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RESEARCH ESSAY



# An elaborated action design research process model

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**ABSTRACT**

This research essay proposes an elaborated process model for applying the action design research (ADR) approach to immersive industry-based projects. Building on the original ADR concepts, we identify four distinct types of ADR cycles for diagnosis, design, implementation, and evolution of the growing artefact-based solution. Each ADR cycle moves through activities of problem formulation, artefact creation, evaluation, reflection, and learning. Rapid iterations of ADR cycles provide a well-defined process map for managing and performing an emergent ADR project. The proposed model supports multiple entry points based on the current state of the problem environment and the goals of the ADR project. The elaborated ADR process model provides a more flexible yet disciplined inquiry into the initiation, conduct, reflection, and presentation of rigorous and relevant ADR projects.

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## 1. Introduction

Action design research (ADR), presented in the seminal paper by Sein, Henfridsson, Purao, Rossi, and Lindgren (2011), provides an insightful structured process model for combining the activities of action research (AR) (Susman & Evered, 1978) and design science research (DSR) (Hevner, March, Park, & Ram, 2004). ADR is used effectively in many research projects and, because of its ever-expanding applications, the ADR concepts and process model continue to grow and evolve to meet the demands of new and challenging environments.

A recent research project of ours employs an ADR approach to the design and development of a novel artefact instantiation in a new IT solution class – an Inter-Organisational Social Networking Information System (IO SNIS) – also known as an Enterprise Social Network System. The project required that we intervene *in situ* with practitioners in the mid-market private equity (MMPE) domain who are interested in opportunities associated with the cost and efficacy of online social networking to identify deal-making opportunities in the MMPE space (Mullarkey, Hevner, & Collins, 2013). During the performance of this research, we identified several key opportunities to more fully elaborate and actualise the ADR process model in order to aid the conduct of each intervention cycle and to make more explicit the knowledge generation in ADR studies. Our immersive experience in this project provided the occasion to reflect on how an elaborated ADR process model could better support users to structure the key decisions and activities necessary to rigorously apply ADR. Section 2 expands on our project experiences. This leads in Section 3 to a detailed discussion of the elaborated ADR process model. In Section 4, we present a brief review of recently published ADR projects and analyse their mappings to the new process model. Section 5 discusses the implications and applications of the proposed model. The final Section 6 presents our conclusions, research limitations, and directions for future research.

## 2. Reflecting on an ADR project

In our IO SNIS research project, we faced the challenge of applying ADR to a complex, "wicked" problem where no artefact existed to address the opportunities and problems of replicating offline inter-organisational social behaviour in an online environment. (Appendix A provides a more detailed overview of the research context.) To begin, we focused on the initial diagnosis and design of an innovative information system as a problem solution. We found that every iteration of our intervention with practitioners provided opportunities to build and evaluate needed design artefacts. These early artefacts included defining concepts, system requirements, problem and solution models, design principles, and design features. Long before we actually built an instantiated system, these iterative ADR cycles added increasingly

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greater design knowledge from the abstraction, evaluation, reflections, and learnings for each artefact.

For the initial design of our ADR process, we adapted the BIE (build, intervention, evaluation) stage in the ADR process model as presented in Sein et al. (2011). A key contribution of the BIE cycle is the close integration of artefact build and evaluation in context. We identified and defined the problem context and then demonstrated the importance of an innovative artefact solution with the client organisation. We determined at the outset that the ADR process must generate design knowledge that creates innovative artefacts and addresses an organisational need for intervention. Following the dictates of action research, we conducted this investigation of the phenomenon through multiple iterative interventions of the researcher–practitioner team in the problem domain. Throughout these iterative interventions, we recorded our adaptations and alterations to the ADR process model for later reflection towards the development of the elaborated model presented here.

Once we had agreement among the researchers and practitioners on the problem and its theoretical grounding but before we could "realise" (i.e., implement) an instantiated information system, we found that we needed to better understand the problem space, i.e., perform problem diagnosis activities. We observed in the ADR process that these activities occur as a function of the artefact build, intervention, and evaluation (BIE) stage of the process. We found that before the organisation (or researchers for that matter) were willing to invest in the realisation of the ensemble information system, a significant set of interventions were required that focused on first diagnosing the need for an ensemble artefact and then additional interventions were required to jointly create possible conceptual designs for the ensemble artefact. Each iterative intervention cycle produced different artefacts for these activities of diagnosis and design.

As we studied our use and adaptation of the ADR process, we recognised that the iterative, emergent cycle of researcher–practitioner intervention could be better visualised as a sequence of iterative cycles of four different types (diagnosis, design, implementation, and evolution) instead of packing all activities into a single Build, Intervention, and Evaluation (BIE) stage. We recognised that the various contributions to knowledge throughout the ADR process would differ as the ensemble artefact creation emerged gradually through the stages of diagnosis to design to implementation and eventually to evolution over time. We also realised that the variety of socio-technical artefacts produced by a research project is dependent on the starting state of the problem environment and the goals of the project.

Finally, we recognised that in ADR researchers could and should emphasise the contribution to knowledge of every single artefact built and evaluated in each iterative cycle. The elaborated ADR process model as presented in the next section unpacks the steps within each ADR cycle, emphasises the intervention possible in each stage, values each artefact built and evaluated, and positions those artefacts on a longitudinal expression of design and implementation of ensemble information systems.

By identifying an agile pattern of interventions within and between each of these ADR cycles, we also support the possibility of multiple ADR project entry points. We posit that researchers conducting ADR might start a project anywhere along the timeline of ensemble system instantiation. For example, a researcher might have missed the opportunity to participate in an organisation's initial activity to diagnose the need for a system. In that case, the researcher might start their interventions in the building and evaluation of design artefacts. Equally possible in our experience, the researcher might only have access to intervene *in situ* once the system is in its implementation or evolution stage at a given organisation. In each of these cases, we believe it to be essential for clear understanding to communicate explicitly which stage of ensemble artefact instantiation is at play in the ADR project.

## 3. Elaborating the action design research process model

The original ADR process model identifies a four-stage approach to the application of the AR paradigm in a DSR study. (See Sein et al. (2011), Figure 1, p. 41.) The four stages are:

(1) Problem Formulation
(2) Building, Intervention, and Evaluation (BIE)
(3) Reflection and Learning
(4) Formulation of Learning

The first three stages form an iterative cycle with the research (i.e., learning) results captured and formalised in the final stage. To assess their ADR method, the authors of the seminal paper ground their study with an example of an ADR project they conducted with Volvo to adapt a competence management system (CMS) for use by IT and human resources (HR) knowledge workers (Lindgren, Henfridsson, & Schultze, 2004). Their discussion of the ADR method draws from that case. The authors enter the research study with an implemented IT instantiation in use by the organisation under study. Their point of entry for the research focuses on the existing artefact (TietoPersona/HR) as an IT solution class of CMS. They begin their ADR study in the Problem Formulation stage by working through an "examination of HR literature [to identify that] TietoPersona/HR lacked the dynamism necessary..." [p. 46]. They describe the next step,

> Based upon the results of the problem formulation stage, the ADR team decided to explore a new direction. The BIE stage was initiated by envisioning CMS

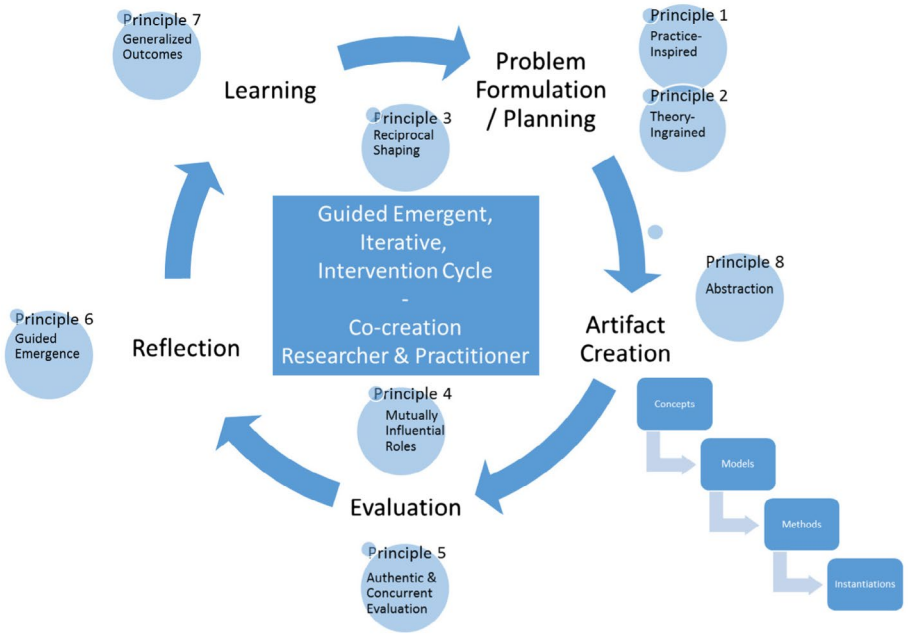


**Figure 1.** The elaborated action design research (ADR) cycle.

> that employed a skill based (as opposed to job based) model of competence…

Thus, given their point of entry, the authors iterate from an existing system via a reformulation of the organisational motivation to requirements for a new instantiated ensemble system. They then iterate through the design and then the implementation of that new ensemble system in the IT solution class chosen.

Thus, in the first BIE stage of the ADR project, they investigate the problems with the existing artefact and research various options to modify the artefact in several iterative cycles with the practitioners until it becomes clear that the environment requires a modified CMS artefact. They describe their intervention with the practitioners as occurring in the BIE stage 2 of ADR. In action research (AR) though, prior researchers including Sussman Susman and Evered (1978, pp. 588–589) find an opportunity for, and in fact encourage, researcher–practitioner intervention in "all or nearly all phases" of the cyclical process of action research.

In our research project, we applied the ADR process to a problem where no ensemble system existed to address the problem of replicating offline inter-organisational social behaviour in an online enterprise environment. We were initially unsure of the need for a new artefact. Thus, before we were able to use the ADR stages on an existing instantiation we needed to investigate aspects of the problem at a much earlier point of entry. We needed to consider and evaluate the fundamental principles of how and why social networks exist, how they exist to impact PE firms, and how instantiations of Social Networking Information Systems (SNIS) for interpersonal networks (e.g., Facebook) might inform the nature of SNIS for the PE Firm. These activities all appeared to us to be types of diagnosis that are needed before designing a new ensemble instantiation.

### 3.1. *Elaborating the activities in an ADR cycle*

The ADR approach itself is quite new and benefits from continual elaboration that marries experience with one or more ADR engagements and with additional grounding in the action research and DSR paradigms. The two concepts at the heart of AR are (i) the researcher and practitioner co-creation and (ii) the iterative intervention cycles (Baskerville, 1999). We find that the details of the BIE engagement in ADR in Sein et al. (2011) are in large part left open to interpretation by the researcher. Our ADR experience (Mullarkey et al., 2013; Mullarkey & Hevner, 2015) led us to unpack the BIE stage in ADR to show that (1) intervention is a core concept in the ADR process and should occur with each ADR cycle and (2) the activities of evaluation (E), reflection (R), and learning (L) occur in each ADR intervention cycle. We found that our practitioners could better relate to a very explicit ADR Cycle (Figure 1) as compared to the BIE diagram (Sein et al., 2011, Figure 1, p. 41.)

Figure 1 elaborates on the activities and principles we find inherent in any ADR intervention cycle. Each intervention cycle (applying the ADR principles of *Reciprocal Shaping* and *Mutually Influential Roles*) supports the full range of ADR activities from problem formulation and planning to artefact creation, evaluation, reflection, and formalisation of learning. The new insight here is that we make explicit the abstracted artefact built and evaluated in every ADR cycle. We also require the reflection and learning to be performed in every cycle – in large part because it informs the problem formulation for the next ADR cycle. The elaborated ADR cycle capitalises on

gaining an understanding of the different nature of the artefacts produced within each intervention cycle and what is communicated to researchers and practitioners at the completion of that cycle (McKay & Marshall, 2001).

The Artefact Creation activity involves the creation and implementation of the artefact. We observe that the exact nature of the artefact created will depend upon the stage of the ADR process in which the researcher–practitioner team is currently engaged. There are many types and forms of artefacts that can be created in any ADR cycle or anywhere along the ADR process continuum. The building and evaluation of innovative socio-technical artefacts (be they constructs, design principles, features, models, tools, and/or instantiations) are the key to DSR. At any given point of entry for an ADR effort, it becomes apparent that the nature and type of artefact being built and the approach and criteria for evaluation are dependent on that point of entry and the type of intervention that occurs with practitioners.

We show the key ADR concepts (intervention, guided emergence, co-creation) at the centre of the cycle as fundamental to the conduct of each activity on the cycle. We also expect every cycle to go through a Problem Formulation, Artefact Creation, Evaluation, Reflection, Learning sequence of activities. The elaborated ADR cycle incorporates the key activities and principles of the current ADR process model with the key addition of the Artefact abstraction activity as a generalisation of the build activity. We complement the original seven ADR principles found in Sein et al. (2011) with a new Principle 8 – *Abstraction* that supports the creation of different levels of artefact abstraction for the current state of research goals in the problem environment (Gregor & Hevner, 2013). An ADR engagement will normally move through multiple intervention cycles that shift among stages of diagnosing, design, implementation, and evolution. We posit that the ADR cycle as elaborated can be used as a generic template at all the different stages in the elaborated ADR process.

### 3.2. Elaborating the ADR stages

Figure 2 provides a view of our proposed four-stage ADR Process model with clear paths of forward progress and feedback loops as required by the emerging project. The important insight we discovered in our project and in our review of ADR projects in literature is that each of the stages supports multiple iterations of the ADR intervention cycle seen in Figure 1 of Problem Formulation/Action Planning (P), Artefact Creation (A), Evaluation (E), Reflection (R), and Formalisation of Learning (L).

As we discovered in our ADR project, the researcher–practitioner intervention can begin with a thorough investigation and diagnosis of the problem domain and an evaluation of IT solution classes. The goals of this first ADR stage, which we term the *Diagnosis* stage, are to analyse the importance of the problem domain and the relevance of the IT solution class to research and practice with mutual agreement among the researcher–practitioner team (Mullarkey & Hevner, 2015). This involves identifying the relevant kernel design theories, any existing socio-technical artefacts, and the goals of the ADR project. There are two critical areas of learning during the *Diagnosis* stage. The researcher must understand the application domain of the project to include specific knowledge of the practitioner's organisation with its strengths, weaknesses, opportunities, and constraints. At the same time, the practitioner must become aware of the existing knowledge base of research and practice in the fields of study that will inform the design and evolution of the intervention artefact.

Our emphasis on diagnosis often leads the researcher and practitioner to spend more time and effort in initiating ADR. This emphasis is consistent with the "four pragmatic premises" outlined by Baskerville and Myers (2004) if we are to insure that the built artefact informs

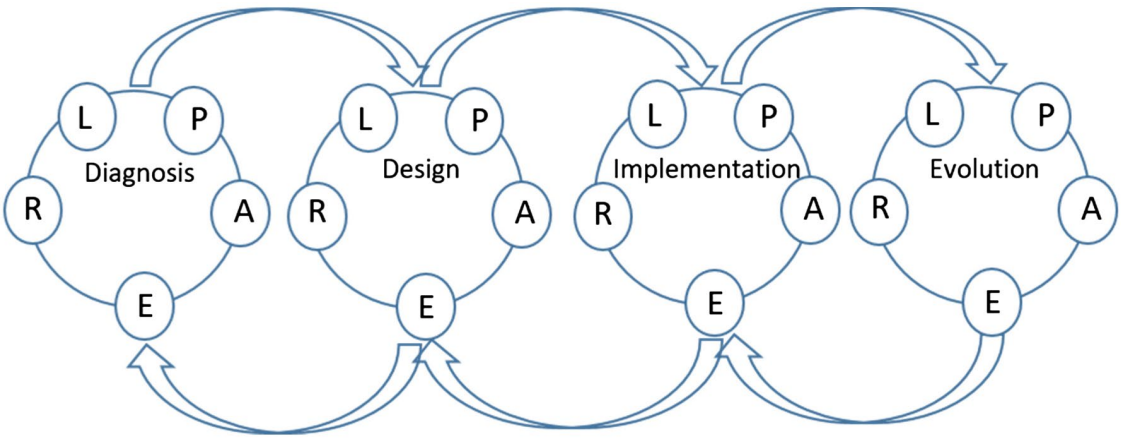


**Figure 2.** The four ADR stages.

both research and practice. This emphasis on diagnosis also supports a more abductive reasoning approach as proposed by Lee, Pries-Jeje, and Baskerville (2011) where more than one possible solution – and even a "do nothing" solution – to a given problem may exist in the design and implementation of a useful IS artefact. In our project, we went through two iterations of the *Diagnosis* cycle to discover and define the problem domain and to evaluate adjacent solution domains (Mullarkey et al., 2013). The artefacts that are built and evaluated in a diagnosis stage can be requirements definitions, technical specifications, and conceptualisations of the problem and solution domains.

The second key stage in our research project focused on the identification and conceptualisation of the proposed artefact design. We term this the *Design* stage of the ADR process. It provides a set of activities over the search space of possible design candidates. Through one or more iterative cycles within the design stage, design principles emerge that address the problem class identified via diagnosis and move towards the implementation of an IT solution. Here, collaborative intervention with co-creation activities is essential as the researcher–practitioner team create designs that incorporate innovative ideas to solve the given problems. Human cognitive and social skills are applied to make clear contributions to both the problem environment and the knowledge base of the field (Hevner et al., 2004; McKay & Marshall, 2001).

The *Design* stage may be iterated as the problem solution evolves over time in the research project. In our project, we iterated through two *Design* cycles as we developed and evaluated design features and then formulated design principles for the desired IO SNIS system. Typical artefacts designed and built in the ADR *Design* cycles include design principles, design features, models, architectures, and implementation methods. Sein et al. (2011) make the design stage an implicit activity within their BIE stage. We find that a more explicit separation of the *Diagnosing* from *Design* and *Design* from *Implementation* stages is more consistent with our experience.

The third stage of the ADR process supports the instantiation of artefacts through an *Implementation* activity at the client organisation. In the *Implementation* cycles for our project, we are actively engaged in building and evaluating our inter-organisational social networking information system as a software system instantiation at the MMPE client. A real-life intervention provides the opportunity to perform onsite evaluations of the efficiency and effectiveness of the proposed design as realised *in situ*. Typical artefacts abstracted and evaluated in the ADR *Implementation* cycle include systems, algorithms, programmes, databases, and processes.

Finally, we propose a fourth ADR stage as the *Evolution* of the artefact over time as the problem environment changes and the artefact solution evolves to meet these changes. We note that the evolutionary processes of problem re-formulation, technology advancements, design improvements, refactoring, and continual re-engineering interventions may be a long-term organisational project and will continue to generate knowledge useful to researcher and practitioner. We find that there is a need to re-consider instantiated artefacts at some point after implementation and during or after adoption as to how they evolve over time. In Section 4, we provide evidence that many other ADR research projects iterated flexibly within and between these four stages.

### 3.3. Multiple ADR process entry points

Another key observation gained from our ADR project is that different problem environments will require different entry points for initiation (Mullarkey & Hevner, 2015). We argue that the abstraction of artefacts at all ADR stages informs research and practice and that the nature of innovative artefacts is often different depending upon the ADR stage involved. In addition, many research-worthy artefacts exist long before the full instantiation of an information system, including models, constructs, design principles, and innovative design features. All of which researchers should consider potential contributions to research and practice. The distinction we draw in Figure 2 is that DSR artefacts can be built and then evaluated in each cycle of any given ADR stage. The artefact built in a given cycle is built and evaluated in order to address the problem formulated in that ADR cycle. Each iteration learns from one or more prior cycles and modifies the problem formulation for the next cycle of the research project.

Thus, there are separate starting points possible in any ADR intervention by researcher–practitioner teams. If the ADR activity begins with an initial goal of identifying design principles (possibly, because the team already has a solid grasp from prior work on the problem and solution domains) then the team will tend to enter the ADR Process with one or more ADR *Design* cycles. The formalisation of learning in each of those cycles will lead either to another cycle in the definition of design artefacts or it could propel the ADR investigation onward to an ADR *Implementation* stage or directionally back in the process model to better understand the problem in an ADR *Diagnosis* stage.

The nature of research communication (e.g., publication) also favours a focus on parsimonious pieces of "bite-sized" research contributions. Publication typically allows for a research focus on only a part of any given IS technology, class of problem, class of solution, or stage in an ADR study. Having a more detailed ADR process that provides multiple points of entry for researchers facilitates the consideration of research contributions often required to obtain publication in top-tier journals. As an applied discipline, IS research frequently demands

a cyclical process of abstraction, evaluation, iteration, and modification of theories, constructs, artefacts, and impacts where a clearly understood starting point is needed as researchers identify and communicate the contributions of their research.

To visualise multiple points of entry, we find it informative to overlay the ADR process stages on the DSR process (DSRP) model of Peffers, Tuunanen, Rothenberger, and Chatterjee (2007) as seen in Figure 3. We appropriate the multiple entry points of the DSRP model to position the interventions in the ADR stages. This alignment clearly shows that four potential entry points for the ADR process are possible and it identifies where the communication of an ADR entry point enables the researcher to better position the research and communicate its contribution to research, practice, and innovative artefact development. In fact, the Peffers et al. (2007, p. 72) authors speculate that the DSRP model "could be used as a structure to present action research."

Based on this mapping, we propose four entry points for the elaborated ADR process model as described in Table 1. These entry points provide clear options for project starting points that support well-defined goals and directions for researcher/practitioners teams as they begin their immersive collaboration.

### 3.4. The fully elaborated ADR process model

Integrating the proposed extensions from the previous three subsections, we suggest an elaborated ADR Process Model as presented in Figure 4.

We believe that for any given problem class and innovative technology solution class, the research point of entry could occur at any one of the stages in an ADR investigation. In fact, we argue that the researcher–practitioner team has an obligation to identify the point of entry that motivates their current ADR study. We also observe that the ultimate goal in ADR as in DSR is the production of one or more innovative artefacts. Since the nature and type of innovative artefact identified, built, and evaluated will vary with the ADR stage involved, the new process model will facilitate the knowledge creation and communication by articulating the point of entry for the research conducted. When performed in adherence with the ADR method, the artefact within each intervention cycle will be constructed by the researcher–practitioner team in the problem space and be relevant to the problem at that point on the research continuum of the ADR process model.

Peffers et al. (2007) discuss their DSR process model as being structured in a "nominally sequential order" but go to lengths to assure the researcher that there "is no expectation that researcher(s) would always actually proceed in sequential order from activity 1 through activity 6" in the DSRP. (p. 92). They find that a DSR project might "start at almost any step and move outwards". Likewise, we find that multiple entry points in ADR provide the project team with the flexibility to support interventions and contributions along the complete project life cycle.

In summary, we see the elaborated ADR process model with multiple entry points as a very effective way for researchers to visualise and communicate the goals and execution steps of their ADR project. The model clearly shows the ADR Stages, the activities within each of the ADR stages, the problem class, the IT solution class, the intervention domain, and the innovative artefacts being created and evaluated within each cycle. We contend that this elaborated ADR process model significantly improves the facility with which ADR researchers

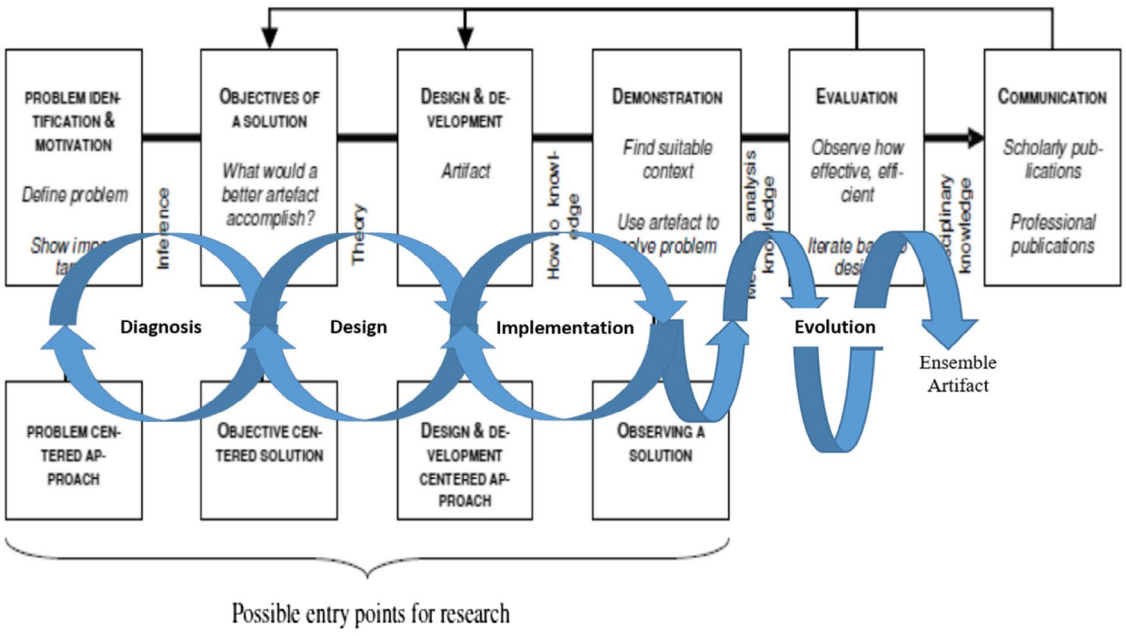


Figure 3. ADR process and DSR process models overlay (Ref: Peffers et al., 2007).

**Table 1.** Elaborated ADR entry points.

| Entry Point Titles | Description | Activities | Questions |
|---|---|---|---|
| Problem-centred | Understand and define the specific research problem; Understand and define the solution space | Problem Identification; Motivations and Goals for ADR Project | What is the problem to be solved in practice?<br>What are the research goals of the project?<br>Why do existing solutions fall short? |
| Objective-centred | Explore the design options based on project objectives; Generate design knowledge of what is feasible in the solution space | Solution Design; Development of Design Principles | What would a better artefact accomplish?<br>What are its critical design principles and features?<br>What is possible?<br>What is feasible? |
| Development-centred | Develop an ensemble instantiated artefact (e.g., system to address research problem; Demonstrate satisfactory solution | Solution Implementation; Demonstration of Solution | How does the instantiated artefact solve the problem?<br>How to evaluate the goodness of the solution? |
| Observation-centred | Observe existing system in context; Identify possible evolution opportunities for system improvements | Improvement Goals; Evolution Possibilities for Existing Systems | How has the solution continued to solve the problem?<br>How has the problem changed and demanded changes/improvements to the solution? |

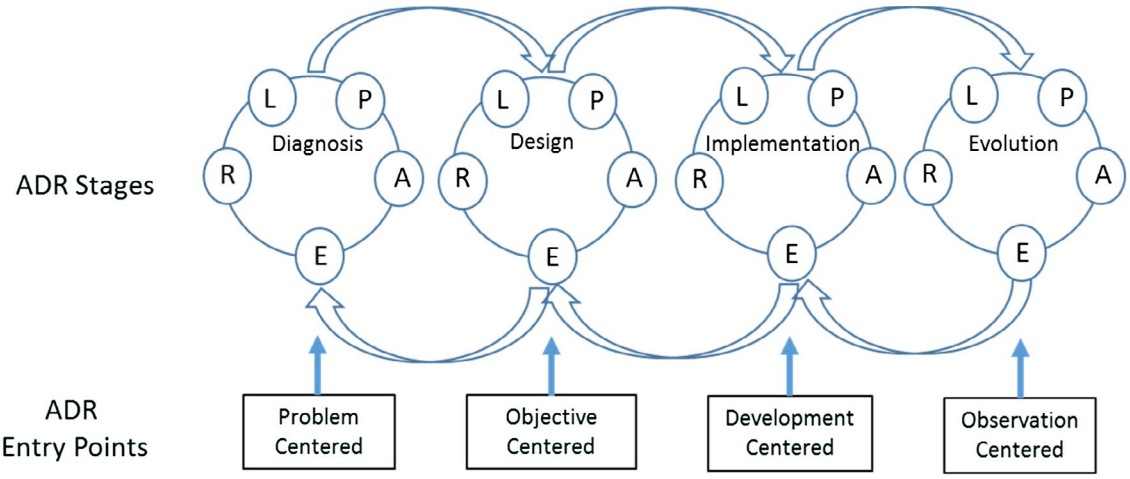


**Figure 4.** The ADR process model with research entry points.

can conduct research in this paradigm and consistently report knowledge contributions.

## 4. Evaluating the elaborated ADR process model

To provide a level of face validity to our proposed elaborated ADR process model, we study a selected set of ADR projects that have been reported in the research literature since the appearance of the Sein et al. (2011) paper. Our evaluation method is similar to the pragmatic analysis approach used by Peffers, Rothenberger, Tuunanen, and Vaezi (2012) in their investigation of the extant literature on how DSR artefacts are evaluated. We identified a convenience sample of published papers that reported completed ADR projects with clearly defined artefacts. We began by reviewing all citations of the Sein et al. (2011) found in a Google Scholar online search at the beginning of 2017. Across this group of 761 research papers, we found a representative sample of research projects that use ADR in real-world application contexts. After eliminating papers that reported on the same project, we narrow the sample to a group of 80 papers. In-depth reading of these articles found that 20 papers describe projects which create identifiable IS artefacts. Consequently, we analyse these 20 articles (see Table in Appendix B) that we consider a representative sample of the ADR literature.

We coded each of the 20 reported projects on the IT Solution Class, the Problem Class, the Intervention Domain, and the Artefact produced. We found a wide range of application domains including record management, smart cities, Internet of Things, virtual reality, and knowledge management across multiple industries. Our primary goal in our analyses is to map each of the ADR projects to the newly proposed ADR process model of Figure 4 in order to identify evidence of research entry points and ADR stages of intervention. We look to see if, in fact, real ADR studies enter the ADR continuum at different stages of intervention. Second, we attempt to understand the number and types of intervention cycles reported in the ADR paper. Third, we consider

the potential benefits to researchers and practitioners of the proposed elaborated ADR process model as used as a means of creation and communication of knowledge.

We order the research projects in Appendix B by their discovered entry points. We find that a detailed reading of the 20 articles allows us to classify the authors' motivations for the conduct of the research, which leads to identifying a starting point for their research inquiries. In the 20 examples, 12 projects have *problem-centred* entry points. These projects are motivated to create and evaluate *Diagnosis* artefact types to include nascent design theory, critical success factors, problem definition, and requirements definition. These projects begin by questioning the reason for an IT/IS instantiation to solve a particular need. In many cases, they show an iteration within the *Diagnosis* ADR cycle and in some cases the research documents further intervention cycles in the *Design*, *Implementation*, and *Evolution* ADR stages from the initial problem-centred entry point.

Four projects are identified to have *objective-centred* entry points. These projects are motivated by the researcher–practitioner desire to understand what a "better artefact would look like" (Peffers et al., 2007). The articles describe situations where the need for the IT Solution is not in doubt. In these cases, the ADR interventions create and evaluate *Design* artefact types including design principles, features, constructs, and models.

Two projects have a *development-centred* entry point. Here, the ADR interventions tend to evaluate existing instantiations. Where the instantiation evaluation depends upon multiple stakeholders and/or utility in multiple settings/environment, multiple iterations within the *Implementation* ADR stage are described. Where the evaluation questions the utility of the instantiation, a feedback iteration of the *Design* ADR stage occurs. The remaining two projects have *observation-centred* entry points and the ADR researcher–practitioner effort starts with an implemented instantiation with a goal to support the effective *Evolution* of the existing artefacts.

Nine of these ADR projects describe a situation where the ADR effort stayed in the ADR stage associated with the entry point. In many of these projects, the articles describe more than one ADR cycle iteration within that ADR stage. They also tend to describe one or more artefacts generated by the multiple ADR cycles.

Several of the ADR studies, however, also offer exemplars where the research describes movement between more than one ADR Stage. Our research project, for example, as reported in Mullarkey et al. (2013), begins with a problem-centred entry point. We perform two *Diagnosis* intervention cycles in order to fully understand the practitioner application domain and potential IT solution class options. Once sufficient understanding of the problem is achieved, the project advances in the ADR process to the *Design* intervention stage. Again, we perform two *Design* intervention cycles in order to develop conceptual model artefacts of a proposed IO SNIS for MMPE firms. As another example, the project descripted in Schacht, Morana, and Maedche (2015) identifies the movement of the ADR researcher–practitioner interactions from *Diagnosis* to *Design* to *Implementation* and then from *Implementation* to *Design* to *Implementation*. The research describes the ways in which multiple iterative cycles occurred within these stages and how the learnings within stages informed movement to the next stage. Keijzer-Broers, Florez-Atehortua, and de Reuver (2016) describes a similarly complex evolution of the ADR Process within and between ADR Stages.

Overall, we find the use of the terminology and framework of the elaborated ADR process model enhances the communication and understanding of the ADR stages that occurred. To illustrate, Westin and Sein (2015) describe the execution of multiple ADR cycles along the path from initial diagnosis to design, implementation, and evolution of a fully implemented instantiation of an innovative Information Quality System (IQS) in the construction engineering domain. Examining their timeline of the project (Figure 4, p. 10), it appears that the intervention team conducts several iterations of the ADR cycle in a phase they call Problem Formulation and that we term *Diagnosis*. Their multiple iterations ultimately lead to the definition of a new design concept for a data quality control system – the IQS. The first half of their next stage – BIE 1 – describes the conduct of design specifications and basic architecture development. In our model, those iterative efforts would occur in the *Design* stage of the ADR process where the intervention team has a specific objective in mind but intervenes to create and evaluate the design principles, features, and architectures. The second half of their BIE 1 describes the iterative ADR cycle activities we term *Implementation*. At this stage the team is development-centred around having "implemented the first set of rules for TestP … implemented automatic IQ5-report … starting training of end-users" (Westin & Sein, 2015, p. 16). Then, the authors report an evaluation of the consequences of the implementation that forces the intervention team to re-diagnose and re-define the problem and solutions domains. Our ADR process model would describe that same progression as a return to the *Diagnosis* stage. The project then enters BIE 2 which is a series of iterative cycles back through *Design* to *Implementation* and the start of *Evolution* for the new technology solution.

The ADR project analyses shown in Appendix B provide a representative, but by no means exhaustive, typology of cases cross-referenced by ADR stage, entry point, problem class, IT solution class, intervention domain, and designed artefact. An ADR project typology of this nature at once reinforces the richness of the elaborated ADR process model and the importance of

establishing the research goals and starting points of the ADR project. The majority of the cases identified in this survey are problem-centred and start with the ADR *Diagnosis* stage. The ADR research projects that do not start with *Diagnosis*, however, can be described more effectively in the context of the appropriate entry point. Moreover, when an ADR project demonstrates a feedback iteration from *Implementation* to *Design* or from *Design* to *Diagnosis*, the proposed process model facilitates the communication of the process at play, the artefact(s) constructed and evaluated, and the design knowledge gained. There are interesting opportunities for researchers to better understand and evaluate the goals and results of ADR projects based on their entry points into research.

## 5. Discussion

The elaborated ADR process model proposed in this essay is the result of the authors' experiences in performing an ADR project on a challenging real-world project. The model elaborations were identified and developed through "hands-on" experience and were found necessary in order for us to complete the research project. We note that this research approach is quite similar to the research approach in the seminal Sein et al. (2011) ADR paper. Their conceptual ADR model was built from experiences in a research project on competence management systems at Volvo IT. They saw a need for an innovative ADR process model and filled it. We have done the same with our elaborated ADR process model, which elaborates and complements the original process model.

Each of our proposed extensions supports a fuller understanding of how researcher/practitioner teams perform ADR research:

- The ADR intervention cycle of Figure 1 clearly identifies the need for the five activities of Problem Formulation/Planning (P), Artefact Creation (A), Evaluation (E), Reflection (R), and Learning (L) in every performed ADR intervention cycle. The recognition that a new artefact at varying levels of abstraction is built in every cycle is explicitly highlighted. We add an eighth ADR principle to expressly encourage researchers to identify the socio-technical artefact built and evaluated within each ADR cycle at its appropriate level of abstraction. Guided by the eight ADR principles, a fuller understanding of the goals and activities of each well-defined ADR intervention cycle is achieved. This "chunking" of the overall project into well-defined iterative cycles provides invaluable management guidance and it insures the discipline of evaluation, reflection, and learning within each cycle.
- The four different ADR stages of Figure 2 effectively unpacks the overloaded BIE stage of the original process model. By distinguishing stages of *Diagnosis*, *Design*, *Implementation*, and *Evolution*, the project team can better understand and achieve clear goals with different artefacts produced to achieve those goals. Each of these four stages has a distinct set of objectives, techniques, set of artefacts, and results for use in the application domain.
- The ADR entry points shown in Figure 4 support essential understandings of project goals and offer ADR teams a means to communicate how they get started in their ADR research study. We draw from the entry point rationales found in the Peffers et al. (2007) paper to build a similar argument that ADR research teams enter a project at different points of problem and solution maturity. Every project must assess their goals and intended research contributions to determine the right starting point in the ADR process model. Then as learning evolves based on the completion of ADR stages, the research project will discover its most effective path of movement in the process model to achieve a desirable set of artefacts and research contributions.
- The elaborated model provides a more detailed, open, and transparent view of the activities of an ADR project. Such transparency allows the researcher–practitioner teams greater opportunities to evaluate and analyse the socio-technical artefacts produced and the resulting changes made to the application context in iterative cycles. The ethical and political implications of what it means to design and implement an improved solution can be more effectively addressed in this more open ADR process model (Agerfalk & Wiberg, 2018).

Current and future ADR research teams can use the elaborated ADR process model to develop research designs that better reflect their project goals and support clearer project management and research designs. Two issues that deserve further discussion are the perception of the ADR stages as a "waterfall" model and the overloaded use of the term "problem".

### 5.1. Scheduling ADR Stages

As we discovered in our ADR project review in Section 4, many of the projects move flexibly among the four ADR stages. There is clear evidence that teams move between these ADR process stages in both forward and backward (i.e., feedback) directions. The flexible movement between ADR stages supports an agile, sprint-based approach that aligns with the goals of many organisational ADR projects. While these four stages of *Diagnosis*, *Design*, *Implementation*, and *Evolution* are on a natural continuum as shown in Figure 2 there is no implied "waterfall" progression in execution. Project teams may perform the ADR stages in any order based

on the entry point of the project and the results of prior stages in the project execution.

### 5.2. Problem as an overloaded term

It is always a challenge to use overloaded terms, such as "problem", in precise ways as we develop conceptual research models. In this essay, we use "problem" in three distinct forms:

- The Problem Formulation and Planning *activity* happens within each intervention iteration of the four ADR stages.
- The problem *Diagnosis stage* occurs when the research team performs an ADR intervention cycle in order to analyse the problem domain and IT solution class for the conduct of the research.
- The problem-centred *entry point* denotes that the research project begins at a point where the problem domain is not well understood and the first ADR stage to be performed is a *Diagnosis* cycle.

Based on common usage of these terms, we would find it inconvenient and confusing to substitute other terms for "problem" to describe these concepts. We are confident that the extended discussions in Section 3 sufficiently clarify our use of the above ideas.

## 6. Conclusions, limitations, and future directions

The action design research (ADR) paradigm has been effectively and consistently applied in a number of interesting research contexts as illustrated by the example papers surveyed in Section 4. As its use expands, researchers will gain new understandings of how best to perform ADR and will continually evolve the ADR techniques and processes accordingly. Thus, the goals of this essay are to present an elaborated ADR process model based on reflections and learnings from a challenging and immersive ADR project that we performed in the context of inter-organisational social networks for deal making in mid-market private equity firms.

The elaborated ADR process model supports the researcher–practitioner teams in several important ways. Every research project faces the immediate question of "Where do we start?" The presence of multiple entry points with clear definitions allows the team to investigate their project goals and identify the entry point that best aligns with the project's purpose. Next, the ability to view the project as a well-defined sequence of discrete, well-defined intervention cycles (i.e., research chunks) provides an essential intellectual control to the project management and the strategic planning of the project directions. An understanding of the emergent, iterative nature of successive intervention cycles keeps the goals and resources of the ADR project-bounded, under management control, and consistent with the action research paradigm. Another key insight is the longitudinal nature of an ADR project. The system artefacts under study will evolve over time and multiple ADR projects may research the underlying issues and opportunities for the same system. The evolution stage of the elaborated ADR model specifically differentiates the initial design context and subsequent evolutionary design contexts.

A key addition to the activities in the ADR intervention cycle is the inclusion of the Artefact Creation activity. This activity highlights the essential artefact build activities that are central to the DSR process. We contend that each ADR intervention cycle must introduce an impactful artefact into the application context. The abstract nature of the new socio-technical artefact will vary depending on the ADR stage of the intervention (Gregor & Hevner, 2013). Thus, a *Diagnosis* artefact may be a concept or a nascent theory. A *Design* artefact may be a model, method, or set of design principles. An *Implementation* artefact may be a system instantiation. An *Evolution* artefact may be a new or improved artefact of any of these types. This important insight is captured by our addition of the new ADR Principle 8, *Abstraction*, which states that every ADR intervention cycle will introduce an artefact at the appropriate level of abstraction for the stage of project activity and goals.

The proposals in this paper derive from our experiences in a single focused ADR project. This is a limitation in that a different set of experiences in a different project context may lead to a different set of recommendations and elaborations of the ADR process. To mitigate this limitation, we consider these models of the ADR cycle and the elaborated ADR process in the context of other key published ADR exemplar cases. Our goal is to share this set of learnings with the ADR community in hopes of providing a richer and more complete ADR process model for future use in a manner that aids in the execution and the communication of results of ADR studies. Over the past three years, the authors of this essay have presented these ideas to approximately 800 students, faculty, and industry researchers as a rigorous approach for performing ADR projects. The model has been received enthusiastically and has been applied effectively in a number of industrial and doctoral ADR projects demonstrating a compelling "proof of use" validation (Nunamaker, Briggs, Derrick, & Schwabe, 2015). We believe that as more IS researchers understand and apply the elaborated ADR methods that the field will engage in more relevant research projects that will support better resonance with practitioners and industry stakeholders (Dreschler, Hevner, & Gill, 2016).

An important direction for further research is the inclusion of design theory development in the ADR process model. A question remains as to where in the model this activity should be placed. Baskerville (1999) speaks to the opportunity to have theory emerge through iterations of action research cycles. He finds that a theoretical contribution emerges through the increased

understanding of the nature of the problem and the IT solution class that offers a measure of generalisability. McKay and Marshall (2001) suggest that two iterative cycles occur simultaneously and in parallel in what we call an ADR Cycle. They propose that one cycle tends to inform research even as the other cycle is informing practice. Both articles suggest that an important distinction from consulting, when conducting AR, is this generation of guidance that informs research. We believe that the elaborated ADR process model can offer a way to generate nascent theory emergence through each iterative intervention within and between stages in ADR Process. A future direction is to employ the proposed ADR process model to not only inform practice and research on the development of innovative artefacts but also to iterate the nascent, emergent design theory to inform IT artefact design and use across problem domains, IT solution classes, and intervention domains (Venable, 2006).

Another important direction for future research is the application of the elaborated ADR process model to the conduct of specific projects with practitioners that demonstrate its utility across various applications of design based research. There may be a need for further elaborations and adaptations of the model in different application domains, such as health care, education, or government. Further, practitioners from multiple application areas can be brought together in common ADR projects by use of a shared process model and produce innovative artefacts of value across disciplines.

Finally, like any rigorous research method, the detailed ADR intervention cycle (Figure 1) and the ADR stages in the elaborated ADR process model (Figure 4) can and should continue to evolve with procedures, techniques, and outcomes that increase the disciplined inquiry into the action research and design science research paradigms. A future direction will be to specify learnings that further elaborate the ADR processes and methods as used in actual projects. Our initial survey of ADR papers serves to highlight areas of intersection (IT solution class x artefact type x problem class x entry point) that may be un(der)explored across the corpus of interesting IT artefacts, systems, and solutions. Identification of these gaps can provide researchers and editors with a means to identify and evaluate the research and practice contribution potentials of additional ADR studies. We contend that ADR researchers have an opportunity to report knowledge contributions by the number and types of ADR cycles conducted at one or more stages in the ADR Process in their formalisation of knowledge contributions.

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## Appendix A. Research project summary

As researchers with expertise in Design Science Research (DSR) and Action Design Research (ADR), the authors were invited to participate in a collaborative research project with a Mid-Market Private Equity (MMPE) firm that was exploring opportunities to build an inter-organisational social network information system (IO SNIS). Their problem revolved around the need to identify and close proprietary deals to acquire (or divest) a corporate entity. On the surface, this problem seems to be a relatively simple class of problems until one realises that the typical MMPE firm only completes two or three deals per year, each with enterprise values ranging from $10-$250 million. A prototypical firm in this space might have a portfolio of just 5–15 corporate entities at any given time. Notably, the scale of this problem domain is impressive. In April 2015 alone, there were 231 completed U.S. private equity deals totalling more than $86 billion in capital invested. Moreover, the number of deals in April 2015 was up 5% from the prior month (Cook M&A Advisory Services, 2015).

There are only two ways to find a MMPE deal: (1) Commit to a public auction of an entity that is for sale and succeed as the highest bidder or (2) Use the firm's social network to identify a proprietary deal to buy or sell a company that is not in the public–private equity domain. Of the two approaches, the second typically offers the greatest value to the MMPE for the equity committed (Sutton Place Strategies, 2012).

Historically, MMPE firms, including our research partner organisation, built their IO SN through an expensive commitment of time and resources on meetings, site visits, tele/video-conferences, trade association participation, and multi-media marketing. Our research with the MMPE firm combined with existing industry research indicated that these firms spent 35–50% of expenses on finding deals with a heavy emphasis on locating proprietary deals through the firm's network of brokers, lawyers, limited partners, business owners, and consultants. Incredibly, the average MMPE has visibility to just 21.1% of deals in their target landscape (Sutton Place Strategies, 2012). Our MMPE firm wanted to know if there was a more effective and less expensive approach for building and maintaining a social network using an information system. They desired a digital, online social network that could replicate their "offline" social network much the same way that interpersonal SNIS (like Facebook and LinkedIn) have affected the landscape of social interaction.

Our investigation began with a diagnosis of the problem domain and IT solution classes. We researched social network theory and the advantages, disadvantages, and linkages to offline social networks of the relatively new interpersonal SNIS. We evaluated all the digital networks for MMPE in existence and ascertained that although the firm was paying for online services that were advertised as private equity networks, these networks were really vehicles for the conduct of deal transactions. Short-term, non-contractual inter-organisational networks like these are typical of market-based transactional environments. Social-based inter-organisational environments, on the other hand, are typified by long-term, cooperative, reciprocal interaction based upon resilient trust (Mullarkey, 2012). Our MMPE was not participating in any online social networks. Until we intervened with a theory-ingrained investigation of what it really meant to be a true 'inter-organizational social network,' the practitioners did not recognise that their online, transactional, low-trust, short-term PE networks could not replicate their offline social behaviours – and therefore would never identify non-auctioned, proprietary PE deals.

As we followed the ADR method of Sein et al. (2011), we noticed that before we could move to system design, we needed cycles of problem diagnosis to investigate the nature of social networking between organisations. Our first ADR diagnosis cycle produced a theoretical construct of inter-organisational social networking and a second cycle, informed by the first, identified all MMPE digital networks used in the domain and evaluated them against the theoretical construct of the first cycle. Both cycles generated interesting artefacts to evaluate and knowledge that informed future ADR design cycles. Upon reflection and learning in these first two cycles, we discovered the need to unpack the ADR steps in BIE into separate diagnosis and design stages with different artefact abstractions (Mullarkey & Hevner, 2015).

Upon completion of these first two diagnosis cycles, we identified that the online PE networks that the firm was participating in (and paying significant sums to join) were simply more efficient ways to gain visibility to those non-proprietary (and less attractive) deals already publicly offered. More importantly, after five years of participation in these market-based online networks, the firm had not completed a single deal from these sources. We also identified that the design of an inter-organisational SNIS would have to be somehow similar to but different from the existing IP SNIS. SN theory demonstrated that individuals interact differently than the ways that organisations interact socially. We recognised that there appeared to be no examples of SNIS for MMPE (Mullarkey, 2012). The learnings from two diagnosis cycles informed our approach to the design stage of our ADR study.

In our design stage we first dissected the features of IP SNIS that distinguished them from the way individuals interacted in social networks offline. This feature set was our first design artefact and was evaluated to inform the second cycle in the design stage. Our second design cycle, built and evaluated a set of principles for the design of an inter-organisational SNIS that could take advantage of the features of IP SNIS and adapt them to the fundamental nature of inter-organisational social behaviour. These innovative design principles were evaluated through an intervention with the firm and generated learnings and reflection that were able to inform the movement of the project to a development team to implement the design through the creation of an instantiated IO SNIS.

Consequently, our ADR study generated the observation that unpacking BIE and explicitly abstracting innovative artefacts in iterative intervention cycles are fundamental and necessary to the conduct of rigorous ADR studies. We used these insights to inform our development of the elaborated ADR process model presented in this essay.

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## Appendix B. Listing and analyses of representative ADR projects

| ADR Project | Stages/EntryPoint | Knowledge Contributions |
|---|---|---|
| Bilandzic and Venable (2011) | Diagnosis<br>Design<br>Implementation<br>–<br>Problem-Centred | IT Solution Class: Urban Informatics (UI)<br>Problem Class: Shared community or societal issues (non-profit)<br>Intervention Domain: Ubicomp<br>Artefact: Innovative UI Design Features and Ensemble artefact |
| Lepinen, Rossi, and Tuunainen (2012) | Diagnosis<br>Design<br>–<br>Problem-Centred | IT Solution Class: Relationship management system (RMS)<br>Problem Class: Stakeholder engagement & power differences in inter-or-ganisational (IO) relationship management<br>Intervention Domain: Public organisation<br>Artefact: Design Principles for IO RMS |
| Marjanovic (2013) | Diagnosis<br>Design<br>–<br>Problem-Centred | IT Solution Class: Team net based learning (TNBL) systems<br>Problem Class: Large lecture classes for information systems<br>Intervention Domain: Large classroom environment higher education<br>Artefact: Model and eventual instantiation |
| Maccani, Donnellan, and Helfert (2014) | Diagnosis<br>Design<br>–<br>Problem-Centred | IT Solution Class: Smart city maturity model (SCC CMF)<br>Problem Class: Digitally connecting internet of things to sustainable city<br>Intervention Domain: Dublin city with public council and private corpo-ration<br>Artefact: Model |
| Coenen, Donoshe, and Ballon (2015) | Diagnosis<br>–<br>Problem-Centred | IT Solution Class: Virtual Reality (VR)<br>Problem Class: Living labs where new systems are tested in simulated "real-life"<br>Intervention Domain: Societal (non-organisational) context<br>Artefact: Innovative VR Constructs |
| Westin and Sein (2015) | Diagnosis<br>Design<br>Implementation<br>Evolution<br>–<br>Problem-Centred<br>–<br>Problem-Centred | IT Solution Class: Information data quality control systems<br>Problem Class: Insufficient Data/Information Quality (DQ/IQ)<br>Intervention Domain: Construction engineering with paradigm of concurrent engineering<br>Artefact: Information Quality System (IQS) |
| Nordstrom and Axelsson (2011) | Diagnosis (4 iterations reported)<br>–<br>Problem-Centred | IT Solution Class: Knowledge Initiatives (KI)<br>Problem Class: IS Systems Maintenance and Update<br>Intervention Domain: Simulation with role play involving eight organisa-tional experts<br>Artefact: Principles for KI design |
| Pluijment, Molnar, and Proper (2013) | Diagnosis (1 iteration reported)<br>–<br>Problem-Centred | IT Solution Class: Enterprise Engineering<br>Problem Class: Enterprise systems selection and deployment<br>Intervention Domain: Interviews with key systems stakeholders<br>Artefact: Critical Success Factors for system selection and deployment |
| Tunkelo, Hameri, and Pigneur (2013) | Diagnosis (Many iterations)<br>Design (Many iterations)<br>Implementation (1 iteration reported over 1 year)<br>Evolution (anticipated)<br>–<br>Problem-Centred | IT Solution Class: Software Process Improvement (SPI)<br>Problem Class: Distributed software platform development<br>Intervention Domain: Multinational post-merger/acquisition legacy systems<br>Artefact: SPI KPIs, Reengineered software platform, Reengineered software process |
| Mullarkey et al. (2013) | Diagnosis (2 iterations)<br>Design (2 iterations)<br>–<br>Problem-Centred | IT Solution Class: Social Networking Information Systems (SNIS)<br>Problem Class: Social network-dependent organisations<br>Intervention Domain: A US Mid-Market Private Equity firm (MMPE)<br>Artefact: Innovative Design Principles |
| Keijzer-Broers et al. (2016) | Diagnosis (1 iteration – 11 stakeholder interviews)<br>Design (3 iterations: 1 iteration of 59 interviews; 2 iterations of focus groups)<br>Implementation (4 parallel scrum iterations; 3 iterations of user workshops)<br>Evolution (1 iteration of multiple stakeholder experience survey)<br>–<br>Problem-Centred | IT Solution Class: Integrated Daily Living Health and Wellbeing Patient Platform<br>Problem Class: Prototype an IT platform to inform healthcare providers of patient needs<br>Intervention Domain: Elderly patients in Living Lab environment<br>Artefact: 3 Design Features, Functional Requirements, Non-functional Requirements, Defined Platform Framework, Critical Design Issues, Pro-ject Plan, Architecture Template, Mockups, Alpha version of Platform, Market release Prototype Patient/Provider Platform |

(*Continued*)

| ADR Project | Stages/EntryPoint | Knowledge Contributions |
|---|---|---|
| Schacht et al. (2015) | Diagnosis (3 iterations total - 1 secondary source; 1 interview iteration with 27 stakeholders; 1 secondary literature iteration)<br>Design (5 iterations – 1 design decision iteration; 1 design concepts iteration; series of three focus groups)<br>Implementation (2 iterations – 1 simulated KMS artefact; 1 instantiation)<br>Design (2 iterations – 1 adaptation of design principles; delineation of 4 design principles)<br>Implementation (- instantiate Just Know; a Knowledge Reuse artefact as a Pilot)<br>-<br>Problem-Centred | IT Solution Class: Knowledge Management System (KMS)<br>Problem Class: Design and redesign of a KMS<br>Intervention Domain: Financial services provider<br>Artefact: Meta-requirements, Preliminary design principles, Functional requirements, Design decisions, Conceptual design, Pilot-simulated KMS artefact, Pilot KMS instantiation informed by "Knowledge Reuse" |
| Noce and Carvalho (2014) | Design<br>–<br>Objective-Centred | IT Solution Class: Integrated Business Intelligence Management Systems (BIMS)<br>Problem Class: Public sector business management practices<br>Intervention Domain: Public institution – the Court of Auditors, Mato Grosso, Brazil<br>Artefact: Innovative Ensemble BI Design |
| Dibia (2015) | Design (5 applications × 2 iterations)<br>–<br>Objective-Centred | IT Solution Class: Wearable digital device (Samsung Gear 2) Human Computer Interface (HCI)<br>Problem Class: Software creation for wearable devices<br>Intervention Domain: Examination of design aspects of the Gear 2 crowdsourcing contest – one developer team, 5 applications, with cross-team technical exchanges<br>Artefact: Six User interaction design principles |
| Niemi and Laine (2016) | Design (7 iterations – 2 primary interviews, 1 secondary data collection, 4 participatory workshops)<br>–<br>Objective-Centred | IT Solution Class: Competence Management Systems (CMS)<br>Problem Class: Generalising design principles from KnoMe software solution<br>Intervention Domain: Siili Solutions PLC competence management service<br>Artefact: Five Design Principles |
| Mayer, Roder, Hartwig, and Quick (2014) | Design<br>–<br>Objective-Centred | IT Solution Class: Management support system (MSS)<br>Problem Class: Identification of subjective information needs in functional requirements definition<br>Intervention Domain: Software development<br>Artefact: Design guidelines |
| Sein et al. (2011) | Implementation<br>Design<br>Implementation<br>–<br>Development-Centred | IT Solution Class: Competence Management Systems (CMS)<br>Problem Class: Knowledge-intensive organisations<br>Intervention Domain: Volvo IT, HR workers<br>Artefact: Innovative adaptation of CMS using a new skill-based paradigm |
| Menschner and Leimeister (2012) | Implementation (4 iterations *in situ*)<br>–<br>Development-Centred | IT Solution Class: Knowledge-Intense Person-Oriented Services (KIPOS) Information Systems<br>Problem Class: Realising IT instantiations for systematic development of an IS<br>Intervention Domain: Development of a KIPOS on Nutritional Advisory for Obesity<br>Artefact: Rapid Implementation using EPOS Method of a new KIPOS Instantiation |
| Sherer (2014) | Evolution<br>–<br>Observation-Centred | IT Solution Class: Electronic Medical Record/Electronic Health Record<br>Problem Class: Healthcare effectiveness<br>Intervention Domain: Healthcare Providers<br>Artefact: Extended Ensemble EMR/EHR |
| Tanskanen, Holmström, and Öhman (2015) | Evolution (1 iteration - 55 stakeholder interviews across 3 stakeholder groups; 1iteration – experts synthesis of design propositions)<br>–<br>Observation-Centred | IT Solution Class: Construction Logistics IT Systems (On-site Shop) VMI<br>Problem Class: Generalise constructs, theory, and principles of innovative instantiated system<br>Intervention Domain: Construction site logistics IS users<br>Artefact: Design Theory, Design Constructs |