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Action Design Research as a Method-in-Use: Problems and Opportunities

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Abstract. This paper reports on the results of a study to investigate how scholars engage with and use the action design research (ADR) approach. ADR has been acknowledged as an important variant of the Design Science Research approach, and has been adopted by a number of scholars, as the methodological basis for doctoral dissertations as well as multidisciplinary research projects. With this use, the research community is learning about how to apply ADR's central tenets in different contexts. In this paper, we draw on primary data from researchers who have recently engaged in or finished an ADR project to identify recurring problems and opportunities related to working in different ADR stages, balancing demands from practice and research, and addressing problem instance vs. class of problems. Our work contributes a greater understanding of how ADR projects are carried out in practice, how researchers use ADR, and pointers to possibilities for extending ADR.

Keywords: Action design research · Use · Design science research and practice

1 Introduction

After the publication of action design research as a research methodology [1], a number of projects [2-10] have been initiated or converted to follow Action Design Research (ADR) as their core research methodology. ADR represents a variant of Design Science Research (DSR) [11-13] that privileges the organizational influences on the design and evolution of the artifact, emphasizing the building-intervention-evaluation (BIE) cycles, as an alternative to the stage-gate model, allowing both the researchers as well as the organizational stakeholders to shape the artifact over the research lifecycle. As several new research projects [2-6] have been initiated with the ADR methodology, others [7-10] who completed their work before the publication of ADR have suggested that

they have implicitly followed the tenets of ADR. Scholars in the research community have also examined ADR proposing modifications and/or extensions to the methodology such as a stronger emphasis on how to elaborate the participatory aspect of conducting ADR with stakeholders and users [14-15], or elaborating a focus on agile software development methods as part of ADR [16].

These efforts along with others [17] have resulted in a better understanding of how to position the ADR methodology as a strategy for conducting a particular sub-class of design science research projects that deals two concerns. First, it addresses real world problems (e.g. specific client's problem in an organization), which requires the research team to consider at least two stakeholder groups: the client organization and the research community. Second, it requires that research team balance the specific problem against the need to consider that problem as an instance of a class of problems. How does the research team actually engage with these difficult concerns?

The question may be seen as an effort to understand the sufficiency of ADR, e.g., how it guides the researchers to address the two concerns outlined above. It may also be seen as an effort to understand how researchers operationalize the central tenets of ADR as they engage in research, and identify any problems they may face as they do this. These issues drive the work we report in this paper. We explore how ADR is being used in research projects and to understand the specific problems that researchers may face in operationalizing ADR in specific contexts. We do this by collecting primary data, via interviews of researchers who have used ADR within the context of a project, either ongoing or recently completed. The data is analyzed with a view to surfacing recurring themes, using modified content analysis techniques [18-19].

The key contribution of our work is to reveal how researchers actually use ADR in practice and what their experiences are. Based on such insights, our initial results we report in this paper can provide input for developing best practices that future practitioners of ADR can draw upon. They also suggest directions that may be followed for potential elaborations of ADR in response to concerns that have surfaced.

We proceed as follows. In the next section, we review prior work about the ADR methodology, including more recent efforts to extend the methodology, and briefly outline possible problems about using ADR in practice. Next, we describe the research approach including the use of specific techniques for data collection and analysis. The Findings section outlines key outcomes that resulted from this analysis. We conclude with a discussion of implications, and provide an outlook for next steps.

2 Prior Work

The introduction of ADR [1] was a direct response to the DSR paradigm [11]. ADR was described as a design research method for generating design knowledge through building and evaluating IT-artifacts in an organizational setting. The ADR methodology focused on two major challenges: (1) addressing a problem situation encountered in a certain organizational setting through intervention [e.g. 4]; (2) building and evaluating an IT-artifact, which addresses the class of problems typified by an encountered situation [e.g. 6-7]. Since its publication, ADR has been adopted by several researchers

to solve problems in organizations through building, intervention, and evaluation of IT-artifacts [2-6]. These scholars have communicated their experiences through design principles and design theories to the design science community [5-10]. The central tenets of ADR advocate significant collaboration with key stakeholders and end-users within the organization to encourage active participation and contributions that shape the IT artifact over the research lifecycle [14-16].

The ADR methodology emphasizes the collaborative philosophy by emphasizing the membership of stakeholders within the ADR research team. This allows the team to address the tension between addressing a particular instance of a problem against the demand to deal with a class of problems. Experts and scholars argue and agree that design can never be decontextualized [20]. Scholars also agree, starting from Rittell and Weber [21] that design remains a wicked problem that starts from an issue, a problem [21, p. 5]. The contextual nature of design poses a challenge for how the ADR methodology should be operationalized in practice.

3 Research Approach

To explore how researchers engage in a research project with the use of ADR methodology, we collected and analyzed primary data via interviews with ADR teams. The intent was to gain insights into how they used ADR during the research life cycle and how they addressed any issues that came up. Instead of self-reporting, which can be subject to vagaries of recall and interpretation [22], we collected data for our study via direct interviews. To identify subjects for the study, we located researchers who have published research papers that declared ADR as their core research methodology. At the time of this writing, these interviews continue. In this paper, we report findings based on an analysis of four subjects, selected based on the richness of their responses and the opportunity to share key recurring themes.

The data was gathered via semi-structured interviews following a variation of the critical incident technique [23-24], which suggests procedures for collecting data about human experiences. This allowed the research team to overcome recall concerns by providing the participants the ability to explore key concerns in the context of a specific scenario that they would identify within their ADR project. This was accomplished by encouraging the respondents to recall specific moments that concerned their use of ADR. The interviews were primarily conducted by one of the researchers, sometimes joined by another researcher. The procedure for conducting the interviews included the following phases.

First, an informational meeting was conducted using an audio/video platform, where the participants were asked to recall a specific incident in their ADR project. Using this anchor, the researchers followed a protocol that included initial and probe questions such as: When was it most challenging to work with stakeholders? How did you involve them? During which ADR-stages did they engage more or less? Each interview was recorded and transcribed. The researcher also took notes, which were captured in a document that was securely shared with the respondents, allowing them to adjust and refine the notes, as well as provide additional commentary. A second phase followed,

which included follow-up questions that allowed the respondents to build upon their responses. The same shared document was used to facilitate this phase of data collection, which included questions such as: What elements of ADR would you like to enhance further? How can other researchers engage better in the reflection and learning stage? Do you have any other concerns that you would like to discuss? The two-phase structure for data collection allowed the respondents to separate (a) sharing what they did as part of their ADR projects, and (b) their suggestions for further elaborating or improving the ADR methodology. The recorded interviews, followed by the co-editing of the notes also ensured member-checking [22] that added reliability to our data collection, and partially, to the data analysis process.

Table 1 shows a summary of the subject's structure with essential elements such as the respondents' name, age, gender, domain of research and so forth. Due to an ethical agreement with the respondents, we do not explicate the respondents' actual name and age.

Table 1. Respondents and Summary of Data Collection

Name	Age	Project	Research Domain	Status	Length (Minutes)
Aaru	39	Dissertation	IS and Health Care	On-Going	58
Sofia	42	Dissertation	ICT for Smart Cities	Completed	38
Nasib	34	Dissertation	Competence Management	On-Going	32
Rafael	37	Dissertation	Innovation Ecosystems	On-Going	52

We coded the data following an open coding [18-19] approach to identify themes and categories to reveal how the researchers used ADR in their respective research projects.

4 Preliminary Findings

Several categories emerged from our analysis. We report some of these, first as impressions across the different ADR stages, and then in terms of the two specific concerns identified earlier. We note that the respondents (Sofia and Rafael) mentioned that they only loosely followed ADR stages although reported that the inspiration for their work could be described as ADR, and two other respondents (Aaru and Nasib) followed ADR implicitly during the earlier stages due to project initiation in 2010. However, all respondents described their categorical choice to frame and communicate the results of their research as outcomes of ADR projects, citing correspondence to the ADR tenets. Due to the small number, we do not report frequencies, relying, instead, on actual quotes from the respondents and interpretations.

4.1 Working with ADR Stages

Several themes emerged from the data. During the first stage, problem formulation, the researchers did not describe crafting of a research question as a key concern. Instead,

their concerns centered around working with stakeholders and addressing different priorities of stakeholders. Multiple respondents described this concern thus:

[it was] difficult to involve stakeholders from health care due to accessibility and time priority. Furthermore, Stakeholders did not take part of this stage due to lack of awareness of ADR in general (Aaru)

A living lab was established to involve stakeholders. Overall, the stakeholders were accessible and involved through focus groups, workshops and interviews. (Sofia)

Due to high degree of accessibility, there were no difficulties with involving stakeholders through daily work activities such as meetings and discussions. But it was a big challenge keeping them happy and motivated all the time. (Nasib)

Comments about the second stage, building, intervention and evaluation, continued this focus on working with the stakeholders. The respondents mentioned that the ongoing interactions suggested by ADR were clearly instrumental in making this stage a success. With mechanisms such as agile development, they were able to engage in the BIE stage with the stakeholders. Multiple respondents described this concern thus:

Efficient and rewarding to demonstrate increments of the IT-artifact continuously through workshop sessions. (Aaru)

[we] worked together through an agile approach to deliver early mock-ups and functionality. (Sofia)

Stakeholders were gathered to share their own data and mindset towards building a new artifact. They felt motivated when interacting with early prototype versions. (Rafael)

The third stage, reflection and learning, produced the most varied responses. Most respondents, however, commented about difficulties related to ongoing reflection and learning, and the need to document lessons learned. In response, they described the use of mechanisms such as workshops, which may provide specific opportunities for capturing reflections. Multiple respondents described this concern thus:

Difficult to document reflection and learning continuously, but easy to conduct dedicated workshops. (Aaru)

This stage was removed and replaced with a stage for defining design requirements. This due to the notion that reflection and learning occurred all the time, and was not necessary as a separate stage. (Sofia)

Workshop sessions were conducted for reflection and learning. However, there were a great lack of documenting the outcomes continuously in the project. (Nasib)

Table 2 describes the themes.

Table 2. Recurring Themes about Working in Different Stages of ADR

Theme	Description	Stage
Stakeholder Access, Awareness, Priorities	• Access was not a significant concern • Researchers used different approaches to work with stakeholders • Awareness on the part of the stakeholders was a possible obstacle	Problem Formulation
Ongoing Stakeholder Engagement	• Early and frequent stakeholder interaction a motivating factor for stakeholders	Building, Intervention,

	• Researchers used strategies such as agile development to facilitate this stage	Evaluation
Problems with Ongoing Reflection and Learning	• Reflecting and document continuously considered difficult • Researchers used strategies such as dedicated workshops • One researcher (who managed ongoing reflection) removed it as a separate stage	Reflection and Learning

4.2 Balancing Expectations from Industry Partners and Research Community

Three key themes emerged from the analysis related to balancing expectations from the industry partners and the research community. The respondents leaned towards seeing this as a concern to be managed. They acknowledged that ADR provided an opportunity to address a relevant problem and a chance to produce research outcomes.

They described this dichotomy between solving real-world problems and distilling design knowledge as an ongoing issue to be managed. They described it thus:

the stakeholders [could] see that the system worked because we delivered small increments of the IT-artifact so that the stakeholders could interact and evaluate early on… (Aaru)

we conducted 5 big workshops in the living lab and had discussions through base camp… we felt that early iterations were useful for balancing outcomes for practice and research… (Sofia)

the design iterations generated both outcomes for new design and functionality, but also input for formalization of learning for research … (Sofia)

but the key success was to deliver everything coupled to the IT-artifact through small batches, and have some progress… (Nasib)

at the same time, it was rewarding for research because we could write and publish preliminary findings… (Rafael)

As the illustrative quotes above show, the balancing concerns manifested in a number of ways. Table 3 describes the themes we were able to discern from this data.

Table 3. Recurring Themes about Balancing Expectations

Theme	Description and Consequences
Impedance Mismatch	• The speed of business for the organizational partners versus the need for slow deliberation important for research writing was cited by respondents as a recurring problem • Research activities [were perceived as] slowing things down • Ongoing, incremental delivery of functionality via the IT artifact was considered a way to overcome the problem
Keeping the Research Team Engaged	• The multi-disciplinary composition of the research team meant different individuals within the research team were busy at different times • Keeping the industry partners engaged and motivated remained an ongoing concern • Researchers conducted activities (e.g. workshops) focusing on different areas of interest to keep the industry partners interested and motivated
Separate but Equal	• Involving stakeholders in discussion of research outcomes was not considered fruitful

	• The researchers needed to make an effort to continue generating outcomes such as versions of prototypes and also generate research outcomes based on preliminary findings

4.3 Balancing the Problem Instance-Class Dichotomy

Here, respondents shared insights about how the practical problems were formulated working the stakeholders, whereas research problems were identified and formulated by the researchers alone. This lack of reciprocity among the stakeholders, practitioners and researchers was described by multiple respondents thus:

The research team had their research questions that were formulated within the research groups, which consisted of psychologists, doctors, nurses, IS-researchers etc… (Aaru)

however, the problems for research were identified by us researchers throughout the ADR-stages, and not separately identified… (Sofia)

people were mostly involved when they were brainstorming about ideas for developing the software and so forth… (Nasib)

the stakeholders were not interested in producing knowledge, but more interested in the actual artifact instead… (Nasib)

so it was hard to allocate class of problems for research together with stakeholders… this was done by us researchers instead … (Rafael)

An analysis of this data revealed three concerns across the respondents. Table 4 describes the themes we were able to discern from this data.

Table 4. Balancing the Problem Instance-Class Dichotomy

Theme	Description
Problem Identification and Evolution	• With multi-disciplinary teams, problem identification remains a problem (likely because of disciplinary requirements) • New and interesting research problems continue to crop up as the team engages in the research life cycle
Taking on Research Responsibility	• Hard to involve stakeholders for casting the problem instance to a class • Easy to focus on solving the problem and ignore the class of problems • Identifying the class of problems requires making a choice
Focus of IT Artifact Easier	• It is easier to describe and elaborate features of the IT artifact • It is easier to elicit and document solution requirements for the IT artifact • It is important to cast these in terms of a class of problems

5 Discussion and Next Steps

In this paper, we have taken initial steps towards investigating the use of ADR in actual projects. Based on an analysis of data gathered from lead researchers in four ADR projects, we find that ADR did provide support to the research activities, such as continuously building, evaluating and demonstrating early prototype versions, and engaging in close collaboration with industry partners to allow mutual shaping of the IT artifact.

The preliminary findings also reveal that researchers continue to find it difficult to balance the (sometimes conflicting) demands from industry-partners versus those of the research community (e.g. impedance mismatch, see Table 3). This is also manifested in the need to focus on problem instance vs. considering the class of problems (e.g. problem evolution, see Table 4).

We note that there are a number of prior research streams that the research community can draw upon to further understand and develop solutions to these concerns. For instance, our preliminary findings indicate that there exists an interest for positioning and distinguishing ADR from other DSR-methods. ADR is not positioned as an explicitly isolated DSR-method. This due to the fact that it is used in multidisciplinary research settings by a team of researchers, practitioners, stakeholders, and end-users. Furthermore, ADR is – as indicated by our findings and previous use of ADR – considered as compatible for retrospectively framing and reporting research findings to a dual community of practitioners (e.g. through the prototype) and researchers (e.g. through scientific concepts such as design principles and theories). This implies that the ADR-method is flexible and adjustable for solving real world problems and generating knowledgeable learning outcomes. Finally, our preliminary findings also suggest possibilities for further refinements to ADR such as greater guidance for engaging in reflection and deriving outcomes such as design principles. We hope that theses initial findings will provide the impetus for greater dialog within the research community to develop practices and refining the ADR approach for further research.

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