence as either strengths or weaknesses.

Overall, we can conclude that the central idea in ADR is supported: generate prescriptive design knowledge through building and evaluating ensemble IT and make organisational impact. We can also conclude that ADR is highly relevant for an applied discipline, such as IS, since researchers are expected to fulfil the dual mission of advancing theory while assisting practitioners in solving current and anticipated problems. Furthermore, we can conclude that our empirical evidence confirms that ADR adopts an ontological position where organisational intervention and practitioner collaboration are added to the traditional design research process. More specifically, ADR creates a bridge between user-oriented perspectives of the IT artefact (e.g. Orlikowski 2000) and technological perspectives (e.g. March and Smith 1995). This is especially striking in stage 2 (BIE) and in relation to the two end points of the research design continuum: IT-dominant BIE and organisation-dominant BIE. Both of these BIE types identify a highly collaborative design process. By supporting the evaluation of IT artefacts through the researcher-practitioner collaboration in real contextual settings, the ADR methodology enables the generation of IT artefacts that fulfil true user value and organisational impact.

Moreover, ADR recommends its users to move conceptually *"… from building a solution for a particular instance to applying that learning to a broader class of problems*" (Sein et al. 2011, p. 8). We can conclude that the recommendations to find a class of problems and class of systems have been supported by the fact that our project included several organisations. It seems that ADR is designed for a single organisation context and an extension of ADR is required to also cover a multi-organisation context. Such a multi-organisation context is common in service-oriented settings (such as in our project), which often consist of co-creation between several organisations and a multi-stakeholder environment. The findings representing weaknesses are mainly that there is a need for more detailed descriptions and examples, as well as guidance processes from "Problem Formulation" to "Formalization of Learning".

As mentioned in section 4, the result from this study is based on experiences obtained during one ADR research project that comprised four researchers and 15 practitioners. That is, we view the result as a hypothesis that can be used as input for a survey study among researchers of information systems in order to evaluate agreement and disagreement based on various projects.

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